CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The marker is arranged to provide incoming class screening in offices equipped with tandem screening.

A.2 The marker is arranged to prevent scoring the trouble intercept, blank number intercept, and regular intercept registers on test calls.

B. CHANGES IN APPARATUS

B.1 Two 13J lamps, (RBL) and (RSL), are added to figure 53 and designated "QZ" option.

B.2 Contact protection networks (IF), 177K, are added to figure 75 and designated "PN" option.

B.3 Resistance (IF), KS-13490-L3, 33,000 ohms, is added to figure 75 and designated "PN" option.

B.4 "OFH1" contact protection is changed from 0.5 MF 160 ohms, designated "PM" option rated MD, to 0.5 MF 100 ohms, designated "PN", option rated STD.

B.5 UB codes are specified as indicated for the following relays:

(CVO0-99), UB 19;
(EX7), UB 14; (GSA1-4), UB 20;
(LP), UB 25; (OSA0-9), UB 19;
(RGTA), UB 21; (SPLC), UB 14;
(TGS3), UB 21; (TXD), UB 24;
(TXC1-9), UB 24; (ARN5), UB 32;

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO ADDED OR REMOVED APPARATUS

C.1 The following relay requirements are changed:

(VFTO-4) (PCN)
(VGTO-11) (MBSO-9)
(HGTO-9) (NCNC)
(BNTH) (NCCN)
(LTR) (TCNC)
(TOS) (TCCN)
(PPX) (CAA)
(PNC)

D. DESCRIPTION OF CIRCUIT CHANGES

The following changes apply to combined or completing markers:

D.01 When two (S-) relays are operated on party mis-matches in offices arranged for split classes of party service, fuses C15, C17, and C18 will fail. Also a cross, multiplying two route series relays may cause either or both relays to operate on a call.

The changes introduced in the marker to prevent these conditions are:

(a) Two 13J resistance lamps, (RBL) and (RSL), are added to figure 53.

(b) Options "QY", (Mfr. Disc.), and "QZ", (Std.) are added.

(c) New non-operate requirements are specified for relays (TOS), (PPX), (PCN), (PNC), (MBSO-9), (NCNC), (NCCN), (TCNC), (TCCN), and (CAA).

D.02 A new equipment arrangement, as shown in figures 269 and 353, permits subsequent expansion to 10 outgoing sender groups and 8 outgoing sender connectors.

This is being applied on all jobs leaving the shop wired in accordance with Issues 23-B and 24-D.

D.03 Wiring changes associated with the operating circuit of the (ND1) relay have been introduced in the marker. They permit the Automatic Progression Trunk Test circuit (SD-25938-01) to use the marker (MT12) relay to block the marker from sending an AMA signal to a sender although allowing the sender to pulse. This wiring change is designated as "TF" option which was originally added on Issue 24-D of the marker circuit for Automatic Progression Test Circuit features.

D.04 Where tandem screening is provided the marker gives service treatment based on the tandem class mark, "TANO-4," received. The marker is changed to use the "TAN4" class relay to screen two or three digit tandem outgoing codes received in error from trunks marked "INC" which are entitled to terminating service only, or to screen one or two digit codes where the same code is used by trunks marked "INC" to indicate completion in the No. 5 office and by trunks marked "TANO-3" to indicate a distant destination.

The changes introduced in the marker to provide these features are:

(a) Wiring option "PL", (Std.), has been added and is associated with the (INCO) and (TAN4) relays.

(b) Notes 102, 103, and 346 are changed.

D.05 Changes are added to the marker to prevent locking conditions at contacts [illegible] of the (OFH 1) relay. These contacts are in the operating circuit of the Incoming Trunk (F) relay. The changes are:

(a) Options "PM", (Mfr. Disc.), and "PN", (Std.), are added.

(b) A 177K contact protection network designated (IF) is added to figure 75.

(c) A 33,000 ohm, 0.5 Watt resistor, KS-13490-L3, designated (IF) is added to figure 75.

(d) "OFH1" contact protection is changed from 0.5 MF 160 ohms, designated "PM" option rated MD, to 0.5 MF 100 ohms, designated "PN" option rated STD.

D.06 It was found that under certain conditions of line identification on a dial tone usage the (VFTO-4), (VGTO-11), and (HGTO-9) relays may buzz. To correct this condition new circuit requirements are specified for these relays.

D.07 The marker is arranged to prevent scoring the trouble intercept, blank number intercept, and regular intercept registers on test calls.

The marker changes added to prevent the scoring are:

(a) Circuit figures AX, (Std.), and AW, (Mfr. Disc.), are added. These figures cover only wiring changes.

(b) Changes are made in Notes 101(F), 102, and 103.

D.08 Changes are added in the marker to permit proper operation with the PBX Allotter Circuit, and will be applied in the shop in all markers arranged for PBX Allotter operation introduced on Issue 24-D.

These changes are:

(a) Wiring changes associated with the (TR2B), (SPL), (THO/7), and (PBX2) relays are designated "SU" option. Wiring changes associated with the (TYM1), (NAR1), (NAR3), (ANR1), and (NGB) relays are shown in figure 142.

(b) Terminal assignments for the "TBA0-9" leads in figure 245 are rearranged.

(c) "XAN" and "AN" leads of figure 307 are interchanged.

(d) Fusing information for fuses C71 and B37 is changed in Note (101(A).

D.09 When the marker releases from an outgoing call under light traffic conditions, a false XTB indication may occur because of a race condition which permits two (TB-) relays to be energized.

The changes necessary in the marker to correct this condition are:

(a) Wiring changes associated with the (DISA) and (RCY) relays are designated options "PR", (Std.), and "PQ", (Mfr. Disc.).

(b) Changes are made in Notes 102 and 103.

D.10 A circuit is added in the marker to score the trunk link frame "TCB" traffic register where 290 line capacity line link frames are used, and fig. Q, shown on issue 18-B, is provided.

The changes necessary in the marker to provide this circuit are:

(a) Wiring associated with the (CB2) and (CB4) relays is changed and designated options "PS" (Mfr. Disc.) and "PT" (Std.).

(b) Changes are made in Notes 102 and 103.

D.11 When applying the circuit requirement table tests to the (BNTH), (AST), and (BST) relays, parallel circuits exist through the number group.

To correct this condition, the following changes are made:

(a) Wiring associated with the (BNTH), (AST), (BST), (TX), and (BX) relays is changed, and designated options "PV", (Std.), and "PU", (Mfr. Disc.).

(b) Circuit requirement information for the (BNTH) relay is changed.

(c) Changes are made in Notes 102 and 103.

D.12 Additional cross-connection information between punchings is specified in figure 135 and Note 349 to allow the marker to use the presort feature with Foreign Area Translation. No wiring or other equipment changes are required.

D.13 Changes are added in the marker to prevent false operation of the (FCG) relay due to switchboard cable capacity where cable runs between the marker and trunk link frame or between the trunk link frame and line link frame are long.

The changes necessary in the marker to correct this condition are:

(a) Circuit requirements for the (LTR) relay are changed.

(b) Wiring associated with the (FCG) and (LTR) relays in figures 30 and 106 is changed and designated options "PX", (Std.), and "PW", (Mfr. Disc.).

D.14 Changes are introduced in the marker to prevent operating the trunk link frame (LV-) relay fuse when misdialing produces 3 out of 5 in the office code digit patterns. These changes are:

(a) Wiring associated with the (TSE1), (TS19), and (MXT) relays is changed and designated options "PZ", (Std.), and "PY", (Mfr. Disc.).

(b) Changes are made in notes 102 and 103.

D.15 The following changes are made on this issue to clarify notes, to facilitate manufacture, and to correct errors in the marker SD drawing so as to bring it into agreement with shop drawings.

(a) Definition of tandem classes in note 342 is clarified.

(b) Cross-connecting information between "VP" and "TSO-45" is deleted in note 342.

(c) Cross-connecting information between "CVR" and "TSC-" terminals is specified in note 342.

(d) Information pertaining to the use of (S-) relays for providing different treatment according to subscriber class in tandem screening, is deleted in note 342.

(e) Cabling diagram information for the "FAT" punchings is changed in figures 343 and 359.

(f) Terminal "TGC 1" is added to Fig. 81.

(g) Resistance information for the primary winding of relay (SLK) is connected. Note 118, previously omitted in error is added.

(h) "LIT" punching designation is added to figure 357.

(i) "RO" lead termination in figures 301, 308 and 359 is changed.

(j) Note 103 is changed to include figures 134 and 135.

(k) Information at "C211-C911" terminals of figure 38 is changed.

(l) The "OC2" lead in figure 79 is re-routed from figure 32 to figure 1.

(m) Note reference at terminal "OS" of figure 51 is changed.

(n) Connections to 2B (TCH) relay are corrected.

(o) Paragraph 20 of note 102 is revised for clarity.

(p) Connections 6-7T (TFK 3) are corrected.

(q) Note 303 has been revised to include provisions for cross-connecting "SC" terminals to the "TS" terminals.

(r) Notes 340, 349, 355 have been revised for clarity.

(s) Wiring to ground at 6T (CKG5) and 8T (CKG3) relays is designated "XA" option instead of "ST".

(t) Wiring between 11B (ONX) and 8T (CHO-9), designated "RV" options, is redesignated "RV, ZL". Option "RV" is removed from note 103 under the section for issue 19-D.

(u) "QU" option is replaced by "RV" option for wiring from 11T (PEG) to 11T (LLC1), and in note 103 under the section for issue 18-B. The "QU" option now replaces strapping at 2B and 4B (CVS) and 5B-6B (TGS3) in figure 19 and is associated with "Code conversion not required for more than one arbitrary digit." (Par. 70, note 103).

(v) All strapping on the (NAR1), (NAR2), (NAR3), and (ANR) relays of figure 124 is removed and replaced by "SX" wiring.

(w) UB relay codes are specified as indicated for the following relays: (CVOO-99), UB19; (EX7), UB14; (GSA1-4), UB20; (LP), UB25; (OSAO-9), UB19; (RGTA), UB23; (SPLC), UB14; (TGS3), UB21; (TXD), UB24; (TXC1-9), UB24; (ARN5), UB32.

(x) The "PRV" and "SPC" terminals of figure 94 are designated "QA" option.

(y) Wiring at 9T and 3T of relay (RGTA), figure 68, is changed from "SD" option to "SD, RM" option. The "G1" lead from 4T (RNG) to figure 62 is changed from "SC" to "SC, RL" option.

(z) In figure 125, strapping is removed from 1T-3T, 5T-6T, and 8T-9T of the (AST) and (BST) relays and is replaced by the addition of "VU" wiring in figure 68.

(aa) Wiring to ground at 2T and 2B of the (BX) relay in figure 91 is changed from "TQ" to "RO" wiring.

(ab) The "FNA" lead from the Master Test Frame Connector circuit in figure AP is designated "SN" wiring.

(ac) In note 101 (f), B8 ground is specified for the "MONL" lead from figure AL to figure 32.

D.16 To conform with issue 15-D of the Dial Pulse Outgoing Sender circuit, SD-25579-01, note 310 is changed to rate (Mfr. Disc.) the use of the "CL1" function between the marker and the sender circuit. This feature was provided to prefix 1-1 as an area code to crossbar tandem. However, this use in crossbar tandem has been discontinued.

D.17 To reduce the number of equipment and questionnaire options for inter-marker features, note 102, paragraph 93 is changed to specify that "XT", "YL", "YN", "YO", and "YU" options be furnished for all types of inter-marker group operation.

D.18 On calls directed to four party tube set stations operating over low capacity cables, the marker work timers may time out because of failure or slow operate of the continuity tube test feature.

To correct this condition, wiring at the (CON) repeating coil is changed and designated options "OA", (Mfr. Disc.), and "OB" (Std.), and note 119 is added.

The following changes apply to dial tone markers:

D.19 To obtain uniform marker wiring in the trunk selection feature the same changes are provided as recommended in paragraph D.14 for the completing or combined marker to prevent operating the trunk link frame (LV-) relay fuse.

D.20 To prevent buzzing of the (VFTO-4), (VGTO-11), and (HGTO-9) relays, circuit requirements are specified for these relays similar to those specified in paragraph D.06 for combined and completing markers.

D.21 To prevent false operation of the (FCG) relay due to cable capacity where cable runs between the marker and trunk link frame or between the trunk link frame and line link are long, changes are made in the dial tone marker similar to those specified in paragraph D.13 for combined and completing markers.

D.22 The "TMB" leads between the dial tone marker and the Line Insulation Test Frame, omitted in error from figure 281, are added.

D.23 To prevent marker work timer time outs on abandoned dial tone calls from four party tube set stations operating over low capacity cables, changes similar to those outlined in paragraph D.13 are applied to the dial tone marker.

D.24 Sections (l), (o), (s), (w), and (aa) of paragraph D.15 are applied to dial tone markers, to clarify notes, facilitate manufacture, and bring the SD drawing into agreement with the shop drawings.

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DETAILED METHOD OF OPERATION

1. PURPOSE OF CIRCUIT

1.1 To assist in the completion of a dial tone connection which connects a subscriber to an originating register circuit that will record the dialed number.

1.2 To assist in the completion of an intra-office call which connects a calling subscriber to a called subscriber located within the same office.

1.3 To assist in the completion of a subscriber outgoing call which connects a calling subscriber to an outgoing trunk associated with the office of the called subscriber.

1.4 To assist in the completion of a terminating call which connects a call on an incoming trunk to the called subscriber.

1.5 To assist in the completion of an intertoll or tandem call which connects a call on an incoming toll trunk or an incoming tandem trunk to an outgoing toll trunk or an outgoing tandem trunk.

2. WORKING LIMITS

2.1 The following working limits for the (GT) relay (239HR) or (280AU) code are based upon the use of the 500 ohm biasing resistance.

WORKING LIMITS

CONDITION	ALLOWABLE EARTH POTENTIAL	RESISTANCE
Max. Ext. Ckt. Loop		7150 ohms
Max. Ext. Ckt. Res. to Ground	0 volt or positive	7150 ohms
Max. Ext. Ckt. Res. to Ground	20 volt negative	3250 ohms
Max. Ext. Ckt. Res. Thru 1000 Ohm Ringer to Ground (See Note A)	12 volt negative	1750 ohms
Min. Ins. Res. (See Note B)		10,000 ohms

NOTE A: Requirement to detect tip party subset if condenser is short-circuited.

NOTE B: For PBX trunks having battery through a 5500 ohm or 6000 ohm relay connected to the tip, the earth potential shall not exceed 10 volts positive, 20 volts negative for the 5500 ohm relay or 13 volts positive, 20 volts negative for the 6000 ohm relay, the minimum insulation resistance being 20,000 ohms and the PBX battery voltage 44 volts minimum.

3. FUNCTIONS

This marker is designed to perform the following functions some of which may be omitted if not required.

The marker functions will be subdivided as follows:

a. Marker seizure and control functions.

b. Registration and translation of information from originating and incoming register functions.

c. Subscriber line identification functions

d. Route information and trunk or originating register circuit selection functions.

e. Channel selection and seizure functions.

f. Outgoing sender circuit selection and seizure functions.

g. Miscellaneous functions, such as recycle and route advance, timing and trouble indicating, cross-detecting, traffic registration, no-test call, no hunt call special hunt call, intermarker group operation, pulse conversion functions and testing information.

3.1 Marker Seizure and Control Functions

3.101 To receive an indication from the line link marker connector that a call or calls has been originated on a line link frame.

8.125 Called Office Code and Customer Number Transfer Checker

The called office code and customer number are stored in the marker and transmitted to the CAMA sender in a manner similar to an outgoing call as described in Section 11.441.

8.126 Trunk Number Transfer Checker

The incoming CAMA trunk number stored on the HN-, T-, and U- relays or HNA-, TNA-, and UA- relays is relayed to the out sdr. connector by way of operated CMCA, B and C relays over leads AR-, BR- and CR-. The marker checks that the CAMA Sdr. has received the information properly. The trunk number information is routed thru the group connector of the out sender connector and therefore is under control of the OST timer.

8.13 Seizure of Trunk Link Frame and Incoming CAMA trunk

After the marker has seized the out sender connector, it puts a bid in for the trunk link frame on which the incoming trunk appears. This bid is steered to the proper trunk link frame thru the FG- and TF- relays. Seizure of the trunk is accomplished over the "F" lead by way of the incoming register marker connector. Operation is similar to that described in Section 17.5.

8.14 Trunk Transfer Checker

The following information is obtained from the incoming trunk and transferred to the CAMA Sender:

TLF Lead	MKR Checker Relay	Out SDR Conn Leads Grded	For
NT NN HF	ORCO ORC1 ORC2	ORCO ORC1 ORC2	Customer Originating Rate Class
AD OD	AD OD	AD OD	Type of CAMA Identification of Calling Customer
0- 9-	RNO-7	RNO-7	Associated Recorder Number

Since receipt of this information may be late subject to trunk link frame delays, it is transmitted to the CAMA SDR thru the control connector of the out sender connector under control of the RNT timer.

8.15 The PEG, PCL-1/3, Auxiliary CAMA Class Relays and the Auxiliary CAMA Trunk Number Relays

The operated CMC1 relay will operate the PEG relay. The operated CMC2 relay will operate the PCL-1/3 relays and the auxiliary CAMA class relays CMCA, CMCB and CMCC. If Figure BQ is provided, the CMC2 relay will also operate the auxiliary CAMA trunk number relays CTNA and CTNB.

8.16 The FTCK and GTU Relays

The CMC2 relay will operate the FTCK relay. The operated CMC3 relay will operate the GTU relay.

8.17 The RNT3, AMA3 and AMA5 Relays

The operated CMC3 relay will operate the recorder number timing check relay RNT3.

The operated RNT3 relay will operate the AMA3 and AMA5 relays in series.

8.18 The RN, ORC and MBK5 Relays

The operated AMA5 relay will operate the RN relay and the originating class relay ORC.

The operated RN relay will operate relay MBK5. Relay AMA3 will ground the "SC" lead to the outgoing sender connector to operate the service call SC relay in the CAMA sender.

8.19 The KG, KA, KBC, KDE, KFG, KHJ, KKL and KK Relays

The operation of relay KG and the KA, KBC, KDE and KFG relays to transmit the called number information to the CAMA sender will be similar to the description for a subscriber outgoing call in Section 11.4411.

If ten digit dialing is recorded, the KG relay will operate the KHJ and KKL relays.

The KK relay will be operated from any one of the KA, KBC, KDE, KFG, KHJ, or KKL relays.

8.20 The A-0/7, B-0/7, C-0/7, D-0/7, E-0/7, F-0/7, G-0/7, H-0/7, J-0/7, K-0/7 and L-0/7 Relays

The A-0/7, B-0/7, C-0/7, D-0/7, E-0/7, F-0/7, G-0/7 relays will be operated similar to the description for a subscriber outgoing call described in Section 11.4412. The operated KHJ relay will operate the H-0/7 and J-0/7 relays on a two-out-of-five basis. The KHJ relay will also extend the ground to the "H-0/7" and "J-0/7" leads to the outgoing sender connector to operate the called number relays in the CAMA sender.

In a similar manner, the operated KKL relay will extend the grounded "K-0/7" and "L-0/7" leads to operate the K-0/7 and L-0/7 relays on a two-out-of-five basis. The KKL relay will also extend the "K-0/7" and "L-0/7" leads to the outgoing sender connector to operate the called customer number relays in the CAMA sender.

8.21 The TGS1, DLK-1/2, CRK-1/3, CLK-1/3, and CTGS relays

The operation of relay TGS1, described in Section 11.412 will operate the DLK-1/2, CRK-1/3 and CLK-1/3 relays similar to the description for an outgoing sender call described in Section 11.44. The operated TGS1 relay will operate the CAMA transmitting ground supply CTGS relay.

8.22 The FT-0/3 and FU-0/7 Relays

The operated CTGS relay operates the FT-0/3 and FU-0/7 relays and also closes grounds to the "FT-0/3" and "FU-0/7" leads to the outgoing sender connector and CAMA sender.

8.23 The TGS2, TRN, TRN1, ECN and OCN Relays

The operation of relay TGS2 is similar to the description for a subscriber outgoing call in Section 11.412. The operated TGS2 relay will operate the TRN and TRN1 relays. The operated TRN relay will operate the ECN or OCN relay.

8.24 The HN-0/7, T-0/7 and U-0/7 Relays

The HN-0/7, T-0/7 and U-0/7 relays will be operated similar to the description for a tandem outgoing call in Section 14.512.

8.25 The HNA-0/7, TNA-0/7 and UA-0/7 relays if Figure BQ is Provided

If figure BQ is provided, the operated CTNA and CTNB relays will operate the trunk number auxiliary relays HNA-0/7, TNA-0/7 and UA-0/7 relays.

8.26 The ST7, ORK1 and ORK2 Relays

The ST7 relay will be operated similar to the description in Section 11.4413 for seven digit dialing. For ten digit dialing the ST7 relay will be operated by the operated KKL relay.

To check that the proper number of called number digit registration, trunk link frame number registration and trunk number registration relays have operated and the proper information has been sent to the CAMA sender, the ORK1 and ORK2 relays will operate. The ground potential through the ORK1 relay winding will be extended by the operated ST7 and CMC3 relays and the HN-, T-, U-, FT-, FU- and A- through K- relays operated on a two-out-of-five basis to the ORK2 relay winding.

8.27 Checking the Information Transferred to the CAMA Sender

The general information for checking the information transferred to the CAMA sender is similar to the general information for a subscriber outgoing call described in Section 11.445.

8.28 The OST1, OST and OST2 Relays

The operation of the OST1 relay is similar to the description for a subscriber outgoing call in Section 11.4451 except for the addition of the operated AMA5 and RNT3 relays in the operating path. The OST relay is operated similar to the description for a subscriber outgoing call in Section 11.4451.

The operated OST relay will operate the OST2 relay from the grounded "TSR" lead.

8.29 Release of the TGS-1/3, KG, KA, KBC, KDE, KFG, KHJ, KKL, KK, CTGS, TRN and TRN1 Relays

The TGS-1/3, KG, KA, KBC, KDE and KK relays will be released similar to the description for a subscriber outgoing call in Section 11.4452. If ten digit registration was provided, the KHJ and KKL relays will be released. The release of relay TGS1 will release the CTGS relay and the release of relay TGS2 will release the TRN and TRN1 relays.

8.30 Release of the OST1 and OST Relays

The release of the OST1 and OST relays is similar to the description for a subscriber outgoing call in Section 11.4453.

8.31 Selection and Connection to the Trunk Link Frame Associated With The Incoming CAMA Trunk

After the marker has seized an idle outgoing sender connector, it will connect to the trunk link frame associated with the incoming CAMA trunk. The trunk link frame will send the automatic or operator identification, originating rate class and recorder number information to the marker.

The seizure of the trunk link frame is similar to the description for a pulse conversion call in Sections 17.5 to 17.53.

8.32 The LF and TF Relays in the Incoming CAMA Trunk

The operated TFK3 relay will extend battery potential to the "F" lead to the incoming register marker connector and through the operated incoming register link crosspoints to operate the incoming CAMA trunk LF and TF relays.

8.33 The FA-, FB-, LV-2/9 and LC-0/9 Relays in the Trunk Link and Connector Circuit

The operated LF relay in the trunk will operate the FA or FB relay in the trunk link frame.

3.157 To recycle the work timer between calls.

3.2 Registration and Translation of Information From Originating and Incoming Register Functions

3.201 To register the A, B and C code digits.

3.202 To provide translation in an office when numerical digits only are received by the marker.

3.203 To provide translation in an office when one office code digit is received by the marker.

3.204 To permit the use of an initial digit to be used as part of a series of two digit numerical codes when numerical digits only or when one code digit is usually received by the marker.

3.205 To provide translation in an office when two office code digits and numerical digits are received by the marker.

3.206 To identify two digit office codes in combination two-three digit office code areas by either the first two code digits or by the three digit office code.

3.207 To provide translation in an office when three office code digits and numerical digits are received by the marker.

3.208 To permit toll traffic access to the local area translator.

3.209 Provides for transferring the identification of the foreign area and the digits representing the local office code to the foreign area translator in calls requiring foreign area translation.

3.210 To provide for translation of OXX and 1XX codes for use as toll code points.

3.211 To provide for translation of three digit office codes used for national toll dialing in offices when numerical digits only are received, where one digit office codes are received and where two digit office codes are received.

3.212 To provide translation for X11 service codes.

3.213 To provide translation for 11X service or directing codes.

3.214 To provide translation for 11XX codes.

3.215 To provide translation when single directing digits are received by the marker in offices where the local area codes consist of two, two or three or three digits.

3.216 Provides means for receiving calls to a double office unit, each unit may contain both physical and theoretical numbers.

3.217 To operate relays to identify the type of call following the translation of information received via the incoming or originating marker connector. The class relays operated are: ITR - for intra-office, TER - for terminating, SOG - for subscriber outgoing and TOG for tandem outgoing.

3.218 To provide means for receiving tandem, toll incoming and reorder class indications from the incoming register marker connector.

3.219 To provide means for receiving originating class indication.

3.220 Provides for transmitting the class of call information to the foreign area translator.

3.221 Provides for returning reorder if an INC class indication is received together with a zero on the A code register.

3.222 Provides for returning reorder if a TAN class indication is received together with a zero on the A code register.

3.223 Provides for returning reorder if a TOL class indication is received together with a zero on the A register when translation of OXX toll codes is not required.

3.224 Provides for returning reorder on incoming calls when vacant code points are called.

3.225 Provides for returning vacant code tone on local originating calls when vacant code points and denied routes are called.

3.226 To return reorder or vacant code tone on toll or tandem calls if vacant code points or denied routs are called.

3.227 To return reorder on tandem class calls when the marker serves multi-frequency or dial pulsing incoming registers which are not arranged for 11X codes in the event that a 1 is received on the A code register due to an operating error.

3.228 Provides called number register relays for recording the thousands, hundreds, tens and unit digits for calls to the local #5 office.

3.229 Provides translator control and number cut-in relays to place the proper digits on the called number register relays in 4, 5, 6, and 7 digit office units.

3.230 To discriminate between local subscribers having 2 and 3 digit codes on the basis of whether the code is office "A", office "B", Physical or Theoretical.

3.231 To place the C, D, E and F digits in the number group when the subscriber is 2 digit and to place the D, E, F and G digits in the number group when the subscriber is 3 digit.

3.232 Provides for transmitting the thousands, hundreds and tens digit information to the PBX allotter circuit.

3.233 Provides 10 start leads to the number group connectors in office "A" and 10 start leads to the number group connector in office "B" if required.

3.234 Provides 10 hundreds block, 10 tens block and 10 units leads for operating the associated relays in the number group connector.

3.235 Provide means on a call to an allotted PBX for receiving information from the PBX allotter circuit as to the thousands, hundreds, tens and units digit associated with the first PBX line in the selected number group.

3.236 Provide means for indicating when a called number is associated with an allotted PBX line.

3.237 Provides for routing calls to blank number trunks when numbers associated with unequipped number groups are called.

3.238 Provides for using an unequipped number series for official PBX, coin police, and fire lines if required.

3.239 Provides 2 start leads for selecting the number group connectors containing trunk numbers.

3.240 Provides for recording the trunk number on the called number hundreds, tens and units relays.

3.241 Reverses the preference to the number groups associated with the trunk number in response to a signal received from an odd or even incoming register marker connector.

3.242 Provides for routing blank number, regular intercept and trouble intercept calls to any one of the equipped number group.

3.243 Provides for transmitting and checking a maximum of 11 digits when the marker operates with outgoing senders or AMA senders.

3.244 Provides for operation with senders that omit either the A and B or the A, B, and C code digit registers.

3.245 Provides for rate discrimination between physical and theoretical numbers when required.

3.246 Provides for controlling rate discrimination between physical and theoretical numbers by high and low incoming group selection in revertive pulse incoming registers.

3.247 Provide for receiving recorder number from trunk circuit.

3.248 Provides for transmitting and checking the recorder number to the outgoing sender on AMA calls.

3.249 Provides a trunk link frame number register circuit for identifying the trunk link frame on incoming calls.

3.250 Provides for routing calls to permanent signal trunks.

3.251 Provides for routing partial dial calls to partial dial trunks or to an operator if required.

3.252 Provides for routing calls to stuck coin trunks.

3.253 Provides for receiving a "coin returned" signal from the originating register circuit.

3.254 To seize and release the number group connector circuit.

3.255 Provide for seizing and operating the number group in accordance with the thousands, hundreds, tens and units digit information received from the PBX allotter.

3.256 To route calls to regular intercept, trouble intercept or blank number trunks over separate trunk groups.

3.257 To route calls to regular intercept or trouble intercept over a common group of trunks.

3.258 To lock in the called line locations and ringing information received from the number group. The line location may be for a subscriber's line or for a trunk.

3.259 To route plugged-up lines to trouble intercept.

3.260 To recognize calls to a PBX line.

3.261 To reverse the order of PBX line test on second trial calls.

3.262 Checks for the operation and release of the number group SC - relay when PBX hunting is involved.

3.263 Checks seizure of number group and stops seize frame timer.

3.264 Checks for the operation of the number group multicontact relays.

3.265 Releases the called line location information on intraoffice calls to permit the reuse of the line identifying relays for the call back portion of the intraoffice call.

3.266 Checks for the operation of the number group hundreds, tens and units relays.

3.267 Checks for the operation and release of the called line location relays.

3.268 Releases the called number register relays when the number group connector is released.

3.269 Checks the release of the number group during the progress of a call.

3.270 Checks for complete line location information if a tandem or toll trunk number indication is received from the number group.

3.271 Provides means for retaining information received from number group on line verification tests of blank or intercepted numbers in order to record number group cross-connection information on trouble record card.

3.272 Provides for testing the sleeve of 10 PBX lines simultaneously.

3.273 Selects the idle line corresponding to the dialed number if idle.

3.274 Provides for hunting from one tens block to another tens block if the PBX group contains more than ten lines.

3.275 Provides for operation where the number group circuit is arranged with more than one PBX group in a single tens block.

3.276 Check for the operation and release of the A - relays in the number group.

3.277 Recognizes the last tens block associated with a PBX group.

3.278 Checks for the release of the number group SC - relays.

3.279 Provides a signal when all lines in a PBX group are busy so that the call may be routed to a tone trunk.

3.280 Provides a timing circuit to permit sufficient time for the PBX sleeve testing relays to operate.

3.281 Releases the sleeve cut in relay when one or more PBX lines test idle.

3.282 Provides a signal for routing a call to a tone trunk when a number representing a permanently busy line or an overflow is called.

3.283 Provides for line overflow registration on PBX and individual lines.

3.284 Permits test calls to be directed to a particular line in a PBX group.

3.285 Provide for connecting a calling subscriber to a ringer test trunk when a ringer test code is received.

3.3 Subscriber Line Identification Functions

3.301 To identify the line link frame number associated with the originating call in the form of frame tens and units. Frame tens are identified on a 1 out of 4 decimal basis. Frame units are identified on a 2 relays operated out of 5 basis and the following addition code is used.

Relays Operated	Digit
-0 and -1	1
-0 and -2	2
-1 and -2	3
-0 and -4	4
-1 and -4	5
-2 and -4	6
-0 and -7	7
-1 and -7	8
-2 and -7	9
-4 and -7	0

3.302 To operate gating relays in the line vertical group, line horizontal group and line vertical file identifier circuits for the purpose of closing thru the vertical group, horizontal group and vertical file test leads to the line link frame.

3.303 To check that all gating relays are operated.

3.304 To record all vertical groups that are originating calls on the VGTO to VGT11 relays.

3.305 To operate a vertical group test check relay and release the vertical group gating relays as soon as one or more vertical groups are recorded.

3.306 To lock the vertical group test relay associated with the vertical group that the marker prefers to serve if this vertical group is originating a call. Vertical group #2 always has preference over other vertical groups on first trial calls.

3.307 To release all vertical group test relays except the one the marker prefers to serve.

3.308 To check that only one vertical group test relay remains operated.

3.309 To operate the VGA- and VGB- relays on the line link frame associated with the vertical group test relay operated in the marker.

3.310 To record all horizontal groups in the selected vertical group that are originating calls.

3.311 To operate a horizontal group test check relay and release the horizontal group gating relay as soon as one or more horizontal groups are recorded.

3.312 To lock the horizontal group test relay associated with the horizontal group that the marker prefers to serve if this horizontal group is originating a call.

3.313 To release all horizontal group test relays except the one the marker prefers to serve.

3.314 To check that only one horizontal group test relay remains operated.

3.315 To operate the HG- relay on the line link frame associated with the horizontal group test relay operated in the marker.

3.316 To check that the HG- relay on the line link frame has operated.

3.317 To operate the LG- relay on the line link frame.

3.318 To record all vertical files or lines associated with the operated line group relay on the line link frame. that are originating calls.

3.319 To operate a vertical file test check relay and release the vertical file gating relay as soon as one or more vertical files are recorded.

3.320 To lock the vertical file test relay associated with the vertical file that the marker prefers to serve if this vertical file is originating a call.

3.321 To release all vertical file test relays except the one the marker prefers to serve.

3.322 To check that only one vertical file test relay remains operated.

3.323 To close a ground to the line link frame over the V- lead associated with the operated vertical file test relay for the purpose of identifying the subscriber's class of service.

3.324 To record the subscriber's class of service on one of the class of service relays. The marker is arranged to record a maximum of 30 classes of services.

3.325 To provide a sequence circuit for changing the selection preference of the line vertical group identifier, the line horizontal group identifier, the line vertical file identifier, and the trunk selector. The sequence circuit also provides a switching circuit for checking the ringing control switch select magnets 0 and 1 during one cycle and 2 to 9 during the next cycle.

3.326 To transmit the calling subscribers line location to the dial or multi-frequency originating register and check that the registration has been recorded. This information is transmitted over the "FT-", "FU-", "VG-", "HG-", and "VF-" leads to the originating register through the trunk line frame connector as shown in the following table.

LINE LINK FRAME TENS	MARKER CHECK RELAYS OPERATED AND LEADS GROUNDED
0	"FTO"
1	"FT1"
2	"FT2"
3	"FT3"
LINE LINK FRAME UNITS	
0	"FU4, FU7"
1	"FUO, FU1"
2	"FUO, FU2"
3	"FU1, FU2"
4	"FUO, FU4"
5	"FU1, FU4"
6	"FU2, FU4"
7	"FUO, FU7"
8	"FU1, FU7"
9	"FU2, FU7"
LINE LINK VERTICAL GROUP	
0	"VG4," VG7"
1	"VGO, VG1"

LINE LINK VERTICAL GROUP (Cont'd.)	MARKER CHECK RELAYS OPERATED AND LEADS GROUNDED
2	"VG0, VG2"
3	"VG1, VG2"
4	"VG0, VG4"
5	"VG1, VG4"
6	"VG2, VG4"
7	"VG0, VG7"
8	"VG1, VG7"
9	"VG2, VG7"
10	"VG0, VG10"
11	"VG1, VG10"

LINE LINK HORIZONTAL GROUP	
0	"HG4, HG7"
1	"HG0, HG1"
2	"HG0, HG2"
3	"HG1, HG2"
4	"HG0, HG4"
5	"HG1, HG4"
6	"HG2, HG4"
7	"HG0, HG7"
8	"HG1, HG7"
9	"HG2, HG7"

LINE LINK VERTICAL FILE	
0	"VF0"
1	"VF1"
2	"VF2"
3	"VF3"
4	"VF4"

3.327 To transmit the calling subscribers class of service to the dial or multi-frequency originating register and check that this information has been recorded. This information is transmitted over the CT- and the CU- leads via the trunk link connector in accordance with the following table.

CLASS OF SERVICE TENS	OPERATED AND LEADS GROUNDED
0	"CT0"
1	"CT1"
2	"CT2"

CLASS OF SERVICE UNITS	
0	"CU4, CU7"
1	"CU0, CU1"
2	"CU0, CU2"
3	"CU1, CU2"
4	"CU0, CU4"
5	"CU1, CU4"
6	"CU2, CU4"
7	"CU0, CU7"
8	"CU1, CU8"
9	"CU2, CU7"

3.328 To transmit the type of line associated with the originating subscriber to the dial or multi-frequency originating register and to check that this information has been recorded. Information is transmitted to the originating register over the "2P", "CN" and "MAN" leads, indicating a two party line, a coin line, a manual line or a manual coin line.

3.329 To change the order of the selection preference of the line vertical group identifier on second trial calls.

3.330 To recognize a subscriber disconnect on originating calls in the line vertical group identifier and the line vertical file identifier. This disconnect signal is only effective until the end of the hold magnet timing interval.

3.331 To receive the calling subscriber's line location from the dial or multi-frequency originating register circuit via the originating register marker connection circuit. This information is recorded on the FT-, FU-, FVG-, HG- and VF- relays in the calling line register and transfer checker and is used on intraoffice and subscriber outgoing calls.

3.332 To receive the calling subscriber's class of service number from the dial or multi-frequency originating register circuit via the originating marker connector circuit. This information is recorded on the CTA- and CU- relays in the class of service tens transfer checker circuit and the units transfer and checker circuit. This information is used on intraoffice and subscriber outgoing calls.

3.333 To identify a reverting call by matching the calling subscriber's line location with the called subscribers line location on intraoffice calls.

3.334 To close a start lead to the line, line link and connector circuit after the trunk link frame has been seized for the purpose of seizing the line link frame on intraoffice, subscriber outgoing, terminating tandem outgoing and reverting classes of calls.

3.335 To close a start lead to the line, line link and connector circuit via the line link marker connector, after the trunk link frame has been seized for the purpose of seizing the line link frame on an originating or dial tone class of call.

3.336 To provide a start lead closure to the line, line link and connector circuit on a dial tone class test call.

3.337 To select a particular vertical file on a dial tone class test call.

3.338 To register the called subscriber's line location received from the number group in the line link frame identifier line vertical group identifier, line horizontal group identifier and the line vertical file identifier circuits on terminating and intraoffice calls.

3.339 To register the line location of a tandem trunk as recieved from the number group in the line link frame identifier, line vertical group identifier, line horizontal group identifier and the line vertical file identifier circuits and tandem class calls.

3.3340 Provide for identification of incoming class of service of incoming trunks with the tandem screening feature.

3.4 Route Information and Trunk or Originating Register Circuit Selection Functions

3.401 To identify the group of outgoing trunks associated with the desired route, by means of an "FC" terminal.

3.402 To identify the block of trunks, on the trunk link frames, in which the desired trunks are located, by means of a "TB" terminal.

3.403 To identify the group of trunks within the block, by means of a "TG" terminal.

3.404 To identify the group of outgoing senders needed for the desired route, by means of an "OS" terminal.

3.405 To control the sending of code route and compensating resistance information to the sender, by means of a "CR" terminal.

3.406 To control the sending of class information to the sender, by means of a "CL" terminal.

3.407 To control the sending of delete digit and number pattern information to the sender, by means of a "DL" terminal.

3.408 To control the sending of code pattern information to the sender, by means of a "CP" terminal.

3.409 To peg count the calls submitted to a route, by means of a "PC" terminal.

3.410 To count the calls that can not be completed to a route because of an all trunk busy condition, by means of an "OF" terminal.

3.411 To peg count separately calls submitted for various destinations but reached over a common tandem route and to operate the tandem route relay.

3.412 To prepare the marker to send assistance class information to a special service trunk, and to operate the special service route relay.

3.413 To seize the number group for ringing information when a ringer test code is received from an originating register.

3.414 To prepare the marker for a reverting call operation when a ringing test code is received from an originating register.

3.415 To operate the route relay for the ringer test trunk when a ringer test code is received from an originating register.

3.416 To transfer the operating circuits for service route relays to other route relays so that the service can be given over different trunk groups, under control of the Master Test Frame Jacks, Key and Lamp circuit.

3.417 To reroute to an operator, calls which are to be assistance completed and should not have been called direct by the subscriber.

3.418 To reroute to a trunk having the proper coin facilities, multiple charge calls made by coin subscribers where such calls are not to be assistance completed.

3.419 To instruct the register to return the coin if the trunksto the desired route are not equipped with coin disposal features, when there is a coin in the box.

3.420 To operate the marker disconnect relays and give the connector an MRL release signal after checking that the register has received a return coin signal.

3.421 On non-AMA calls to prepare for operating a trunk circuit class relay over lead "TC" when required.

3.422 On non-AMA calls to prepare for operating a trunk circuit class relay over lead "TP" when required.

3.423 On non-AMA calls to prepare for operating a trunk circuit class relay over lead "CN" when required.

3.424 On non-AMA calls to check for the presence of the trunk circuit class relay locking grounds (when operated) and to close a checking circuit to the marker controller.

3.425 On non-AMA calls to operate the trunk class relay on lead "TC" when a call is routed to a tone trunk because the called line is busy.

3.426 On non-AMA calls to not operate the trunk class relay on lead "TP" when a tip party is routed to a Tone trunk because the called line is busy.

3.427 On non-AMA calls to not operate the trunk class relays on leads "TC" or "TP" when a call is routed to a Tone trunk because of a failure to match.

3.428 On non-AMA calls to operate the trunk class relay on lead "TP", regardless of whether a tip or ring party originated the call, when a call is routed to a Tone trunk because of a partial dial or because a vacant code was dialed.

3.429 On non-AMA calls to operate the trunk class relay on the "TP" lead when a call is routed to a Permanent Signal Holding trunk because of a permanent signal from a coin line.

3.430 On non-AMA calls to not operate the trunk class relay on the "TC" lead when a call is routed to a Permanent Signal Holding trunk because of a permanent signal from a coin line.

3.431 On non-AMA calls to operate the trunk class relay on the "TC" lead when a call is routed to a Permanent Signal Holding trunk because of a permanent signal from a PBX line.

3.432 On non-AMA calls to not operate the trunk class relay on the "TP" lead when a call is routed to a Permanent Signal Holding trunk because of a permanent signal from a PBX line.

3.433 On non-AMA calls to not operate the trunk class relays on leads "TC" and "TP" when a call is routed to a Permanent Signal Holding trunk because of a permanent signal from a non-coin non-PBX line.

3.434 On non-AMA calls to operate the trunk class relay on lead "TC" when a call is routed to a Common Overflow trunk because of an overflow from the Permanent Signal Holding trunk group.

3.435 On non-AMA call to not operate the trunk class relay on lead "TC" when a call is routed to a Common Overflow trunk because of an overflow from the Tone trunk group.

3.436 On non-AMA calls to operate the trunk class relay on lead "TC" when a call from a subscriber which requires special assistance is routed to an operator.

3.437 On non-AMA calls to not operate the trunk class relay on lead "TP" when a call from a subscriber which requires special assistance is routed to an operator.

3.438 On non-AMA calls to operate the trunk class relay on lead "TC" when the class of line and the route require charge, except on calls to free numbers in the intraoffice route.

3.439 On non-AMA calls to operate the trunk class relay on lead "TP" when the Originating Register signals that the call is being made by a tip party.

3.440 On non-AMA calls to operate the trunk class relay on lead "CN" when the Originating Register signals that the call is being made by a coin line and the call is to be completed to a trunk requiring coin discrimination;

3.441 On AMA call to control the sending of message billing index information to the sender circuit thru the route information transfer checker.

3.442 On AMA calls to set for sending message billing index 0 when a free number is called on an intraoffice call.

3.443 On AMA calls to prepare for operating a trunk circuit class relay over lead "CN" when the register signals that the call is from a coin line.

3.444 On AMA calls to prepare for setting a sender circuit class relay over either lead "RP" or "TP".

3.445 On AMA calls to prepare for sending an AMA signal to the sender circuit thru the route information transfer checker and

(a) To set the AMA signal on transverter test calls and service observed calls, regardless of whether or not a free number is called or what billing index is required.

(b) To set the AMA signal on regular outgoing calls or intraoffice calls to non-free numbers if an MB1-MB9 billing index is required.

(c) To omit the AMA signal on regular calls when the MBO billing index is required or when the call is an intraoffice call to a free number.

3.446 On AMA calls to check for the presence of the class relay locking grounds in the trunk and sender circuits and for the setting of the message billing index and AMA signals in the route information transfer checker and to close a checking circuit to the marker controller.

3.447 To operate the tandem relay of the outgoing trunk on tandem calls to non-sender routes.

3.448 Provides a toll class mark to an outgoing trunk where a group of trunks are used to complete intertoll calls and calls originated by subscribers in the No. 5 office or in other offices in the local area.

3.449 To provide by means of service relays means for switching connections between route relay windings and route series relay windings or battery.

3.450 To provide by means of service relays means for switching connections between code points and route or preroute relays.

3.451 To close the trunk link frame test leads for the desired route and to determine which trunk link frames have idle trunks or originating registers in the desired route.

3.452 To close the trunk link frame busy leads and to determine which trunk link frames are occupied by other markers.

3.453 To signal the recycle controller when no trunk link frame has idle trunks or idle originating registers in the desired route.

3.454 To prefer a trunk link frame which has idle trunks or idle originating registers and is unoccupied as determined by the setting of the frame memory relays.

3.455 To close the trunk frame start lead to the preferred trunk link frame, but not until the sender group has been seized if a sender is required for the call.

3.456 To recognize that the trunk link frame has been seized.

3.457 To release the frame memory relay which controlled the frame selection and to operate the frame memory relay associated with the selected frame.

3.458 To test a maximum of 20 trunks or originating registers in the desired route on the selected trunk link frame.

3.459 To prefer one of the trunks or one of the originating registers which test idle according to the setting of the preference circuit.

3.460 To signal the recycle controller if no trunks test idle in a two way trunk group.

3.461 To select the preferred trunk or preferred originating register and apply battery to its trunk test lead to operate its F relay.

3.5 Channel Selection and Seizure Functions

3.501 To receive a size of office signal.

3.502 To receive a single frame or paired trunk link frame signal.

3.503 To select a first choice junctor subgroup according to the size of office, trunk link frame pairing and the setting of the junctor preference circuit.

3.504 To inform the trunk link frame as to whether the desired junctor connector relay is on the regular trunk link frame or the extension trunk link frame.

3.505 To inform the trunk link frame as to whether the desired junctor connector relay is associated with the right or the left section of the trunk link frame junctor switches.

3.506 To inform the trunk link frame as to which of five groups of junctor connector relays contains the desired junctor connector relay.

3.507 To inform the trunk link frame as to which junctor connector relay within the selected group is desired.

3.508 To determine whether or not the junctor subgroup under test is a full subgroup or a partial subgroup.

3.509 To recognize, thru cross-connections on the trunk link frame, the junctor subgroup pattern associated with the particular line link frame and trunk link frame.

3.510 To prevent the selection of those channels associated with the junctors that are non-existent in the junctor subgroup under test.

3.511 To release the junctor connector relay of the first choice junctor subgroup and to operate the junctor connector relay of the second choice junctor subgroup if the channel test circuit fails to find an idle channel in the first choice subgroup, providing a second choice junctor subgroup is available.

3.512 To release the blanking out relays associated with the pattern of the first choice junctor subgroup and to operate the blanking out relays required for the pattern of the second choice subgroup if the channel test circuit fails to find an idle channel in the first choice subgroup.

3.513 To operate the marker "Failure to Match" relay if the channel test circuit fails to find an idle channel in the second choice junctor subgroup.

3.514 To regulate the current thru the biasing winding of the double connection test relay according to whether the trunk link frame is a single or paired trunk link frame.

3.515 To check that either the LK or RK relays on the trunk link frame has operated.

3.516 To check that the LC-0/9 relay on the trunk link frame has operated.

3.517 To check that the junctor cut-in relay JC-0/19 on the trunk link frame has operated.

3.518 To check that the test channel TCH-0/9 relay or relays have operated.

3.519 To check that the HG-0/9 relay on the line link frame has operated.

3.520 To select an idle line link, a junctor and a trunk link over which the call can be set up. The combination consisting of a line link, junctor and trunk link is called a channel.

3.521 To time the channel testing interval and at the end of this interval operate a channel selected CH-0/9 relay if a channel is found idle.

3.522 To signal the junctor subgroup selection circuit when all channels test busy.

3.523 To transmit and to check the identity of the selected channel line link, within the selected group of channels, to the dial or multi-frequency originating register when setting up a dial tone connection. The line link number 0 to 9 is transmitted through the trunk link and connector circuit on a 2 out of 5 basis over the LL-0/7 leads.

3.524 To change the order of channel selection on second trial calls.

3.525 To provide cross-connection terminals to change the normal order of channel selections to prevent excessive wear on the lower or first choice channels.

3.526 To check that the FA- or FB- relays on the trunk link frame are operated. One or both may be operated in accordance with the following table:

Type of Trunk	Trunk Switch Appearance
Orig. Register	A or B
Outgoing	A or B
Incoming	B
Intra-Office	A and B
Reverting	B

3.527 To operate the select magnets on the line link frame associated with the selected channel.

3.528 To operate the select magnets on the junctor switch of the trunk link frame associated with the selected channel.

3.529 To operate the select magnets of the trunk switch on the trunk frame associated with the selected trunk or register.

3.530 To operate the RL relay in the originating register after the marker has selected an idle channel on a subscriber outgoing call, a reverting call and on the call back portion of the intra-office call. This releases the linkage between the calling subscriber and the originating register.

3.531 To provide a hold magnet timing interval to delay the operation of the hold magnets for channel selection. This insures that a select finger associated with a channel that becomes idle and is immediately select by the marker, will have sufficient time to release. The select magnets associated with the channel selected by the marker also start to operate during this interval. On calls where the linkage between a subscriber and an originating register is released prior to setting up the subscriber to the called destination, the hold magnet timing interval is increased to permit release of the subscriber's line hold magnet.

3.532 To operate the hold magnets on the line switch on the line junctor switch, on the trunk junctor switch and on the trunk switch associated with the selected call.

3.533 To check that the junctor of the selected channel is not falsely grounded.

3.534 To check that the line sleeve conductor is not crossed with ground on calls other than terminating calls and the call forward portion of an intra-office call.

3.535 To make a sleeve conductor check that the crosspoints associated with the selected channel are closed.

3.536 To make a tip and ring conductor continuity of the crosspoints associated with the selected channel. This test is made on a dial tone connection, a subscriber outgoing call, a tandem outgoing call, a terminating call and on both the call forward and call back portion of an intra-office call.

3.537 To reverse the continuity test which is normally applied to the ring conductor, on a dial tone connection in the event that the ring party is not equipped on a two party line.

3.538 To reverse the continuity test on a terminating call and on the call forward portion of an intra-office call if the information received from the number group indicates that the called subscriber is on the tip side of the subscriber line.

3.539 To reverse the continuity test on a subscriber outgoing call and on the call back portion of an intra-office call if continuity test failure occurs and if the originating register did not inform the marker that the calling subscriber line is on the tip or on the ring side of the subscriber line.

3.540 To reverse the continuity test on a subscriber outgoing call and on the call back portion of an intra-office call if the originating register informs the marker that the calling subscriber is on the tip side of the subscriber line.

3.541 To cancel the continuity test under control of a key in the master test frame jack, lamp and key circuit.

3.542 To make a double connection test to check that the sleeve conductor of the established channel is not falsely grounded.

3.543 To check that the holding ground on the sleeve conductor is applied in the trunk or originating register.

3.544 To make a false cross and ground test on the tip and ring conductors of the line switch, the line junctor switch, the trunk link frame junctor switch and on the trunk switch. This test is made only during periods of light traffic. This test is made on all types of calls except a subscriber outgoing call if the originating subscriber is a PBX subscriber and on the call back portion of an intra-office call if the originating subscriber is a PBX subscriber.

3.545 To provide a ground test for testing the subscriber's line. The purpose of the ground test are as follows:

(a) To detect two-party lines which have become grounded and might give a false party indication.

(b) To detect double connections which would cause the supervisory ground to hold the GT relay.

(c) To avoid connecting to PBX lines which are off-normal and which would produce false charge.

This test is made on the call forward portion of an intra-office call and on terminating calls. The ground test may be cancelled on calls to PBX lines or to individual lines or to both types of lines under control of two keys in the master test frame jack, lamp and key set.

3.546 To cancel continuity test on second trial calls for the following types of calls:

(a) Intra-office (call forward portion)

(b) Terminating

(c) Tandem Outgoing

3.547 To operate the heavy traffic relay when the marker is not normal for 1 to 1.5 seconds.

3.548 To operate the light traffic relay on calls following a marker normal interval of 1 to 1.5 seconds.

3.549 To provide for discharging the wiring capacity of the tip and ring conductors following the false cross and ground test.

3.550 To prevent subscriber bell tapping following continuity test.

3.551 To operate the linkage check (LK1) relay when the first channel has been set up. Only one linkage is set up between the line link frame and the trunk link frame on all types of calls excepting intra-office calls in which case two linkages are set up between the intra-office trunk and line link frames.

3.552 To operate the disconnect relays following the operation of the LK1 relay on a dial tone connection. This releases the line link frame, trunk link frame and marker.

3.553 To release the called line location information registered in the identifier circuits after the called forward connection of an intra-office call has been set up.

3.554 To hold the call forward connection under control of the DCT1 relay on an intra-office call.

3.555 To release the line, line link and connector, relays and select magnets of the line link frame under control of the line link control relays LLC-1 and LLC-2 after the called forward connection of an intra-office call is set up.

3.556 To release the L or R, G-0/4, F or EF and the JC-0/19 relays on the trunk link frame after the call forward connection of an intra-office call has been set up.

3.557 To release the hold magnet operation, channel test, junctor grouping, junctor pattern, junctor sequence, line busy continuity and ground test circuits after the first linkage of an intra-office call has been set up.

3.558 To operate the start call back SCB relay after the first linkage of an intra-office call has been set up.

3.559 To check that the called line location information has released after the first linkage of an intra-office call has been set up.

3.560 To operate the call back relays in the calling line register and transfer checker. This enables the contacts of the FT-0/3, FU-0/7, VG-0/10, HG-0/7 and VF-0/4 relays to operate relays in the line link frame identifier, the line vertical group identifier, the line horizontal group identifier and line vertical file identifier.

3.561 To operate call back relays in the line link frame identifier, line vertical group identifier, line horizontal group identifier and the line vertical file identifier. This permits operation of the identification relays associated with the calling line.

3.562 To operate the call back relay in the channel test circuit. This permits the LL-0/7 relays to operate and identify the line link used when setting up the linkage to the originating register.

3.563 To release the select magnets which were operated on the trunk link frame after setting up the first linkage of an intra-office call.

3.564 To advance the junctor sequence circuit after the first linkage of an intra-office call has been set up.

3.565 To reoperate the line link control LLC-1 and LLC-2 relays after the call back relay in the marker control circuit has operated. This enables the hold magnet operation, the channel test, line busy, continuity and ground test circuits for setting up the second linkage on an intra-office call.

3.566 To set up and check a linkage between the intra-office trunk and the calling subscriber after a linkage between the same intra-office trunk and the called subscriber is established.

3.567 To release the trunk link frame FA- and FB- relays associated with the intra-office trunk after both linkages to the trunk have been set up.

3.568 To check that the sleeve holding circuit closes after setting up the second linkage to an intra-office trunk.

3.569 To operate the disconnect relays and release the line link frame, the trunk link frame and the marker after both linkages of an intra-office call have been set up.

3.570 To test the called line for busy on intra-office and terminating calls.

3.571 To signal the recycle controller if a busy line is encountered on intra-office and terminating calls.

3.572 To operate the tandem relay in the outgoing trunk via the outgoing sender connector.

3.573 To operate the F relay in the incoming trunk via the incoming register marker connector.

3.574 To operate the IF relay in the incoming intertoll trunk via the incoming register marker connector.

3.575 Receives ringing information from the number group.

3.576 Operates the ringing switch select magnets.

3.577 Checks for the operation of the ringing switch select magnets.

3.578 Checks for crosses on the contacts of the RCT - relays which control the RS relays.

3.579 Check for crosses between the ringing switch select magnet.

3.580 Sets the ringing switch to provide ringing pick-up on calls to free numbers such as official PBX, information and repair service.

3.581 Sets the ringing switch in accordance with the ringing information received from the number group on calls to free lines other than official PBX, information and repair service.

3.582 Sets the ringing switch to provide ringing pick-up on calls to blank number and regular intercept trunks.

3.583 Sets the ringing switch to distinguish between toll and local intercept calls for both trouble and regular intercept.

3.584 Sets the ringing switch so that the trunk may return busy back or overflow tone.

3.585 Operates and checks the locking circuit of the trunk RC relay.

3.586 Operates and checks the locking circuit of the trunk TC relay.

3.587 Applies busy test relays to the line links for the purpose of recording the number of busy line links at the time the marker attempts to set up a linkage between the line link and trunk link frames.

3.6 Outgoing Sender Circuit Selection and Seizure Functions

3.601 To test two subgroups of senders to determine whether the subgroups contain idle senders.

3.602 To test two subgroups of senders to determine whether the subgroups are occupied by another marker.

3.603 To prefer one of the two sender subgroups as determined by the setting of the sender sequence relays, and whether there are idle senders, and whether the subgroups are occupied.

3.604 To seize the preferred subgroup when there are idle trunks in the desired route.

3.605 To send an all sender busy signal to the recycle controller when neither subgroup can be preferred because of no idle senders.

3.606 To recognize that the desired subgroup has been seized.

3.607 To close battery supply leads "MA", "MB), "MC", "SAM", "SBM" and "SCM" to the outgoing sender connector for operating relays in the connector.

3.608 To prepare circuits for the sender link select magnets associated with the chosen subgroup.

3.609 To test a maximum of 5 senders in the seized subgroup for the sender idle conditions.

3.610 To prefer one of the idle senders according to the setting of the master sequence circuit.

3.611 To lock the sender test relay corresponding to the preferred sender and to release the other sender test relays.

3.612 To operate the connector S relay associated with the preferred sender and the marker.

3.613 To operate the sender link select magnet associated with the preferred sender.

3.614 To transmit and check registration of information in the DP, MF, RP and PCI senders via the outgoing sender connector, concerning the numbers to be dialed out, the number of digits to be dialed out, the speed at which the digits are to be dialed, whether or not compensation is to be used, whether loop or battery and ground pulsing is to be used, the number of pulses required for an arbitrary digit if one is to be dialed, whether a start dialing signal is required and information pertaining to Automatic Message Accounting.

The following table shows the leads used for registering this information in the senders and the purpose of each type of information.

Lead	Used in Senders	Purpose
A0, A1, A2, A4, A7 to H0, H1 H2, H4 H7 and J0, J1 J2, J4 J7 to L0, L1, L2, L4, L7	DP, MF, REV, PCI	These leads and associated relays are used for transmitting and checking that the number received from the incoming or originating register has been recorded in the outgoing sender. Relays are provided on an optional basis for transmitting and checking a number composed of a toll directing code, a 3 digit completing code, 4 numerical digits and ringing control digit for party lines. The number is received and transmitted on a two relays operated out of five basis and the following additive code is used.

Relays Operated	Number Transmitted
-0 and -1	1
-0 and -2	2
-1 and -2	3
-0 and -4	4
-1 and -4	5
-2 and -4	6
-0 and -7	7
-1 and -7	8
-2 and -7	9
-4 and -7	0

Lead	Used in Senders	Purpose
AR0, AR1 AR2, AR4 AR7	DP and MF	These leads and the associated ARNO-4 relays are used to transmit an arbitrary hundreds code digit, if required, to the sender. This digit if required will be prefixed to the tens and units code digits and to the other digits to be outdialed by the sender. The digit is transmitted on a two-out-of-five basis.
BR0, BR1 BR2, BR4 BR7	DP and MF	These leads and the associated BRNO-4 relays are used to transmit an arbitrary tens code digit, if required, to the sender. This digit if required will be prefixed to the units code digit and to the other digits to be outdialed by the sender. The digit is transmitted on a two-out-of-five basis.
CR0, CR1 CR2, CR4 CR7	DP and MF	These leads and the associated CR0 to CR10 relays are used to transmit an arbitrary units code digit to the sender. This digit if required will be prefixed to the other digits to be outdialed by the sender. The digit is transmitted on a two-out-of-five basis.
CR0, CR1, CR2, CR4, CR7	RP and PCI	These leads are used for transmitting compensating resistance information to the sender.
CL1	DP and MF	This lead is used to transmit 1-1 prefix to the sender. This requires the sender to dial the 1-1 prefix before the arbitrary code digit or before the code is dialed.

Lead	Used in Senders	Purpose
CL1	RP	This lead is used for transmitting information to the sender to indicate a call to a number 1 crossbar office. Short intervals between selections are used on these calls.
CL2	DP	This lead transmits information to the sender to indicate that the call is to a community dial office or a toll call.
CL2	RP	This lead transmits information to the sender to indicate that the call is to a 2 digit office in a 2/3 digit area.
CL2	PCI	This lead transmits information to the sender to indicate that the call is to an office with no numbers above 9999.
CL2	MF	This lead transmits information to the sender to indicate that the call is toll. The sender gives immediate trunk closure on this type of call.
CL3	DP	This lead transmits a start dialing signal to the sender. This requires the sender to delay dialing until a start dialing signal is received from the distant sender or register.
CL3	RP	This lead transmits information to the sender to indicate that the call is to a non-repeating incoming ground cut off office and that a marginal trunk test should be made.
CL3	PCI	This lead transmits information to the sender to indicate that the call is to an office with numbers above 9999.
CL4	DP	This lead transmits information to the sender to indicate that 20 pps dialing is to be used.
CL4	RP	This lead transmits information to the sender to indicate that 5 should be added to incoming group selection.
CL5	DP	This lead transmits information to the sender to indicate that battery-ground dialing is required.
CL6	DP	This lead transmits information to the sender to indicate a call to a trunk with outgoing repeaters requiring loop compensation resistance.
TM	DP, MF RP, PCI	This lead transmits information to the sender to indicate that this call is using the #5 crossbar office as a tandem point.
ND	DP, MF RP, PCI	This lead transmits information to the sender to indicate that no digits are to be outdialed. Used for test calls and intra-office AMA calls.

Lead	Used in Senders	Purpose
DL1 to DL6	DP, MF, PCI	These leads transmit information to the sender which causes the sender to delete from 1 to 6 digits starting with the digit registered on the A register when outdialing or pulsing is started.
AMA	DP, MF RP, PCI	This lead transmits information to the sender to indicate that an AMA record is required.
MBO, 1, 2, 4, 7	DP, MF, RP, PCI	These leads transmit information to the sender on a 2 out of 5 basis to indicate the message billing index for the call.
4DG	DP, MF, RP, PCI	This lead transmits information to the sender to indicate that the call is to an office having no numbers of more than 4 digits.
5DG	DP, MF, RP, PCI	This lead transmits information to the sender to indicate that the call is to an office having some 5 digit number but not lettered stations. The "5DG" office may also have numbers of less than 4 digits.
LST	DP, MF, RP, PCI	This lead transmits information to the sender to indicate calls to an office having 4 digit numbers, some of which have lettered stations.
L5D	DP, MF, RP, PCI	This lead transmits information to the sender to indicate a call to an office having 3, 4 or 5 digit numbers and some 4 digit numbers with lettered stations.
CP0, CP1, CP2, CP4, CP7	DP, MF, RP, PCI	Information is transmitted over these leads on a 2 out of 5 basis to indicate the code pattern of the called office and the number of digits (zero to three) in the called office code together with the area, extended or local.
RN0, RN1, RN2, RN4, RN7	DP, MF, RP, PCI	These leads together with the associated relays transmit and check the registration of the recorder number in the outgoing senders. The number is transmitted and checked on a 2 out of 5 basis.
SC, TVT	DP, MF, RP, PCI	These leads transmit information to the sender to indicate that the call is a service call or a transverter test call.
OBS, NOB	DP, MF, RP, PCI	These leads transmit information to the sender to indicate whether or not the call is from a line connected to service observing equipment.

Lead	Used in Senders	Purpose
TP, RP	DP, MF, RP, PCI	These leads transmit information to the sender to indicate the identification of the calling line as to individual or ring or tip party.
FTO, 1, 2, 3	DP, MF, RP, PCI	These leads and associated relays transmit and check information to the sender on a 1 out of 4 basis to indicate the line link frame tens location of the calling line.
FUO, FU1, FU2, FU4, FU7	DP, MF, RP, PCI	These leads and associated relays transmit and check information to the sender on a 2 out of 5 basis to indicate the line link frame units location of the calling line.
VGO, VG1, VG2, VG4, VG7, VG10	DP, MF, RP, PCI	These leads and associated relays transmit and check information to the sender on a 2 out of 6 basis to indicate the line link vertical group location of the calling line. The two relays operated out of six uses the following additive code.

Relays Operated	Vertical Group Transmitted
VG4 and VG7	VGO
VGO and VG1	VG1
VGO and VG2	VG2
VG1 and VG2	VG3
VGO and VG4	VG4
VG1 and VG4	VG5
VG2 and VG4	VG6
VGO and VG7	VG7
VG1 and VG7	VG8
VG2 and VG7	VG9
VGO and VG10	VG10
VG1 and VG10	VG11

Lead	Used in Senders	Purpose
HGO, HG1, HG2, HG4, HG7	DP, MF RP, PCI	These leads and associated relays transmit and check information to the sender on a 2 out of 5 basis to indicate the line link horizontal group location of the calling line.
VFO, VF1 VF2, VF3, VF4	DP, MF, RP, PCI	These leads and associated relays transmit and check information to the sender on a 1 out of 5 basis to indicate the line link frame location of the calling lines.
ST7	DP, MF, RP, PCI	This lead and associated relay transmits and checks information to the sender to indicate that a full complement of digits has been sent on AMA calls. On non-AMA calls this relay indicates that the marker has received a full complement of digits.

Part of the route information noted above is obtained by cross connections to either the primary or secondary winding of relays as noted below.

TRANSMIT ON LEADS

Operated Relay	With Primary Cross-Connected	With Secondary Cross-Connected
ARN0	AR-4,AR-7	AR-1,AR-4
ARN1	AR-0,AR-1	AR-2,AR-4
ARN2	AR-0,AR-2	AR-0,AR-7
ARN3	AR-1,AR-2	AR-1,AR-7
ARN4	AR-0,AR-4	AR-2,AR-7
ARN5		None
BRN0	BR-4,BR-7	BR-1,BR-4
BRN1	BR-0,BR-1	BR-2,BR-4
BRN2	BR-0,BR-2	BR-0,BR-7
BRN3	BR-1,BR-2	BR-1,BR-7
BRN4	BR-0,BR-4	BR-2,BR-7
CR0	CR-4,CR-7,CL1	CR-4,CR-7
CR1	CR-0,CR-1,CL1	CR-0,CR-1
CR2	CR-0,CR-2,CL1	CR-0,CR-2
CR3	CR-1,CR-2,CL1	CR-1,CR-2
CR4	CR-0,CR-4,CL1	CR-0,CR-4
CR5	CR-1,CR-4,CL1	CR-1,CR-4
CR6	CR-2,CR-4,CL1	CR-2,CR-4
CR7	CR-0,CR-7,CL1	CR-0,CR-7
CR8	CR-1,CR-7,CL1	CR-1,CR-7
CR9	CR-2,CR-7,CL1	CR-2,CR-7
CR10	CL1	None
CL0	CL-2,CL-3	CL-3
CL1	CL-2,CL-3,CL-4	CL-3,CL-4
CL2	CL-2	None
CL3	CL-2,CL-4	CL-4
CL4	CL-2,CL-5	CL-5
CL5	CL-2,CL-6	CL-6
MB0	MB-4,MB-7,AMA	MB-1,MB-4,AMA
MB1	MB-0,MB-7,AMA	MB-2,MB-4,AMA
MB2	MB-0,MB-2,AMA	MB-0,MB-7,AMA
MB3	MB-1,MB-2,AMA	MB-1,MB-7,AMA
MB4	MB-0,MB-4,AMA	MB-2,MB-7,AMA
SCC	SC	
TVA	TVT	
NOB	NOB	
OBS	OBS	
DL0	4DG	5DG
DL1	DL-1,4DG	DL-1,5DG
DL2	DL-2,4DG	DL-2,5DG
DL3	DL-3,4DG	DL-3,5DG
DL4	DL-4,4DG	DL-4,5DG
DL5	DL-5,4DG	DL-5,5DG
DL6	DL-6,4DG	DL-6,5DG
DL7	L5D	LST
DL8	DL-1,L5D	DL-1,LST
DL9	DL-2,L5D	DL-2,LST
DL10	DL-3,L5D	DL-3,LST
DL11	DL-4,L5D	DL-4,LST
DL12	DL-5,L5D	DL-5,LST
DL13	DL-6,L5D	DL-6,LST
CP0	CP-4,CP-7 (Local Area)	CP-1,CP-4 (Extended Area)
CP1	CP-0,CP-1 (Local Area)	CP-2,CP-4 (Extended Area)
CP2	CP-0,CP-2 (Local Area)	CP-0,CP-7 (Extended Area)
CP3	CP-1,CP-2 (Local Area)	CP-1,CP-7 (Extended Area)
CP4	CP-0,CP-4 (Not Used)	CP-2,CP-7 (Extended Area)

3.615 To check that the proper information has been transmitted on the "CL" leads with check relays CLK1, CLK2, CLK3 together with relays CLP and CLS.

3.616 To check that proper information has been transmitted over the "CR" - leads with check relays CRK1, CRK2, CRK3 together with relays CRP and CRS.

3.617 To check that proper information has been transmitted over the "AR-" leads with check relays ARK1 and ARK2 together with ARP and ARS relays.

3.618 To check that proper information has been transmitted over the "BR-" leads with check relays BRK1 and BRK2 together with BRP and BRS relays operated.

3.619 To check that proper information has been transmitted over the "MB-" leads with check relays MBK-1, MBK-2 and MBK-3.

3.620 To check that proper information has been transmitted over leads "SC" and "TVT" with check relay MBK4.

3.621 To check that proper information has been transmitted over leads "NOB" and "OBS" with check relay MBK5.

3.622 To check that proper information has been transmitted over the "DL-", "4DG", "5DG", "L5D", and "LST" leads with check relays DLK1 and DLK2 together with relays DLP and DLS.

3.623 To check that proper information has been transmitted over the "CP-" leads with check relays CPK1 and CPK2 together with relays CPP and CPS.

3.7 Miscellaneous Functions

3.71 Recycle and Route Advance Functions

3.7101 To disable the FCR, TB, TG and OS contacts of the route relays when the recycle relay is operated.

3.7102 To disable the FCR, TB, TG, OS, DL, CR, CL, CP and PC contacts of the route relays of a ground supply group when the ground supply relay is operated.

3.7103 To operate the ground supply relay when a route relay of the group is operated and when the route advance relays are operated.

3.7104 To maintain the recycle or route advance relays operated until the selections normal check SNK relay has released.

3.7105 To release the recycle relay and reselect a trunk, sender, etc. in the same route, after the selections normal check relay has released.

3.7106 To release the route advance relays after the selections normal check relay has released.

3.7107 To advance the trunk link frame, trunk, sender subgroup, junctor group, and line preferences when the recycle or route advance relays function.

3.7108 To give the sender a reorder signal when the route advance or recycle relays operate.

3.7109 For a dial tone connection to operate the marker disconnect relays and give the marker connector an MRL release signal when the route advance relays function.

3.7110 For a dial tone connection to operate the route advance relays when all registers are found busy.

3.7111 For a dial tone connection to operate the recycle relay after a first failure to match.

3.7112 For a dial tone connection to operate the route advance relays after a second failure to match.

3.7113 To ground "RL" lead to the originating register when the marker give the register a "BT" release following an "All permanent signal trunks busy" and an "All common overflow trunks busy" condition.

3.7114 For a subscriber outgoing call to operate the route relay of the next preferred alternate route when the ground supply relay of the previous route is operated and the route advance relays are released.

3.7115 For a subscriber outgoing call to operate the marker trouble release relays and give the connector a BT release signal if the route advance relays operate on the last available route.

3.7116 For a subscriber outgoing call to operate the marker trouble release relays and give the connector a BT release signal if a third failure to match occurs on one marker usage.

3.7117 For a subscriber outgoing call to operate the marker trouble release relays and give the connector a BT release signal if the desired line link frame is found plugged busy.

3.7118 For a tandem outgoing call to advance to the next preferred alternate route, when the route advance relays function, if the incoming trunk is marked TAN.

3.7119 For a tandem outgoing call to advance the class from TOG to TER when the route advance relays operate on the last available route.

3.7120 For a tandem outgoing call to operate the route relay of the next preferred alternate route when the route advance relays function, if the incoming trunk is marked TOL.

3.7121 For a tandem outgoing call to advance the class from TOG to TER when the route advance relays function on the last alternate route, if the incoming trunk is marked TOL.

3.7122 For a tandem outgoing call to operate the marker reorder relays when the class is advanced from TOG to TER.

3.7123 For a tandem outgoing call to choose one of two number groups (in which the trunk number is located) according to whether the call arrived thru an even or odd numbered connector circuit.

3.7124 For a tandem outgoing call to reverse the choice of number groups (in which the trunk number is located) when the marker recycle relays function.

3.7125 For a tandem outgoing call to reverse the choice of number groups (in which the trunk number is located) when the chosen number group is plugged busy.

3.7126 For a tandem outgoing call to operate the route advance relays when the line link frame is plugged busy if the incoming trunk is marked TAN.

3.7127 For a tandem outgoing call to operate the recycle relays when the line link frame is plugged busy if the incoming trunk is marked TOL.

3.7128 For a subscriber outgoing or tandem outgoing call associated with one trunk group and no senders to operate the route advance relays if all trunks are found busy.

3.7129 For a subscriber outgoing or tandem outgoing call associated with one trunk group and no senders to operate the recycle relay after a first failure to match.

3.7130 For a subscriber outgoing or tandem outgoing call associated with one trunk group and no senders to operate the route advance relays after a second failure to match.

3.7131 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and no senders to prefer each of two groups of trunks on alternate calls started by registers.

3.7132 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and no senders to advance the allotter and select a trunk in the non-preferred group if all trunks in the preferred group are found busy.

3.7133 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and no senders to operate the route advance relays if all trunks in the non-preferred group are found busy.

3.7134 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and no senders to operate the recycle relay, advance the allotter, and select a trunk in the non-preferred group after a failure to match to a trunk in the preferred group.

3.7135 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and no senders to operate the route advance relays after a failure to match to a trunk in the non-preferred group.

3.7136 For a subscriber outgoing or tandem outgoing call associated with one trunk group and one sender group to operate the route advance relays if all trunks or all senders are found busy.

3.7137 For a subscriber outgoing or tandem outgoing call associated with one trunk group and one sender group to operate the marker recycle relay after a first failure to match.

3.7138 For a subscriber outgoing or tandem outgoing call associated with one trunk group and one sender group to operate the route advance relays after a second failure to match.

3.7139 For subscriber outgoing or tandem outgoing call associated with two trunk groups and one sender group to prefer each of two groups of trunks on alternate calls started by registers.

3.7140 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and one sender group to advance the allotter and select a trunk in the non-preferred group when all trunks in the preferred group are found busy.

3.7141 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and one sender group to operate the route advance relays when all trunks have been found busy in the non-preferred group or when all senders are found busy.

3.7142 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and one sender group to operate the recycle relay, advance the allotter, and reselect a sender and a trunk in the non-preferred group after a failure to match to a trunk in the preferred group.

3.7143 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and one sender group to operate the route advance relays after a failure to match to a trunk in the non-preferred group.

3.7144 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and two sender groups to prefer each of two groups of trunks and each of two groups of senders on alternate calls started by registers.

3.7145 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and two sender groups to advance the allotter and select a sender and a trunk in the non-preferred group when all senders or all trunks in the preferred group are found busy.

3.7146 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and two sender groups to operate the route advance relays when all senders or all trunks in the non-preferred group are found busy.

3.7147 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and two sender groups to operate the recycle relay, advance the allotter and select a sender and a trunk in the non-preferred group after a failure to match to a trunk in the preferred group.

3.7148 For a subscriber outgoing or tandem outgoing call associated with two trunk groups and two sender groups to operate and route advance relays after a failure to match to a trunk in the non-preferred group.

3.7149 For a subscriber outgoing or tandem outgoing call associated with a two way trunk group to operate the recycle relay if an all trunk busy condition develops in a two way trunk group after the trunk link frame has been selected but before the trunk has been selected.

3.7150 For an intraoffice call to advance the class from ITR to SOG when the route advance relays function.

3.7151 For an intraoffice call to route advance to a reverting call trunk group, a tone trunk group, or a service trunk group under control of the reverting relay and a service relay.

3.7152 For the call forward portion of an intraoffice call to match the location of the calling line against the location of the called line and to operate the reverting call relay if they are the same.

3.7153 For the call forward portion of an intraoffice call to operate the route advance relays if the desired number group is plugged busy on calls associated with non PBX lines or non-allotted PBX lines.

3.7154 For the call forward portion of an intraoffice call on a first recycle to recycle the marker and the PBX allotter to select another number group if the desired number group is plugged busy on calls associated with allotted PBX lines.

3.7155 For the call forward portion of an intraoffice call to operate the route advance relays if the desired line link frame is plugged busy on calls associated with non PBX lines and non-allotted PBX lines.

3.7156 For the call forward portion of an intraoffice call on a first recycle to recycle the marker and the PBX allotter to select another number group if the desired line link frame is plugged busy on calls associated with allotted PBX lines.

3.7157 For the call forward portion of an intraoffice call to route to busy tone if the desired number group is plugged busy and the marker and the PBX allotter have previously been recycled when the call is associated with an allotted PBX line.

3.7158 For the call forward portion of an intra-office call to route to busy tone if the desired line link frame is plugged busy and the marker and the PBX allotter have previously been recycled when the call is associated with an allotted PBX line.

3.7159 For the call forward portion of an intra-office call to operate the route advance relays and apply busy tone if the PBX line group is busy on calls associated with non-allotted PBX lines.

3.7160 For the call forward portion of an intra-office call on a first recycle to recycle the marker and the PBX allotter to select another number group on PBX line group busy on calls associated with allotted PBX lines.

3.7161 For the call forward portion of an intra-office call to operate the route advance relays if the desired PBX line group is busy and the marker and the PBX allotter have previously been recycled on calls associated with allotted PBX lines.

3.7162 For the call forward portion of an intra-office call associated with one trunk group to operate the route advance relays if all trunks are found busy.

3.7163 For the call forward portion of an intra-office call associated with one trunk group to operate the recycle relay after a failure to match, if the failure to match in the first one on this route.

3.7164 For the call forward portion of an intra-office call associated with one trunk group to operate the route advance relays after a second failure to match on this route.

3.7165 For the call forward portion of an intra-office call associated with two trunk groups to prefer each of two trunk groups on alternate calls started by registers.

3.7166 For the call forward portion of an intra-office call associated with two trunk groups to advance the allotter and select a trunk in the non-preferred group, if all trunks in the preferred group are found busy.

3.7167 For the call forward portion of an intra-office call associated with two trunk groups to operate the route advance relays if all trunks in the non-preferred group are found busy.

3.7168 For the call forward portion of an intra-office call associated with two trunk groups to operate the recycle relay, advance the allotter and reselect a trunk in the non-preferred group after a failure to match to a trunk in the preferred group, if the failure to match is the first one on this route.

3.7169 For the call forward portion of an intra-office call associated with two trunk groups to operate the route advance relays after a failure to match to a trunk in the non-preferred group.

3.7170 For the call back portion of an intra-office call to operate the marker trouble release relays and give the connector a BT release signal if the desired line link frame is found plugged busy.

3.7171 For the call back portion of an intra-office call to operate the recycle relay after a failure to match, if the failure to match is the first one on this route.

3.7172 For the call back portion of an intra-office call to release the call back relays and the call forward connection, when the recycle relay functions during the call back stage.

3.7173 For the call back portion of an intra-office call to operate the route advance relays after a failure to match, if the failure to match is the second one on this route.

3.7174 For the call back portion of an intra-office call to operate the route advance relays when all senders are found busy, if a sender is required for AMA purposes.

3.7175 To give a "BT" release when the Incoming Register gives "TST" signal when trouble is encountered.

3.7176 To release the Automatic Monitor when the marker recycles on an allotted trunk group.

3.72 Cross Detection Functions

3.7201 To provide a standing test to test for false ground on the "BT" release lead to the marker connector.

3.7202 To provide a standing test to test for false ground on the "MRL" release lead to the marker connector.

3.7203 To provide a standing test to test for false ground on the "TRL" release lead to the marker connector.

3.7204 To provide a standing test to test for false ground on the "LO", "LOB", "LOK" and "G" leads as the line link marker connector.

3.7205 To provide a standing test to test for false ground on the "TC" lead to the line link marker connector.

3.7206 To provide a standing test to test for false ground on the "TC1" lead to the line link marker connector.

3.7207 To provide a standing test to test for false battery on leads "SM 0-9" to the line link frame.

3.7208 To provide a standing test to test for false ground on leads "LL 0-9" to the line link frame and leads "J 0-9" and "LH 0-9" to the trunk link frame.

3.7209 To provide a standing test to test for false ground on lead "XFT" to the trunk link frame.

3.7210 To provide a standing test to test for false ground on the "LV" lead or the operation of more than one LV relay on the trunk link frame.

3.7211 To provide a standing test to test for false battery on the "TB 0-5" leads to the trunk link frame.

3.7212 To provide a standing test to test for false ground on "ALC" and "BLC" leads and for the operation of more than one LC relay on the trunk link frame.

3.7213 To provide a standing test to test for false ground on leads "TG 0-19" to the trunk link frame.

3.7214 To provide a standing test to test for false battery on leads "RS 0-1" to the trunk link frame.

3.7215 To provide a standing test to test for false battery on leads "RS 2-9" to the trunk link frame.

3.7216 To provide a standing test to test for false ground on leads "CR 0, 1, 2, 4, 7", "CL 1-6", "DL 1-6", "AMA", "ND", "CPO, 1, 2, 4, 7", "MBO, 1, 2, 4, 7", "4DG", "5DG", "L5D", "LST", "NOB", "OBS", "TVT", and "SC" leads to the outgoing sender connector.

3.7217 To test during marker usage for false ground in the route series relay check circuit.

3.7218 To test during marker usage for simultaneous operation of marker FAK and FBK relays.

3.7219 To test during marker usage for simultaneous operation of the marker CLP and CLS relays.

3.7220 To test during marker usage for simultaneous operation of the marker CPP and CPS relays.

3.7221 To test during marker usage for simultaneous operation of the marker CRP and CRS relays.

3.7222 To test during marker usage for simultaneous operation of the marker DLP and DLS relays.

3.7223 To test during marker usage for simultaneous operation of the marker MBP and MBS relays.

3.7224 To test during marker usage for simultaneous operation of the marker OBS and NOB relays.

3.7225 To test during marker usage for simultaneous operation of the marker TVA and SCC relays.

3.7226 To test during marker usage for simultaneous operation of the marker FGO and FG1 relays.

3.7227 To test during marker usage for simultaneous operation of the marker RSO and RS1 relays.

3.7228 To test during marker usage for the operation of more than one relay in the group of RS2-9 relays of the marker.

3.7229 To test during marker usage for the operation of more than one relay in the group of OR, TAN, TOL, INC and RO relays of the marker.

3.7230 To test during marker usage for the operation of more than one relay in the group of CS 0-29 relays of the marker.

3.7231 To test during marker usage for the operation of more than one relay in the group of FTT 0-3 relays of the marker.

3.7232 To test during marker usage for the operation of more than one relay in the group of FUT 0-9 relays of the marker.

3.7233 To test during marker usage for the operation of more than one relay in the group of TBIA, RIA, BNA, TRN1 and NE relays and for the simultaneous operation of the OAN and OBN relays of the marker.

3.7234 To test during marker usage for the operation of more than one relay in the group of PA, PB, PC and PNR relays of the marker.

3.7235 To test during marker usage for the operation of more than one relay in the group, of ONN, 1TB, 2MB, 3FB, 4TT, 5MT, 6FT, 7TP, 8MP and 9FP relays of the marker.

3.7236 To test during marker usage for the operation of more than one relay in the group of P 0-9 relays of the marker.

3.7237 To test during marker usage for the operation of more than one relay in the group of RCT 1-15 relays of the marker.

3.7238 To test during marker usage for the operation of more than one relay in the group of OA, OB, X11, 11X, TCT, TC6 and TC5 relays of the marker.

3.7239 To test during marker usage for the operation of more than one relay in the group of TB 0-5 relays of the marker.

3.7240 To test during marker usage for the operation of more than one relay in the group of TG 0-19 relays of the marker.

3.7241 To test during marker usage for false ground on the "RL" lead to the originating register marker connector.

3.7242 To test during marker usage for false ground or the operation of more than one VGA relay of the Line Link Frame.

3.7243 To test during marker usage for false ground or the operation of more than one VGB relay of the Line Link Frame.

3.7244 To test during marker usage for false ground or the operation of more than one HG relay of the Line Link Frame.

3.7245 To test during marker usage for false ground or the operation of more than one LG relay of the Line Link Frame.

3.7246 To test during marker usage for false ground or the operation of more than one AMA relay (for the same marker) of the Outgoing Sender Connector.

3.7247 To test during marker usage for false ground or the operation of more than one S relay (for the same marker) of the Outgoing Sender Connector.

3.7248 To test during marker usage for false ground or the operation of both EF and RF relays of the Trunk Link Frame

3.7249 To test during marker usage for false ground or the operation of more than one JC relay of the Trunk Link Frame.

3.7250 To test during marker usage for false ground or the operation of more than one G relay of the Trunk Link Frame.

3.7251 To test during marker usage for false ground or the operation of more than one junctor switch select magnet of the Trunk Link Frame.

3.7252 To test during marker usage for false ground or the operation of both R and L relays of the Trunk Link Frame.

3.7253 To test during marker usage the "AST" and "BST" leads to the Trunk Link Frame for false ground.

3.7254 To test during marker usage the "SS 0-9" leads to the Trunk Link Frame for false battery.

3.7255 To test during marker usage the "TSX", "ASM" and "BSM" leads to the Trunk Link frame for false battery and to test for the operation of more than one trunk select magnet on lead "TSX".

3.7256 To test during marker usage the "TRK" lead to the marker connector for false ground on second trials.

3.7257 To test during marker usage for a cross connection between line hold magnets.

3.73 Timing and Trouble Indicating Functions

3.7301 To start the work timer when the marker is seized.

3.7302 To recycle the work timer when

a. Making channel test.

b. Operating the line hold magnet.

c. Line hunting in a block of 10 lines.

d. The route advance or recycle relays function.

e. Other miscellaneous conditions occur.

3.7303 To stop the work timer when

a. The seize frame timer starts.

b. The marker returns to normal.

c. The marker asks for the trouble recorder without a work time out having occurred.

d. Other miscellaneous conditions occur.

3.7304 To start the seize frame timer when the marker attempts to seize a sender group.

3.7305 To stop the seize frame timer when the sender group is seized.

3.7306 To prevent starting the seize frame timer while the marker is holding a sender group.

3.7307 To start the seize frame timer when the marker attempts to seize a trunk link frame (provided the marker is not holding a sender group).

3.7308 To stop the seize frame timer when the trunk link frame is seized.

3.7309 To start the seize frame timer when the marker attempts to seize a number group (provided the marker is not holding a sender group).

3.7310 To stop the seize frame timer when the number group is seized.

3.7311 To prevent starting the seize frame timer while the marker is holding a number group.

3.7312 To start the seize frame timer when the marker attempts to seize a line link frame (provided the marker is not holding a sender group or a number group).

3.7313 To stop the seized frame timer when the marker seizes the line link frame.

3.7314 To start the seize frame timer regardless of frame seizures on a monitored call or a test call other than a marker test call.

3.7315 To start the seize frame timer when the marker is ready to disconnect but is waiting for the sender to make trunk test.

3.7316 To lock in a seize frame timed out condition when the trouble recorder timer starts.

3.7317 To stop the seize frame timer when the route advance relays operate.

3.7318 To start both the long and short delay timers when the seize frame timer times out.

3.7319 To disable the short delay timer when the trouble recorder is off normal except when the marker is waiting for the sender to make trunk test.

3.7320 To start the trouble recorder timer and take a trouble record when the work timer times out, and indicate on the trouble record card that the work timer timed out.

3.7321 To start the trouble recorder timer and take a trouble record when either the short or the long delay timer times out, and indicate on the trouble record card which timer has timed out.

3.7322 To start the trouble recorder timer when the marker asks for the trouble recorder.

3.7323 To operate the heavy traffic relay when the marker returns to normal.

3.7324 To maintain the heavy traffic relay operated until the heavy traffic timer times out.

3.7325 To start the heavy traffic timer when the marker is normal and the heavy traffic relay is operated.

3.7326 To stop the heavy traffic timer when the marker is reseized.

3.7327 To release the heavy traffic timed out condition when the heavy traffic relay releases.

3.7328 To start the over-all timer when the marker is seized.

3.7329 To stop the over-all timer when the marker returns to normal.

3.7330 To operate the marker trouble release relays and give the connector a TRL release when a ground test failure occurs on a first trial.

3.7331 To remove the operating grounds from the line link, junctor and trunk link hold magnets when a ground test fails on a first trial.

3.7332 To ask for the trouble recorder when either the work timer or the short or long delay timer times out and the trouble recorder timer starts.

3.7333 To ask for the trouble recorder when the master cross test relay operates.

3.7334 To ask for the trouble recorder when an incoming register reports a link release failure.

3.7335 To ask for the trouble recorder when a ground test failure occurs on a second trial.

3.7336 To ask for the trouble recorder when the marker is ready for disconnect and when the line link marker connector reports a transferred start lead.

3.7337 To ask for the trouble recorder when the marker is ready for disconnect when setting up a connection from a line to a permanent signal trunk.

3.7338 To stop the progress to prevent seizing a sender group, trunk link frame, number group or line link frame (if not already seized) when asking for the trouble recorder.

3.7339 To proceed without waiting for the trouble recorder to become idle if it is busy when the marker asks for it.

3.7340 To give a display lost signal to the master test frame jack, lamp and key circuit when the marker asks for the trouble recorder but proceeds without a trouble record due to the recorder being busy.

3.7353 For a trouble recorder failure to signal the trouble recorder control circuit.

3.7354 When the over-all timer times out to give the connector both an MRL and a BT release.

3.7355 When the over-all timer times out to release a line link marker connector, by opening lead OC.

3.7356 When the over-all timer times out to remove the operating ground from the line link, junctor and trunk link hold magnets.

3.7357 When the over-all timer times out to release the sender connector.

3.7358 When the over-all timer times out to release the number group.

3.7359 When the over-all timer times out to release the trunk link frame.

3.7360 When the over-all timer times out to release the line link frame.

3.7361 When the over-all timer times out to release the ringing switch hold magnet on a terminating call, by opening lead "TP".

3.74 Traffic Register Functions

3.7401 To operate a peg count register on the line link frame when a call back connection is established to a trunk on the trunk link frame. A dial tone call will not score the register. The register will be common to all classes of subscribers on the line frame and will indicate the originating traffic, which is completed to a trunk termination including toll and tandem thru switched calls, line busies, overflow, partial dial, permanent signals, etc.

3.7402 To operate a peg count register on the line link frame on intra-office call forward connections established between the trunk link and line link frames. Also to score on a completed terminating connection between the incoming trunk and the line link frame.

3.7403 To operate an overflow register on the line link frame on any failure to match on call forward or call back connection for any marker usage.

3.7404 To operate a peg count register on the trunk link frame to score on intra-office call back calls and outgoing trunks calls; the latter including inter-office, operator test desk, tone etc. trunks.

3.7405 To operate the peg count register on the trunk link frame when a connection is established to an originating register. This register will score total originating traffic including false starts and toll and tandem thru switched calls.

3.7406 To operate a peg count register on the trunk link frame on incoming calls that are completed or encountered line busy or overflow.

3.7407 To operate an overflow register on the trunk link frame on any failure to match on call forward or call back connections for any marker usage.

3.7408 To operate a common register per office on a second failure to match on a call back or a call forward connection.

3.7409 To operate an originating matching loss register on all intra-office or outgoing calls encountering a second failure to match except outgoing calls to tone trunks, permanent signal trunks or stuck coin trunks.

3.7410 To operate a common register per office on incoming calls when a failure to match is encountered.

3.7411 To operate an overflow register in the traffic register circuit per trunk group as specified when all trunks are busy.

3.7412 To operate a register in the traffic register circuit per trunk group as specified for intra-office and outgoing trunk groups.

3.7413 To operate a register in the traffic register circuit per sender group on all offered pulse conversion calls.

3.7414 To operate a common register in the traffic register circuit for each group of outgoing senders after the subscriber and the outgoing sender have been connected to the outgoing trunk.

3.7415 To operate a common register in the traffic register circuit as an outgoing sender group overflow indication.

3.7416 To operate a register in the traffic register circuit (maximum 10) for each class of originating service when the marker completes a call.

3.7417 To operate a common register in the traffic register circuit for each code point using a common outgoing trunk group.

3.7341 To proceed when the trouble recorder reports that the record is complete.

3.7342 To open the trouble recorder start lead after receiving the proceed signal from the trouble recorder.

3.7343 To remove the operating grounds from the line link, junctor and trunk link hold magnets after receiving the proceed signal from the trouble recorder, provided the failure is one which will require use of the marker trouble release relays.

3.7344 To request for a trouble record due to work time out, delay time out (not caused by TG failure), cross or link release failure and,

a. For a subscriber outgoing call or the call back portion of an intra-office call on first trial to operate the marker disconnect relays and give the connector an MRL release if the call has advanced to the point where the connection from the line to the subscribers register is released.

b. For a subscriber outgoing call or the call back portion of an intra-office call on first trial to operate the marker trouble release relays and give the connection a TRL release if the call has not advanced to the point where the connection from the line to the subscribers register is released.

c. For other than a subscriber outgoing call or the call back portion of an intra-office call and for a link release failure with a link double connection on first trial to operate the marker trouble release relays and give the connector a BT release.

d. For other than a subscriber outgoing call or the call back portion of an intra-office call and for a link release failure with a link double connection on first trial to operate the route advance relays to prepare the marker for setting the trunk in overflow.

e. For other than a subscriber outgoing call or the call back portion of an intra-office call and for a link release failure with a link double connection on first trial to operate the marker trouble release relays and give the connector a BT release after setting the trunk in overflow or if a failure occurs while setting the trunk in overflow.

f. For other than a subscriber outgoing call or the call back portion of an intra-office call and for other than a link release failure on first trial to operate the marker trouble release relays and give the connector a TRL release.

g. For a terminating call or a tandem outgoing call on second trial to operate the route advance relays to prepare the marker for setting the trunk in overflow.

h. For a terminating call or a tandem outgoing call on second trial to operate the marker trouble release relays and give the connector a BT release if the failure occurs while setting the trunk in overflow.

i. For other than a terminating or tandem outgoing call on second trial to operate the marker trouble release relays and give the connector a BT release.

3.7345 To request for trouble record due to ground test failure on second trial and,

a. For a PBX line to operate the marker trouble release relays and give the connector a BT release.

b. For a non-PBX line to operate the cancel ground test relay and complete the call in the normal manner.

3.7346 To request for trouble record due to line link transferred start lead or the setting up of a connection from a line to a permanent signal trunk and to operate the marker disconnect relays and give the connector an MRL release.

3.7347 To request for trouble record due to delay time out caused by sender failure to make trunk test and,

a. To give the sender a reorder signal.

b. To return the marker to normal when the sender recognizes the reorder signal and removes ground from the TG lead.

3.7348 To give the monitor circuit a dismissal signal when the marker wishes to take a trouble record or give a trouble release without a record.

3.7349 For a trouble recorder failure when the trouble recorder timer times out to open the trouble recorder start lead.

3.7350 For a trouble recorder failure to operate the marker disconnect relays and give the connector an MRL release, except on marker test calls.

3.7351 For a trouble recorder failure to remove the operating grounds from the line link, junctor and trunk link hold magnets.

3.7352 For a trouble recorder failure to release the marker if there is a false ground on the TG lead from the sender.

3.7418 To operate an overflow register when associated with the subscribers line each time a terminating call to this line encounters a busy.

3.7419 To operate a common register in the traffic register circuit whenever a test call uses a marker.

3.7420 To operate a common register in the traffic register circuit whenever a test call uses a line link frame.

3.7421 To operate a register in the master test frame plant register circuit to record central office troubles detected by the marker on a per marker basis.

3.7422 To operate a register in the master test frame plant register circuit on a per marker basis for each second trial failure.

3.7423 To operate a register in the master test frame plant register circuit on a per marker basis for each ground test failure.

3.7424 To operate a peg count register for all offered marker pulse conversion traffic except test calls.

3.7425 To operate a register in the traffic register circuit for all offered blank number calls.

3.7426 To operate a register in the traffic register circuit for all offered regular intercept number traffic calls.

3.7427 To operate a register in the traffic register circuit for all offered trouble intercept calls.

3.75 No Test Call, No Hunt Call and Special Hunt Call Functions

3.7501 On a no-hunt call, a no test call or a special hunt call to receive information via the incoming register marker connector to indicate that the incoming call is special.

3.7502 On a no-hunt call, a no test call or a special hunt call to receive information via the trunk line connector circuit to indicate that the special call is no test, no hunt or special hunt.

3.7503 On a no-hunt call, a no test call or a special hunt call to close a start lead to the master test frame connector circuit to determine which of the special markers or the master test frame shall have preference in setting up a no test train. This avoids having two F relay operated in two no test trunks which would result in a double connection on the no test connector.

3.7504 On a no test call to test the called line sleeve for busy and if the line is idle a linkage is set up between the called line and the no test trunk in the usual manner.

3.7505 On a no test call to use the no test train for setting up a call to the no test incoming if the called line tests busy.

3.7506 On a no test call to apply a message registration voltage detector to the line links when the no test train is used.

3.7507 On a no test call to delay the test for identifying the line link associated with the busy line if message registration voltage is detected.

3.7508 On a no test call to apply test relays to the line links for the purpose of identifying the line link associated with the busy line.

3.7509 On a no test call to detect the presence of message registration potential while identifying the line link.

3.7510 On a no test call to recycle the test for identifying the line link if message registration potential is detected.

3.7511 On a no test call to operate the channel selection CH- relay associated with the line link connected to the busy line.

3.7512 On a no test call to operate the select magnets on the line link frame when the channel selection relay is operated.

3.7513 On a no test call to operate the hold magnet on the no test connector and the hold magnets associated with the no test junctor on the line switch.

3.7514 On a no test call to operate the disconnect relay after the no test train has been set up.

3.7515 On a no test call to set the no test incoming to return overflow if the no test junctor tests busy.

3.7516 On a no test call to set the no test incoming to return busy back when the marker fails to identify the line link associated with the busy line.

3.7517 On a no test call to cancel PBX hunting, continuity test, false cross and ground test, and ground test.

3.7518 On a no hunt call to set up a terminating connection to a called number.

3.7519 On a no hunt call cancel PBX testing.

3.7520 On a no hunt call cancel continuity test.

3.7521 On a no hunt call cancel ground test.

3.7522 On a special hunt call to set up a terminating call to a PBX line from the test desk.

3.7523 On a special hunt call to set up a second call to the same PBX trunk and then hunt to the next idle line.

3.7524 On a special hunt call to cancel continuity test.

3.7525 On a special hunt call to cancel ground test.

3.76 Pulse Conversion Functions

3.7601 To recognize a signal from an incoming register that a pulse conversion, to reverting, operation is required.

3.7602 To recognize a signal from an incoming register that a pulse conversion operation to either of two groups of dial pulse senders is required.

3.7603 To receive from the incoming register the identification of the trunk link frame on which the pulse conversion trunk is located.

3.7604 To receive from the incoming register the number to be transmitted over the trunk by the sender.

3.7605 To operate a route relay which has been assigned to the group of senders required for the pulse conversion call.

3.7606 To seize the trunk link frame on which the pulse conversion trunk appears.

3.7607 To operate the trunk F relay thru the incoming register.

3.7608 To receive a class signal from the trunk and to transmit the trunk class signal to the sender.

3.7609 To shift the called number digits, received on the A, B, C and D registers of the marker to the C, D, E and F digit leads of the sender in a 2 digit area or to the D, E, F and G digit leads of the sender in a 2-3 or 3 digit area.

3.7610 To advance the sender, give a release signal to the incoming register and release after priming the sender.

3.7611 To set the pulse conversion trunk in overflow when all senders are found busy.

3.7612 To cancel operation of the TT relay of the pulse conversion trunk on test calls.

3.77 Intermarker Group Operation Functions

3.711 To transmit, via the "CL" leads of the route information transfer circuit, information to the intermarker group sender indicating type of translator and class of incoming trunk.

3.772 To cancel operation of the TT relay of the intermarker group trunk on test calls.

3.773 To not close the start lead for calling in the Automatic Monitor, since intermarker group senders will not be monitored.

3.774 To receive a signal from the intermarker group sender, thru the incoming register marker connector, that a test call is being made.

3.775 To stop progress take a trouble record and give a normal release when the test call signal is received.

3.8 Testing Information

3.81 The marker shall be capable of performing all the service functions specified in this circuit description and also shall be capable of functioning under the test conditions listed below. Testing circuits per Figs. 1, 2 and 3 are suggested as an aid in testing.

3.82 The marker shall be capable of performing its functions when voltages are within the following limits.

	Min.	Max.
Signaling battery	-48.5 V	-50.0 V
Plate Battery	+133.0 V	+135.0 V
20 cycle ringing supply	86.0 V	87.0 V

3.83 Contact Protection Networks shall be capable of meeting an electrical check (tone or equivalent) to verify the presence and proper wiring of each condenser, resistance, retard coil or combination of these that is provided for contact protection or surge absorption purposes.

3.84 The crosspoint continuity test feature of the marker shall be capable of meeting the following test:

With the marker in position for making tip and ring crosspoint continuity test, connect the circuit shown in Fig. 1 to the ring (terminal 3 on terminal strip MTFC-TO at the top of the common equipment bay).

(1) With keys 1 and 2 operated in turn, the CON and CON3 relays shall not operate.

FIG. 1

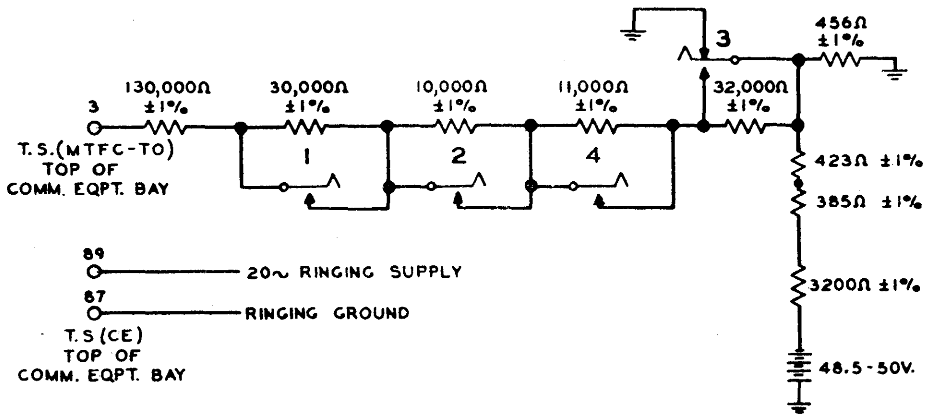


FIG. 2

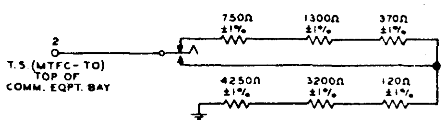
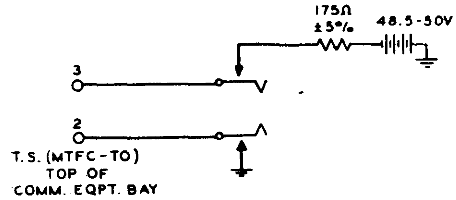


FIG. 3



(2) With keys 1, 2, 3 and 4 operated in that order, the CON and CON3 relays shall operate.

3.85 The ground test feature of the marker shall be capable of meeting the following test:

With the marker in position for making ground test, connect the circuit shown in Fig. 2 to the tip (terminal 2 on terminal strip MTFC-TO at the top of the common equipment bay).

(1) With the key operated, the GT relay shall operate and with the key normal the GT relay shall release.

3.86 The plug up feature of the marker shall be capable of meeting the following test:

With the marker in position for making ground test, connect the circuit shown in Fig. 3 to the tip and ring (terminals 2 and 3 on terminal strip MTFC-TO at the top of the common equipment bay)

(1) With the key operated the PU relay shall operate.

4. CONNECTING CIRCUITS

When this circuit is listed on a key sheet the information thereon is to be followed.

4.01 SD-25586-01, Marker Connector Ckt.

4.02 SD-25762-01, Master Test Frame Jack, Lamp, and Key Ckt.

4.03 SD-25733-01, P.C.I. Outgoing Sender.

4.04 SD-25548-01, Line, Line Link and Connector Ckt.

4.05 SD-25556-01, Number Group and Connector Ckt.

4.06 SD-25549-01, Trunk Link and Connector Ckt.

4.07 SD-25587-01, Outgoing Sender Connector Ckt.

4.08 SD-25680-01, Automatic Monitor Sender and Register Test Ckt.

4.09 SD-25805-01, Master Test Frame Connector Ckt.

4.10 SD-25800-01, Master Test Control Ckt.

4.11 SD-25656-01, (Typical) Spl. Serv. Trunk.

4.12 SD-25671-01, Alarm Ckt.

4.13 SD-25574-01, Misc. Ckt.

4.14 SD-25892-01, Traffic Reg. Ckt.

4.15 SD-25795-01, Group Busy Ckt.; For Org. and Inc. Registers.

4.16 SD-80978-01, Ringing Ckt., 800 Type Plant.

4.17 SD-25793-01, Plant Reg. Ckt.

4.18 SD-25695-01, All Markers Busy or All Transverters Busy Ckt.

4.19 SD-25796-01, Line Insulation Test Control Ckt.

4.20 SD-25938-01, Automatic Progression Trunk Test Circuit.

4.21 SD-25864-01, Foreign Area Translator Connector Circuit

4.22 SD-25714-01, PBX Allotter Circuit.

5. FUNCTIONAL DESIGNATIONS AND LOCATIONS OF APPARATUS

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
A	ADVANCE	77	-01038
A 0,1,2,4,7	"A" DIGIT CHECK	49	-01025
AC 0,1,2,4,7	"A" DIGIT CODE	35	-01023
AK	ADVANCE CHECK	77	-01038
AL 0-3	ALLOTTED GROUPS	64	-01027
AMA	AUTOMATIC MESSAGE ACCOUNTING	53	-01026
AMA 1-2	AUTOMATIC MESSAGE ACCOUNTING	9	-01010
AMA 3	AUTOMATIC MESSAGE ACCOUNTING	67	-01029
AMA 4-5	AUTOMATIC MESSAGE ACCOUNTING	89	-01022
AMB	ALL MARKERS BUSY	73	-01032
ANR	ALLOTTED NUMBER RECYCLE	142	-01043
ANR1	ALLOTTED NUMBER RECYCLE AUXILIARY	142	-01043
AO	ALL OTHERS	10	-01011
AR	ADVANCE ROUTE	32	-01020
ARK 1, 2	"A" ARBITRARY DIGIT CHECK	122	-01040
ARN 0-5	"A" ARBITRARY DIGIT	122	-01040
ARP	"A" ARBITRARY DIGIT PRIMARY	122	-01040
ARS	"A" ARBITRARY DIGIT SECONDARY	122	-01040
ASB	ALL SENDERS BUSY	69	-01030
AST	"A" SERIES START	125	-01040
AT 0-9	"A" DIGIT TRANSLATOR	39	-01023
AVK	ADVANCE CHECK (Checks operation of AV relay in outgoing sender)	34	-01022
AVK 1	ADVANCE CHECK	34	-01022
B 0,1,2,4,7	"B" DIGIT CHECK	49	-01025
BC	BUSY CUT-IN	21	-01013
BC 0,1,2,4,7	"B" DIGIT CODE	A	-01023
BCA	BUSY CUT-IN AUXILIARY	22	-01013
BG	BATTERY AND GROUND SUPPLY	33	-01021
BL	BUSY LINE	53	-01026
BN	BLANK NUMBER	68	-01030
BNA	BLANK NUMBER AUXILIARY	48 108	-01024 -01004
BNB	BLANK NUMBER AUXILIARY	75	-01033
BNTH	BLANK NUMBER THOUSANDS OR HUNDREDS	68	-01030
BRK 1,2	"B" ARBITRARY DIGIT CHECK	121	-01040
BRN 0-4	"B" ARBITRARY DIGIT	121	-01040
BRP	"B" ARBITRARY DIGIT PRIMARY	121	-01040
BRS	"B" ARBITRARY DIGIT SECONDARY	121	-01040
BST	"B" SERIES START	125	-01040
BT 00-09	"B" DIGIT TRANSLATOR	40 117	-01023 -01023

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
BX	BIAS CROSS DETECTING	91	-01039
BY	BUSY LINE	75	-01033
C 0,1,2,4,7	"C" DIGIT CHECK	49	-01025
CAA	CATCHALL AUXILIARY	53	-01026
CB	CALL BACK	32	-01020
CB 1-2	CALL BACK	1	-01006
CB 3	CALL BACK	3	-01007
CB 4	CALL BACK	5	-01008
CB 5	CALL BACK	29	-01017
CB 7	CALL BACK	9	-01010
CBD	CALL BACK, DIAL TONE	8	-01009
CBD 1	CALL BACK, DIAL TONE	8	-01009
CBF	CALL BACK, CALL FORWARD	8	-01009
CC 0,1,2,4,7	"C" DIGIT CODE	C	-01023
CCT	CANCEL CONTINUITY TEST	30 106	-01018 -01005
CDK 0-1	"C" DIGIT CHECK	143	-01043
CGT	CANCEL GROUND TEST (non PBX)	30	-01018
CH 0-9	CHANNEL SELECTION	29	-01017
CHA	CHANNEL SELECTION AUXILIARY	31	-01019
CHE	CHANNEL END	31	-01019
CHT	CHANNEL TIMER	29	-01017
CKG 1-3	CONNECTOR CHECK GROUND	32	-01020
CKG 4	CONNECTOR CHECK GROUND	31	-01019
CKG 5	CONNECTOR CHECK GROUND	29	-01017
CKG 6-7	CONNECTOR CHECK GROUND	32	-01020
CKO	CHECK RELAYS OPERATED	68	-01030
CKR	CHECK RELEASE	68	-01030
CL 0-5	CLASS	67	-01029
CLG	CLASS GROUNDS	33	-01021
CLK	CLASS CHECK	33	-01021
CLK 1-3	CLASS CHECK	67	-01029
CLP	CLASS PRIMARY	67	-01029
CLS	CLASS SECONDARY	67	-01029
CLT	CLASS TIMING	33	-01021
CLT 1-2	CLASS TIMING	33	-01021
CN	COIN	10	-01021
CNC	COIN CLASS	53	-01026
CON	CONTINUITY	30 106	-01018 -01005
CON 1,3	CONTINUITY	30 106	-01018 -01005

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
COX	CUT-OFF (Of trouble recorder start condition)	91	-01039
CP 0-4	CODE PATTERN	67	-01029
CPK 1-2	CODE PATTERN CHECK	67	-01029
CPP	CODE PATTERN PRIMARY	67	-01029
CPS	CODE PATTERN SECONDARY	67	-01029
CR	COIN RETURN	37	-01023
CR 0-10	COMPENSATING RESISTANCE OR CODE ROUTE	67	-01023
CRK 1-3	COMPENSATING RESISTANCE OR CODE ROUTE CHECK	67	-01029
CRP	COMPENSATING RESISTANCE OR CODE ROUTE PRIMARY	67	-01029
CRR 0-2	COIN ZONE REROUTE	57	-01026
CRS	COMPENSATING RESISTANCE OR CODE ROUTE SECONDARY	67	-01026
CS 0-9	CLASS OF SERVICE (0-9)	12	-01011
CS 10-19	CLASS OF SERVICE (10-19)	14	-01011
CS 20-29	CLASS OF SERVICE (20-29)	16	-01011
CT 0	CLASS TENS (0-9)	11	-01011
CT 1	CLASS TENS (10-19)	13	-01011
CT 2	CLASS TENS (20-29)	15	-01011
CTA 0	CLASS TENS AUXILIARY (0-9)	11	-01011
CTA 1	CLASS TENS AUXILIARY (10-19)	13	-01011
CTA 2	CLASS TENS AUXILIARY (20-29)	15	-01011
CU 0,1,2,4,7	CLASS UNITS	10	-01011
CV 00-99	CODE CONVERSIONS	118	-01040
CVS	CODE CONVERSION SERIES	119	-01040
D	DIAL PULSE LINE FRAME	32	-01020
D 0,1,2,4,7	"D" DIGIT CHECK	49	-01025
DCK	DOUBLE CONNECTION CHECK	33	-01021
DCT	DOUBLE CONNECTION TEST	31	-01019
DCT 1	DOUBLE CONNECTION TEST	31	-01019
DCT 2-3	DOUBLE CONNECTION TEST	J	-01019
DIS 1-2	DISCONNECT	32	-01020
DISA	DISCONNECT AUXILIARY	32	-01020
DL	DISPLAY LOST	79	-01035

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
DL 0-13	DELETE DIGIT	67	-01029
DLK 1-2	DELETE DIGIT CHECK	67	-01029
DLP	DELETE DIGIT PRIMARY	67	-01029
DLS	DELETE DIGIT SECONDARY	67	-01029
DR 0-2	DENIED SERVICE REROUTE	58	-01026
DT 1	DIAL TONE CLASS	32	-01020
DT 2-3	DIAL TONE CLASS	31	-01019
DTK	DIAL TONE CHECK	33 103	-01021 -01005
DX 0,1,2,4,7	"D" DIGIT CODE	124	-01024
E 0,1,2,4,7	"E" DIGIT CHECK	49	-01025
ECN	EVEN CONNECTOR	47	-01024
EG	END PBX GROUP	77	-01038
EX 7	"E" DIGIT CHECK	124	-01024
F 0,1,2,4,7	"F" DIGIT CHECK	49	-01025
FA	FUSE ALARM	73	-01032
FA 1	FUSE ALARM	73	-01032
FAK	FRAME A(Appearance) CHECK	31	-01019
FB 0-19	FRAME BUSY	23,24,25	-01013
FBK	FRAME B(Appearance) CHECK	J	-01019
FC-	FRAME CONNECTOR	19	-01013
FCA-	FRAME CONNECTOR AUXILIARY	20	-01013
FCG	FALSE CROSS AND GROUND	30 106	-01018 -01005
FCGA	FALSE CROSS AND GROUND AUXILIARY	30 106	-01018 -01005
FCK	FRAME CONNECTOR CHECK	18	-01013
FCKA	FRAME CONNECTOR CHECK AUXILIARY	18	-01013
FG 0-1	TRUNK FRAME GROUP	66	-01028
FKA	TRUNK FRAME CHECK AUXILIARY	69	-01031
FLG	FIRST LINKAGE GROUND	33	-01021
FLG-1	FIRST LINKAGE GROUND	33	-01021
FLG-2	FIRST LINKAGE GROUND	100	-01018
FM	FAILURE TO MATCH	82 105	-01027 -01005
FM 0-19	FRAME MEMORY	23,24,25	-01013

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
FMG	FRAME MEMORY GUARD	18	-01013
FMK	FRAME MEMORY CHECK	18	-01013
FML	FRAME MEMORY LOCK	18	-01013
FMP	FAILURE TO MATCH PEG COUNT	82 105	-01027 -01005
FN	FREE NUMBER	AQ AR	-01041 -01041
FNA	FREE NUMBER	AO AP	-01041 -01041
FNB	FREE NUMBER	75	-01033
FR	VERTICAL FILE RELEASE	5	-01008
FS 0-19	FRAME SELECTION	23,24,25	-01013
FSA	FRAME SELECTION AUXILIARY	18	-01013
FT 0-3	FRAME TENS	9	-01010
FTB 0-3	FRAME TENS (Line Link)	17	-01012
FTC 0-19	FRAME TEST COMMON	23,24,25	
FTCK	FRAME TEST CHECK	18	-01013
FTCK-1	FRAME TEST CHECK	18	-01013
FTK	VERTICAL FILE TEST CHECK	5	-01008
FTK1	VERTICAL FILE TEST CHECK (One and one only)	5	-01008
FTL	FRAME TENS LOCK	68	-01030
FTN 0-3	FRAME TENS NUMBER	8	-01009
FTT 0-3	FRAME TENS TEST	8	-01009
FTTB	AUXILIARY TO XFTN AND XFUN	8	-01009
FU 0,1,2,47	FRAME UNITS	9	-01010
FUL	FRAME UNITS LOCK	68	-01030
FUN 0-9	FRAME UNITS NUMBER	8	-01009
FUT 0-9	FRAME UNITS TEST	8	-01009
G 0,1,2,4,7	"G" DIGIT CHECK	49	-01025
GB	PBX GROUP BUSY	77	-01038
GBA	SENDER SUBGROUP A	69	-01031
GBB	SENDER SUBGROUP B	69	-01031
GC	"G-0/4" LEAD CONNECTOR	17	-01012
GK	GATE CHECK	1	-01006
GLH	GROUND LINE HOLD MAGNET	30 106	-01018 -01005

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
GLH 1	GROUND LINE HOLD MAGNET	30 106	-01018 -01005
GOS	GATE OUTGOING SENDER	69	-01031
GP 1-3	GROUP TEST TRANSFER	64	-01027
GPA-B	SUBGROUP A OR B	64	-01027
GS 1-5	GROUND SUPPLY	50	-01026
GSA 1-4	GROUND SUPPLY AUXILIARY	120	-01040
GT	GROUND TEST	30	-01018
GT 1-2	GROUND TEST	30 106	-01018
GT 3	GROUND TEST	30	-01005
GT 4	GROUND TEST	G or H	-01018
GT 5	GROUND TEST	30	-01018
GTL	GROUND TRANSMITTING LEAD	32	-01020
GTL 1	GROUND TRANSMITTING LEAD	5	-01008
GTL 2-4	GROUND TRANSMITTING LEAD	9	-01010
GTU	GROUND TRANSMITTING TENS AND UNITS	9	-01010
GW	GROUP (W)	64	-01027
GZ	GROUP (Z)	64	-01027
H 0,1,2,4,7	"H" DIGIT CHECK	49	-01025
HFA	HIGH VOLTAGE (+130 VOLT) FUSE ALARM	73	-01032
HG 0,1,2,4,7	HORIZONTAL GROUP	9	-01010
HGG	HORIZONTAL GROUP GATE	3	-01007
HGK	HORIZONTAL GROUP CHECK	31	-01019
HGL	HORIZONTAL GROUP LOCK	68	-01030
HGL 1	HORIZONTAL GROUP LOCK (One and one only)	3	-01007
HGN 0-9	HORIZONTAL GROUP NUMBER (Called line)	4	-01007
HGR	HORIZONTAL GROUP RELEASE	3	-01007
HGT 0-9	HORIZONTAL GROUP TEST	3	-01007
HMC	HOLD MAGNET CONTROL	31	-01019
HMS	HOLD MAGNET START	31	-01019
HMS 1	HOLD MAGNET START	31	-01019
HMT	HOLD MAGNET TIMING	31	-01019
HMT 1	HOLD MAGNET TIMING	31	-01019
HN 0,1,2,4,7	HUNDREDS	48 108	-01024 -01004

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
HTK	HORIZONTAL GROUP TEST CHECK	3	-01007
HTK 1	HORIZONTAL GROUP TEST CHECK (One and one only)	3	-01007
HTR	HEAVY TRAFFIC	30 106	-01018 -01005
HTT	HEAVY TRAFFIC TIMING	79	-01035
HTUK	HUNDREDS, TENS, UNITS CHECK	68	-01030
IMG	INTERMARKER GROUP CALL	99	-01032
IMT	INTERMARKER GROUP TEST CALL	99	-01032
INC	INCOMING CLASS	43	-01023
INCO	INCOMING CLASS	110	-01004
IRT	INCOMING REGISTER TEST	AL	-01041
ITA	INTRAOFFICE AUXILIARY	82	-01027
ITR 1	INTRAOFFICE CLASS	82	-01027
ITR 2	INTRAOFFICE CLASS	J	-01019
ITR 3	INTRAOFFICE CLASS	33	-01021
J 0,1,2,4,7	"J" DIGIT CHECK	49	-01025
JB	NO-TEST JUNCTOR BUSY	78	-01034
JCK 0-1	JUNCTOR CONNECTOR CHECK (Trunk link frame)	29	-01017
JG 0-4	JUNCTOR GROUP	17	-01012
JLE	JUNCTOR LOCK EVEN	27	-01015
JLO	JUNCTOR LOCK ODD	27	-01015
JSE	JUNCTOR SEQUENCE EVEN	27	-01015
JSO	JUNCTOR SEQUENCE ODD	27	-01015
JSQ 0-5	JUNCTOR SEQUENCE	27	-01015
JT	JUNCTOR TEST	31	-01019
K 0,1,2,4,7	"K" DIGIT CHECK	49	-01025
KA	"A" DIGIT CUT-IN (Out sender class)	49	-01025
KBC	"B" & "C" DIGIT CUT-IN (Out sender class)	49	-01025
KCM	CODE CONVERSION INTERMARKER GROUP	137	-01041
KCV	CANCEL CODE CONVERSION	137	-01041
KDE	"D" & "E" DIGIT CUT-IN (Out sender class)	49	-01025
KFG	"F" & "G" DIGIT CUT-IN (Out sender class)	49	-01025
KG	GROUNDING RELAY FOR KA, KBC, KDE, KFG, KHJ & KL RELAYS	49	-01025
KGS 1-2	DIGIT CUT-IN AND SHIFT	95	-01028

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
KHJ	"H" & "J" DIGIT CUT-IN (Out sender class)	49	-01025
KK	CHECK RELAY FOR KA, KBC, KDE, KFG, KHJ and KL RELAYS	49	-01025
KKL	"K" & "L" DIGIT CUT-IN (Out sender class)	49	-01025
L 0,1,2,4,7	"L" DIGIT CHECK	49	-01025
LB	LINE BUSY	30	-01018
LB 0-9	LINE BUSY	29	-01017
LBT	LINE BUSY TEST	30	-01018
LCH	LOCAL CHARGE	AO AP	-01041 -01041
LCK	LINK CONNECTOR CHECK (trunk link frame)	31	-01019
LDT	LONG DELAY TIMING	AG AH	-01004 -01035
LE	LOCK EVEN	7	-01008
LF 0-9	LINE FRAME LINK IDENTIFIER	78	-01034
LFK	LINE FRAME CHECK	32	-01020
LGT	LOOP GROUND TEST	H	-01018
LHT	LINE HOLD MAGNET TEST	30 106	-01018 -01005
LI	LINE IDLE	75	-01033
LIN	LOCAL INCOMING	75	-01033
LK	LEFT HALF FRAME CHECK	31	-01019
LK 1	LINKAGE CHECK	31	-01019
LK 2	LINKAGE CHECK	J	-01019
LL 0,1,2,4,7	LINE LINK	29	-01017
LLB	LINE LINK FRAME PLUGGED BUSY	82	-01027
LLC 1-2	LINE LINK CONTROL	32	-01020
LLI	LOCK LINE IDENTIFICATION	68	-01030
LNT	NO-TEST LINE CHECK	78	-01034
LOD	LOCK ODD	7	-01008
LOT	LO LEAD TEST	33	-01021
LOT 1	LO LEAD TEST	33	-01021
LP	PROGRESS LAMP CONTROL	138	-01041
LPA	LOCAL PHYSICAL "A" OFFICE	44 or 97	-01023
LPB	LOCAL PHYSICAL "B" OFFICE	44 or 97	-01023
LR	LINK RELEASE - INCOMING LINK (Indicates trouble condition)	33	-01021
LTA	LOCAL THEORETICAL "A" OFFICE	44 or 97	-01023

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
LTB	LOCAL THEORETICAL "B" OFFICE	44 or 97	-01023
LTR	LIGHT TRAFFIC	30 106	-01018 -01005
LXP	LINE CROSSPOINT	31	-01019
LXP 1	LINE CROSSPOINT	31	-01019
M 0-9	MONITOR	84	-01034
MAK	MARKER CONNECTOR CHECK (MA relay)	73	-01032
MAK 1	MCA RELAY OPERATE CHECK (Trunk link connector check)	33 103	-01021 -01005
MAN	MANUAL (Class)	10	-01011
MB	MARKER BUSY	73	-01032
MB 0-4	MESSAGE BILLING (Index)	67	-01029
MBK 1-5	MESSAGE BILLING CHECK	67	-01029
MBP	MESSAGE BILLING PRIMARY	67	-01029
MBS	MESSAGE BILLING SECONDARY	67	-01029
MBS 0-9	MESSAGE BILLING SERIES	56	-01026
MCB 1	MARKER CONNECTOR BUSY (For first four marker connectors)	73	-01032
MCB 2-6	MARKER CONNECTOR BUSY (For succeeding marker connectors)	74	-01032
MCK	MARKER CONNECTOR CHECK (MC relay)	73	-01032
MCN	MANUAL COIN (Class)	10	-01011
MDK	MCD RELAY OPERATE CHECK (Trunk link connector check)	32	-01020
MF	MULTIFREQUENCY LINE FRAME	32	-01020
MLF	MIXED LINE FRAME	32	-01020
MN	MONITOR	84	-01034
MN 1	MONITOR	84	-01034
MON	MONITOR	AI	-01041
MON 1	MONITOR	AI	-01041
MPT	MESSAGE REGISTER POTENTIAL TEST	84	-01034
MRL	MARKER RELEASE	79	-01035
MRL 1	MARKER RELEASE	79	-01035
MSK	MARKER CONNECTOR CHECK (MS relay)	73	-01032
MT	MARKER TEST	79	-01035
MT 1	MARKER TEST	79	-01035
MT 2	MARKER TEST	69	-01031

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
MT 3	MARKER TEST	21	-01013
MT 3A	MARKER TEST AUXILIARY	22	-01013
MT 4	MARKER TEST	21	-01013
MT 4A	MARKER TEST AUXILIARY	22	-01013
MT 5-6	MARKER TEST	26	-01014
MT 7	MARKER TEST	28	-01016
MT 8	MARKER TEST	27	-01015
MT 9	MARKER TEST	18	-01013
MT 10	MARKER TEST	77	-01038
MT 11	MARKER TEST	5	-01008
MT 12-14	MARKER TEST	79	-01035
MT 15	MARKER TEST	8	-01009
MT 16-17	MARKER TEST	78	-01034
MT 18	MARKER TEST	Q	-01019
MT 19-20	MARKER TEST	114	-01038
MXT	MASTER CROSS TEST	91	-01039
N 1-4	NUMBER TRANSLATOR CUT-IN	46	-01024
N 1A-4A	NUMBER TRANSLATOR CUT-IN AUXILIARY	46	-01024
NAR 1-3	NO ALLOTTER RECYCLE	142	-01043
NC	NUMBER CHECK CLASS	80	-01036
NC 1-4	NUMBER CHECKING	80	-01036
NCA	NUMBER CHECKING AUXILIARY	80	-01026
NCCN	COIN CLASS	53	-01026
NCF	NUMBER CHECKING FAILURE	80	-01036
NCK	NUMBER CHECK OX	80	-01036
NCL	NUMBER CHECKING LINE (Individual)	80	-01036
NCNC	NO CLASS	53	-01026
NCS	NUMBER CHECKING SLEEVE (PBX)	80	-01036
NCSA	NUMBER CHECKING SLEEVE AUXILIARY	80	-01036
ND 1	NO DIGIT	33	-01021
NDK	NO DIGIT CHECK	33	-01021
NE	NUMBER END	46	-01024
NGB	NUMBER GROUP PLUGGED BUSY	82	-01027
NGC	NUMBER GROUP CONTROL	68	-01030

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
NGK	NUMBER GROUP CHECK	68	-01030
NGK 1	NUMBER GROUP CHECK	68	-01030
NGP	TRUNK NUMBER GROUP PREFERENCE	82	-01027
NGP 1	TRUNK NUMBER GROUP PREFERENCE	102 109	-01022 -01022
NH	NO-HUNT	78	-01034
NOB	NO OBSERVING SERVICE	67	-01029
NOC	NO CLASS	33	-01021
NR	NUMBER RELEASE	45	-01023
NS	NO SENDER	102 109	-01022 -01022
NSI	NO SENDER INTRAOFFICE	33	-01021
NSO	NO SENDER OUTGOING	E or F	-01022
NT	NO TEST CLASS	78	-01034
NT 1-5	NO TEST CLASS	78	-01034
NTC	NO TEST AND NUMBER CHECK TIMING	78	-01034
NTH	NO TEST HOLD MAGNET	78	-01034
NTR	NO TEST RELEASE (Of marker)	78	-01034
NTT	NO TEST TRAIN (Busy line)	78	-01034
OA	OFFICE "A"	38	-01023
OAN	OFFICE "A" NUMBERS	48 108	-01024 -01004
OAT	OVER-ALL TIMING	79	-01035
OAT 1	OVER-ALL TIMING	79	-01035
OB	OFFICE "B"	38	-01023
OBN	OFFICE "B" NUMBERS	48 108	-01024 -01004
OBS	OBSERVING SERVICE	67	-01029
OBS 1-2	OBSERVING SERVICE	33 103	-01021 -01005
OC	ORIGINATING CALL	32	-01020
OC 1-2	ORIGINATING CALL	32	-01020
OCN	ODD CONNECTOR	47	-01024
OFH	OVERFLOW HOLD MAGNET OPERATE (Ringing Switch)	75	-01033
OFH 1	OVERFLOW HOLD MAGNET OPERATE	75	-01033
OFK	LINE OVERFLOW	77	-01038

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
OGC	OUTGOING CLASS (Having a sender)	34	-01022
ONW	OFF NORMAL WALK	32	-01020
ONX	OFF NORMAL CROSS	91	-01039
OPE	OPERATOR ERROR	124	-01024
OPR	OPERATOR (Operator assistance)	53	-01026
OPS 0-3	OPERATOR (Assistance preroute)	54	-01026
OR	ORIGINATING CLASS	43	-01023
ORO-A/D	ORIGINATING CLASS	110,112	-01004
ORK 1-2	OUTGOING REGISTRATION CHECK	49	-01025
ORT	ORIGINATING REGISTER TEST	AL	-01041
OS 0-4	OUTGOING SENDER SELECTION	69	-01031
OSA 0-4	OUTGOING SENDER SELECTION AUXILIARY	70	-01031
OSC	OUTGOING SENDER CONTROL	69	-01031
OSE	OUTGOING SENDER END	69	-01031
OSG 0-4	OUTGOING SENDER GROUP	70	-01031
OSK	OUTGOING SENDER CHECK	69	-01031
OST	OUTGOING SENDER REGISTRATION TIMING	34	-01022
OST 1-2	OUTGOING SENDER REGISTRATION TIMING	34	-01022
OTT	OPERATES TT (Trunk test) RELAY IN TRUNK	33	-01021
OV	OVERFLOW	75	-01033
P 0-9	PATTERN	28	-01016
PA	PATTERN "A"	28	-01016
PB	PATTERN "B"	28	-01016
PBN	PERMANENTLY BUSY NUMBER	77	-01038
PBX 1	PRIVATE BRANCH EXCHANGE	68	-01030
PBX 2	PRIVATE BRANCH EXCHANGE	77	-01038
PBXA	PRIVATE BRANCH EXCHANGE AUXILIARY (To PBX 2)	G or H	-01018
PBXB	PRIVATE BRANCH EXCHANGE AUXILIARY (To PBX 2)	G	-01018
PBY	PATHS BUSY	53	-01026
PC	PATTERN "C"	28	-01016
PC 0-19	PEG COUNT (Preroute)	55	-01026
PCCL	PULSE CONVERSION CLASS LEAD CONNECTOR	94	-01028
PCD 0-1	PULSE CONVERSION DIAL	96	-01028
PCL 1-3	PULSE CONVERSION MARKER CLASS	94	-01028

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
PCN	PERMANENT SIGNAL COIN	53	-01026
PCN 0,2,3,5	PULSE CONVERSION TRUNK CLASS	94	-01028
PCR	PULSE CONVERSION, REVERTING	95	-01028
PD	PARTIAL DIAL	36	-01023
PEG	PEG COUNT	31	-01019
PHC	PHYSICAL CODE	65	-01028
PK	CHECK - NON PARTIAL DIAL, NON PERMANENT SIGNAL	36	-01023
PL	PER CENT LOAD (Link busy)	29	-01017
PMO	PERMANENT OVERFLOW (Marker sets trunk in overflow)	77	-01038
PN	PHYSICAL NUMBER	65	-01028
PNC	PERMANENT SIGNAL NON COIN NON PBX	53	-01026
PNR	PATTERN NORMAL	28	-01016
PPX	PERMANENT SIGNAL PBX	53	-01026
PR	PAIRED FRAMES (Trunk link)	17	-01012
PS	PERMANENT SIGNAL	36	-01023
PSA 0-1	PRESORT AUXILIARY A GROUP	135	-01040
PSA	PRESORT A GROUP	134	-01040
PSB	PRESORT B GROUP	134	-01040
PSB 0-1	PRESORT AUXILIARY B GROUP	134	-01040
PSR	PERMANENT SIGNAL RECORD CONTROL	36	-01023
PT-0/9	POTENTIAL TEST (For M.R. signal)	84	-01034
PTC	PATTERN TEST CONNECTOR	107	-01016
PTK	PHYSICAL AND THEORETICAL CHECK	33	-01021
PTL	POTENTIAL TEST LINE (For M.R. signal)	84	-01034
PTN	PHYSICAL AND/OR THEORETICAL NUMBER	65	-01028
PU	PLUG UP	30	-01018
PU 1	PLUG UP	68	-01030
PUL	PLUGGED UP LINE	68	-01030
R-	ROUTE (Ground supply groups)	51	-01026
R-	ROUTE (Originating register and catchall)	52	-01026
RA 1-5	ROUTE ADVANCE	50	-01026
RA 6	ROUTE ADVANCE	50 104	-01026 -01005
RAV 1	ROUTE ADVANCE	82 105	-01027
RAV 2	ROUTE ADVANCE	82	-01027
RBT	REGISTER RETURN BUSY	82	-01027
RCCK	RECORDER CHECK	79	-01035
RCK 1-2	RINGING SWITCH CHECK	75	-01033
RCK 3	RINGING SWITCH CHECK	33	-01021

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
RCL	RINGING CONTROL LOCK	68	-01030
RCLA	RINGING CONTROL LOCK AUXILIARY	92	-01022
RCN 1-15	RINGING COMBINATION NUMBER	76	-01033
RCT	REVERSE CONTINUITY TEST	30 106	-01018 -01005
RCT 1-8, 10-15	RINGING CONTROL	75	-01033
RCT 9	RINGING CONTROL	AO AP	-01041 -01041
RCTA	REVERSE CONTINUITY TEST AUXILIARY	30 106	-01018 -01005
RCTB	REVERSE CONTINUITY TEST AUXILIARY	30 106	-01018 -01005
RCY	RECYCLE	82 105	-01027 -01005
RCY 1	RECYCLE	32	-01020
RCY 2-4	RECYCLE	68	-01030
RD	ROUTE FOR DIAL PULSE ORIG. REGISTER	104 AT	-01005 -01003
RF	ROUTE FAILURE TO MATCH	82 or 105 105	-01027 -01005
RFA	ROUTE FAILURE TO MATCH AUXILIARY	82 105	-01027 -01005
RGT 0-1	RINGER TEST	62	-01026
RGT A	RINGER TEST AUXILIARY	68	-01030
RI	REGULAR INTERCEPT	68	-01030
RIA	REGULAR INTERCEPT AUXILIARY	48 108	-01024 -01004
RIB	REGULAR INTERCEPT AUXILIARY	75	-01033
RK	RIGHT HALF FRAME CHECK	31	-01019
RK 1-3	REGISTRATION CHECK	32	-01020
RLG	RETURN LOCK GUARD	63	-01026
RMF	ROUTE MULTIFREQUENCY ORIG. REG.	104 AT	-01005 -01003
RN	RECORDER NUMBER	65	-01028
RN 0,1,2,4,7	RECORDER NUMBER	65	-01028
RNG	RELEASE NUMBER GROUP	68	-01030
RNK 1,2	RECORDER NUMBER CHECK	65	-01028
RNT	RECORDER NUMBER TIMER CHECK	89	-01022
RNT 1,2	RECORDER NUMBER TIMER CHECK	89	-01022
RO	REORDER	43	-01023
ROA	REORDER AUXILIARY	82	-01027
RON	RECORDER OFF NORMAL	79	-01035

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
RP	RING PARTY	L M	-01026 -01026
RPK	RING PARTY CHECK	53	-01026
RQ	REGULAR QUAD	17	-01012
RR	REGISTER RETURN (Signal to register)	3	-01026
RRC	REGISTER RETURN COIN	63	-01026
RRK	REGISTER RETURN COIN CHECK	63	-01026
RS 0-9	RINGING SELECT (MAGNET)	75	-01033
RSC	RELEASE SENDER CONNECTOR	34	-01022
RSK	RINGING SWITCH SELECT MAGNET CHECK	75	-01033
RT 0-4	ROUTE TRANSFER	60	-01026
RTC	ROUTE TRANSFER CONTROL	59	-01026
RTST	REGISTER TEST START LEAD (Used by monitor)	AK	-01041
RV	REVERTING	53	-01026
RV-1/3	REVERTING	33	-01021
RYC	RECYCLE CONTROL	33	-01021
RYT	RECYCLE TIMING	79	-01035
RYT 1	RECYCLE TIMING	79	-01035
S 00-44/100-144	SERVICE CLASS	61	-01026
S1K	SI RELAY (TRUNK) CHECK	33	-01021
SA 0-9	SLEEVE TEST AUXILIARY	77	-01038
SAE	SLEEVE AUXILIARY END	77	-01038
SB 0-9	SLEEVE BUSY TEST (Line link)	80	-01036
SCB	START CALL BACK	J	-01019
SCB 1-2	START CALL BACK	33	-01021
SCBA 0-2	MARKER MAKE BUSY FOR SENDER CONNECTOR (A subgroup)	71	-01031
SCBB 0-2	MARKER MAKE BUSY FOR SENDER CONNECTOR (B subgroup)	71	-01031
SCC	SERVICE CALL	67	-01029
SCK	CHECK - NON COIN RETURN, NON STUCK COIN	37	-01023
SCN	STUCK COIN	37	-01023
SCR	NUMBER GROUP SC RELEASE CHECK	77	-01038
SCT	STOP CONNECTOR TIMING	AM	-01041
SDT	SHORT DELAY TIMING	AG AH	-01004 -01035
SE	SEQUENCE EVEN	7	-01008

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
SF	SEIZE FRAME	AD AE	-01004 -01004
SFR	SEIZE FRAME TIMER RELEASE	78	-01034
SFT	SEIZE FRAME TIMING	AD AE	-01004 -01004
SIA	SENDER IDLE (A subgroup)	69	-01031
SIB	SENDER IDLE (B subgroup)	69	-01031
SKA	SENDER CONNECTOR CHECK (A subgroup)	69	-01031
SKA 1	SENDER CONNECTOR CHECK (A subgroup)	92	-01022
SKB	SENDER CONNECTOR CHECK (B subgroup)	69	-01031
SKB 1	SENDER CONNECTOR CHECK (B subgroup)	92	-01022
SL	SLEEVE (Trunk link frame)	31	-01019
SL 0-9	SLEEVE TEST	77	-01038
SLC	SLEEVE CUT-IN	77	-01038
SLCK	NUMBER GROUP SC OPERATE CHECK	77	-01038
SLCK 1	NUMBER GROUP SC OPERATE CHECK	68	-01030
SLK	SENDER LINK CHECK	34	-01022
SLK 1-2	SENDER LINK CHECK	34	-01022
SNG 1-2	SEIZE NUMBER GROUP	68	-01030
SNK	SELECTIONS NORMAL CHECK	82 105	-01027 -01005
SO	SEQUENCE ODD	7	-01008
SOG 1	SUBSCRIBER OUTGOING CLASS	82	-01027
SOG 2	SUBSCRIBER OUTGOING CLASS	J	-01019
SOG 3	SUBSCRIBER OUTGOING CLASS	33	-01021
SON	SENDER OFF NORMAL	69	-01031
SP	STOP PROGRESS	91	-01039
SPC	SPECIAL CALLS (Preference relay lockout)	78	-01034
SPH	SPECIAL HUNT (Operates on no-nothing lead)	78	-01034
SPL	SPECIAL CLASS	78	-01034
SPL 1	SPECIAL CLASS	78	-01034
SPLC	SPECIAL CLASS AUXILIARY	78	-01034
SPT	SPLIT TENS GROUP	68	-01030
SQ 0-9	SEQUENCE	7	-01008
SQA	SEQUENCE ADVANCE	32	-01020
SQA 1	SEQUENCE ADVANCE	32	-01020
SQT 0-1	SEQUENCE TEST	7	-01008
SRK	START RINGING CHECK	75	-01033

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
SSA-B	SENDER LINK SWITCH SELECT MAGNET (A subgroup or B subgroup)	69	-01031
ST 7	START SIGNAL	49	-01025
STF	SINGLE TRUNK FRAME	17	-01012
STP	STEPPING	27	-01015
STP 1-3	STEPPING	27	-01015
STX	STANDING CROSS TEST	91	-01039
SW	SENDER GROUP PREFERENCE (W)	69	-01031
SZ	SENDER GROUP PREFERENCE (Z)	69	-01031
T 0,1,2,4,7	TENS	48 108	-01024 -01004
TA 2-9	"A" DIGIT TRANSLATOR	40 116	-01023 -01023
TAL	OVER-ALL TIME ALARM	73	-01032
TAN	TANDEM TRUNK CALL	43	-01023
TANO-A/D	TANDEM TRUNK CALL	110,112	-01004
TAN1-A/D	" " "	110,112	-01004
TAN2-A/D	" " "	111,113	-01004
TAN3-A/D	" " "	111,113	-01004
TAN4-A/D	" " "	111,113	-01004
TB 0-5	TRUNK BLOCK	81	-01026
TBH	TROUBLE INTERCEPT - HOLD MAGNET OPERATE (Ringing switch)	75	-01033
TBI	TROUBLE INTERCEPT	68	-01030
TBIA	TROUBLE INTERCEPT AUXILIARY	48 108	-01024 -01004
TBIB	TROUBLE INTERCEPT AUXILIARY	75	-01033
TBK	TRUNK BLOCK CHECK	33 103	-01021 -01005
TBT	TRUNK (or register) BUSY TIMING	18	-01013
TBTA	TRUNK (or register) BUSY TIMING AUXILIARY	18	-01013
TBTB	TRUNK (or register) BUSY TIMING AUXILIARY	18	-01013
TBW	TENS BLOCK WET	68	-01030
TC	TALKING CHARGE	53	-01026
TC 5-7	TRANSLATOR CONTROL	38	-01023
TCCN	CHARGE CLASS FOR COIN	53	-01026
TCH	TOLL CHARGE	75	-01033
TCH 0-9	TEST CHANNEL	28	-01016
TCHK	TEST CHANNEL CHECK	31	-01019
TCK	TALKING CHARGE CHECK	75	-01033

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
TCNC	TALKING CHARGE NON COIN	53	-01026
TEA	TERMINATING AUXILIARY	82	-01027
TER 1	TERMINATING CLASS	82	-01027
TER 2	TERMINATING CLASS	J	-01019
TER 3	TERMINATING CLASS	33	-01021
TER 4	TERMINATING CLASS	J	-01019
TF 0,1,2,4,7	TRUNK FRAME UNITS	66	-01028
TFK 1-2	TRUNK FRAME CHECK	18	-01013
TFK 3	TRUNK FRAME CHECK	33	-01021
TG	TRUNK GUARD (Test completed or not completed)	34	-01022
TG 0-19	TRUNK GROUP	81	-01026
TGS 1-3	TRANSMITTING GROUND SUPPLY	67 119	-01029 -01040
TGT	TRUNK GUARD TEST (Prevents release of sdr. until TG releases)	34	-01022
TH 0,1,2,4,7	THOUSANDS	48 108	-01024 -01004
THC	THEORETICAL CODE	65	-01028
TIN	TOLL INCOMING	75	-01033
TJ 0-9	TEST JUNCTOR	29	-01017
TK	TEST CHECK (For channel timing)	31	-01019
TLC-1/3	TRUNK LINK CONTROL	32	-01020
TLL 0-9	TEST LINE LINK	29	-01017
TM	TIMING (Marker off normal)	73	-01032
TMK	TANDEM CHECK	J	-01019
TMS	TIMING START	79	-01035
TN	THEORETICAL NUMBER	65	-01028
TNK	TRUNK NUMBER CHECK	75	-01033
TNR	TRUNK NUMBER RELEASE	102 109	-01022 -01022
TOA	TANDEM OUTGOING AUXILIARY	82	-01027
TOG 1	TANDEM OUTGOING CLASS	AA AB	-01027 -01027
TOG 2	TANDEM OUTGOING CLASS	J	-01019
TOG 3	TANDEM OUTGOING CLASS	33	-01021
TOL	TOLL CLASS	43	-01023
TOLO-A/D	TOLL CLASS	111,113	-01004
TOL 1	TOLL CLASS	102	-01022

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
TOS	TOLL ROUTE SERIES	98	-01026
TP	TIP PARTY	L M	-01026 -01026
TPK	TIP PARTY CHECK	53	-01026
TR 1	TAKE TROUBLE RECORD AND GIVE TROUBLE RELEASE	79	-01035
TR 1A	FIRST TRIAL	68	-01030
TR 2	SECOND TRIAL	32	-01020
TR 2A	SECOND TRIAL	68	-01030
TR 2B	SECOND TRIAL	29	-01017
TR 2C	SECOND TRIAL	30	-01018
TR 2D	SECOND TRIAL	1	-01016
TR 2E	SECOND TRIAL	32	-01020
TR 2F	SECOND TRIAL	33 103	-01021 -01005
TRA	TROUBLE RECORDER TIME ALARM	73	-01032
TRB	TROUBLE RECORDER BUSY	79	-01035
TRL	TROUBLE RELEASE DISCONNECT	32	-01020
TRL 1	TROUBLE RELEASE DISCONNECT WITHOUT TAKING TROUBLE RECORD	79	-01035
TRLA	TROUBLE RELEASE DISCONNECT AUXILIARY	32	-01020
TRN	TRUNK NUMBER	47	-01024
TRN 1	TRUNK NUMBER	47	-01024
PRR	TAKE TROUBLE RECORD AND GIVE NORMAL RELEASE	N O AF	-01035 -01035 -01035
TRS	TRANSFER START	32	-01020
TRSA	TROUBLE RECORDER START AUXILIARY	79	-01035
TRST	TROUBLE RECORDER START	79	-01035
TRT	TROUBLE RECORDER TIMING	79	-01035
TRTR	TROUBLE RECORDER TROUBLE RELEASE	79	-01035
TS 0-19	TRUNK SELECTED	26	-01014
TSE 1-3	TRUNK SELECTED END	26	-01014
TST	TEST CALL	79	-01035
TT 0-19	TEST TRUNK	26	-01014
TTK	OTT RELAY CHECK	33	-01021
TTL 0-9	TEST TRUNK LINK	29	-01017
TVA	TRANSVERTER TEST CALL	67	-01029

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
TWT 0-2	TWO-WAY TRUNKS	72	-01031
TX	TEST CROSS RELAYS (Manually operated to remove battery for current flow tests)	91	-01039
TXC 1-9	TX CODE TRANSLATOR	123	-01024
TXD	TRANSLATE "D" DIGIT	124	-01024
TYM	TIMING (For receipt of information from number group)	77	-01038
TYM 1	TIMING FOR PBX ALLOTTER	142	-01043
U 0,1,2,4,7	UNITS	48 108	-01024 -01004
UC	UNITS CUT-IN	68	-01030
UK	UNITS CHECK	68	-01030
UT	UNITS TRANSFER	77	-01038
VF 0-4	VERTICAL FILE	9	-01010
VFG	VERTICAL FILE GATE	5	-01008
VFL	VERTICAL FILE LOCK	68	-01030
VFL 1	VERTICAL FILE LOCK (One and one only)	5	-01008
VFN 0-4	VERTICAL FILE NUMBER	6	-01008
VFT 0-4	VERTICAL FILE TEST	5	-01008
VG 0,1,2,4,7,10	VERTICAL GROUP	9	-01010
VGG 1-2	VERTICAL GROUP GATE	1	-01006
VGL	VERTICAL GROUP LOCK	68	-01030
VGL 1-2	VERTICAL GROUP LOCK	1	-01006
VGN 0-13	VERTICAL GROUP NUMBER (Called line)	2	-01006
VGR	VERTICAL GROUP RELEASE	1	-01006
VGT 0-13	VERTICAL GROUP TEST	1	-01006
VP	VACANT CODE, PARTIAL DIAL	53	-01026
VTK	VERTICAL GROUP TEST CHECK	1	-01006
VTK 1	VERTICAL GROUP TEST CHECK (One and one only)	1	-01006
WT	WORK TIMING	AG AH	-01004 -01035
X11	SERVICE CODES	38	-01023
XAB	CROSS ON FAK AND FBK RELAYS	91	-01039
XACH	AUXILIARY TO XCH	83	-01037
XACL	AUXILIARY TO XCL	91	-01039
XACP	AUXILIARY TO XCP	91	-01039
XACR	AUXILIARY TO XCR	91	-01039
XADL	AUXILIARY TO XDL	91	-01039
XAF	AUXILIARY TO XF	91	-01039
XAFT	AUXILIARY TO XFT	83	-01037

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
XAHG	AUXILIARY TO XHG	83	-01037
XAJC	AUXILIARY TO XJC	91	-01039
XAJG	AUXILIARY TO XJG	91	-01039
XAJS	AUXILIARY TO XJS	91	-01039
XALC	AUXILIARY TO XLC	91	-01039
XALG	AUXILIARY TO XLG	83	-01037
XALR	AUXILIARY TO XLR	91	-01039
XALV	AUXILIARY TO XLV	83	-01037
XAMB	AUXILIARY TO XMB	91	-01039
XAPTN	AUXILIARY TO XPTN	91	-01039
XARN	CROSSED "A" ARBITRARY DIGIT	91	-01039
XARS	AUXILIARY TO XRS 1-2	83	-01037
XATS	AUXILIARY TO XTS	91	-01039
XAVGA	AUXILIARY TO XVGA	83	-01037
XAVGB	AUXILIARY TO XVGB	83	-01037
XBRN	CROSSED "B" ARBITRARY DIGIT	91	-01039
XBT	CROSS ON BT LEAD TO MARKER CONNECTORS	83	-01037
XCH	CROSS ON LH 0-9 OR J 0-9 LEADS (T.L.) OR LL 0-9 LEADS (L.L.)	83	-01037
XCKR	CROSS ON PATH OF NOC AND CLE RELAYS	83	-01037
XCL	CROSSED CL 0-5 RELAYS	91	-01039
XCLC	CROSSED CLASS OF CALL RELAYS	91	-01039
XCP	CROSSED CP 0-4 RELAYS	91	-01039
XCR	CROSSED CR 0-10 RELAYS	91	-01039
XCS	CROSSED CS 0-29 RELAYS	91	-01039
XDL	CROSSED DL 0-13 RELAYS	91	-01039
XF	CROSSED RF AND EF RELAYS (TL)	91	-01039
XFG	CROSSED FG 0-1 RELAYS	83	-01037
XFT	CROSS ON FTC LEADS (TL)	83	-01037
XFTN	CROSSED FTN 0-3 RELAYS	91	-01039
XFTT	CROSSED FTT 0-3 RELAYS	91	-01039
XFUN	CROSSED FUN 0-9 RELAYS	91	-01039
XFUT	CROSSED FUT 0-9 RELAYS	91	-01039
XHG	CROSSED HG 0-9 RELAYS (LL)	83	-01037
XJC	CROSSED JC 0-19 RELAYS (TL)	91	-01039
XJG	CROSSED G 0-4 RELAYS (TL)	91	-01039
XJS	CROSSED J 0-9 SELECT MAGNETS (TL)	91	-01039
XLC	CROSSED LC 0-9 RELAYS (TL)	91	-01039
XLG	CROSSED LG RELAYS (LL)	83	-01037
XLH	CROSSED LINE HOLD MAGNETS	91	-01039

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
XLO	CROSS ON LOCK-OUT LEADS TO LINE LINK	83	-01037
XLR	CROSSED L AND R RELAYS (TL)	91	-01039
XLS	CROSSED LINE LINK SELECT MAGNETS (LL)	83	-01037
XLV	CROSSED LV 2-9 RELAYS (TL)	83	-01037
XMB	CROSSED MB 0-4 RELAYS	91	-01039
XMRL	CROSS ON "MRL" LEAD TO MARKER CONNECTOR	83	-01037
XN	CROSS IN CALLED NUMBER FIGURES	83	-01037
XOB	CROSSED OBS AND NOB RELAYS	91	-01039
XPG	CROSSED PNR, PA, PB, PC RELAYS	91	-01039
XPT	CROSSED INCOMING TRUNK CLASS RELAYS	91	-01039
XPTN	CROSSED PO-P9 RELAYS	91	-01039
XRCT	CROSSED RCT RELAYS	91	-01039
XRL	FALSE GROUND ON "RL" LEAD TO ORIGINATING REGISTER MARKER CONNECTOR	83	-01037
XRS 1/2	CROSSED RINGING SWITCH SELECT MAGNETS	83	-01037
XRS 3	CROSSED RS-0/1 RELAYS	83	-01037
XRS 4	CROSSED RS-2/9 RELAYS	83	-01037
XS	CROSSED S RELAYS (O.G. sender connector)	83	-01037
XSA	CROSSED S RELAYS AUXILIARY	83	-01037
XSL	FALSE GROUND ON "AST" OR "BST" LEAD TO T.L.	83	-01037
XSS	CROSSED SENDER LINK SELECT MAGNETS	83	-01037
XT	CROSSED TRANSLATOR CONTROL RELAYS	91	-01039
XT 1-2	FALSE GROUND ON TRANSMITTING LEADS TO O.G. SENDER CONNECTOR	83	-01037
XT 5	AUXILIARY TO XT 1-2	83	-01037
XTAN	CROSSED CLASS OF CALL RELAYS	91	-01039
XTB	CROSSED TB 0-5 RELAYS	91	-01039
XTB 1	CROSS ON "TB 0-5" LEADS TO TRUNK LINK	83	-01037
XTC	FALSE GROUND ON "TC" LEAD TO L.L.M.C.	83	-01037
XTC 1	FALSE GROUND ON "TC1" LEAD TO L.L.M.C.	83	-01037
XTG	CROSSED TG 0-19 RELAYS	91	-01039
XTG 1	CROSS ON "TG 0-19" LEADS TO TRUNK LINK	83	-01037
XTRK	FALSE GROUND ON TRK LEAD TO MARKER CONNECTORS	83	-01037
XTRL	FALSE GROUND ON TRL LEAD TO MARKER CONNECTORS	83	-01037
XTS	CROSSED TRUNK SWITCH SELECT MAGNETS (TL)	91	-01039
XTS 1	FALSE GROUND ON TRUNK SWITCH SELECT MAGNETS (TL)	83	-01037

DESIGNATION	FUNCTIONAL MEANING	FIG. NO.	SHEET NO.
XTV	CROSSED TVA AND SCC RELAYS	91	-01039
XVGA	CROSSED VGA RELAYS (LL)	83	-01037
XVGB	CROSSED VGB RELAYS (LL)	83	-01037
0NN	AMA RECORDER 0	65	-01028
1F	FIRST FAILURE TO MATCH	82	-01027
1FA	FIRST FAILURE TO MATCH AUXILIARY	82	-01027
1TB	AMA RECORDER 1, OR TOLL TRUNK BOTH PHYSICAL AND THEORETICAL	65	-01028
2DT2-9	TWO DIGIT TRANSLATOR	115	-01023
2F	SECOND FAILURE TO MATCH	82	-01027
2FA	SECOND FAILURE TO MATCH AUXILIARY	82	-01027
2G	TWO JUNCTOR SUBGROUPS	27	-01015
2MB	AMA RECORDER 2, OR MANUAL TRUNK BOTH PHYSICAL AND THEORETICAL	65	-01028
2P	TWO-PARTY (Class)	10	-01011
2SG	TWO SENDER SUBGROUPS	64	-01027
2TLF	TWO TRUNK LINK FRAMES	27	-01015
2-3TLF	TWO-THREE TRUNK LINK FRAMES	27	-01015
3FB	AMA RECORDER 3, OR FULL SELECTOR TRUNK BOTH PHYSICAL AND THEORETICAL	65	-01028
3G	THREE JUNCTOR SUBGROUPS	27	-01015
3TLF	THREE TRUNK LINK FRAMES	27	-01015
4TLF	FOUR TRUNK LINK FRAMES	27	-01015
4TT	AMA RECORDER 4, OR TOLL TRUNK THEORETICAL	65	-01028
5MT	AMA RECORDER 5, OR MANUAL TRUNK	65	-01028
5TLF	FIVE TRUNK LINK FRAMES	27	-01015
6FT	AMA RECORDER 6, OR FULL SELECTOR TRUNK THEORETICAL	65	-01028
6TLF	SIX TRUNK LINK FRAMES	27	-01015
7Q	SEVEN QUAD	17	-01012
7TLF	SEVEN TRUNK LINK FRAMES	27	-01015
7TP	AMA RECORDER 7, OR TOLL TRUNK PHYSICAL	65	-01028
8MP	AMA RECORDER 8, OR MANUAL TRUNK PHYSICAL	65	-01028
8TLF	EIGHT TRUNK LINK FRAMES	27	-01015
9FP	AMA RECORDER 9, OR FULL SELECTOR TRUNK PHYSICAL	65	-01028
9TLF	NINE TRUNK LINK FRAMES	27	-01015
10TLF	TEN TRUNK LINK FRAMES	27	-01015
11X	SERVICE CODES OR CDO'S AND FOREIGN AREA	38	-01023
20F	MAXIMUM 20 LINE FRAMES	17	-01012
40F	MAXIMUM 40 LINE FRAMES	17	-01012

6. GENERAL METHOD OF OPERATION

The marker assists in the completion of five basic calls or connections as follows:

(a) A dial tone connection which connects to a subscriber that wishes to originate a call by dialing the called subscriber number to an originating register circuit that will record the dialed number.

(b) An intraoffice call which connects a calling subscriber to a called subscriber located within the same office.

(c) A subscriber outgoing call which connects a calling subscriber to an outgoing trunk associated with the office of the called subscriber.

(d) A terminating call which connects a call on an incoming trunk to the called subscriber.

(e) A thru intertoll or tandem call which connects a call on an incoming tandem or incoming toll trunk to an outgoing trunk.

The marker will also assist in the completion of other calls and connections as follows:

(a) Service calls such as a manual subscriber line originating call, a zero operator call or special service code calls.

(b) A test call or connection initiated by the maintenance personnel for the purpose of testing certain circuits or certain functions. The marker will also assist the automatic monitor on calls which are being monitored.

(c) A pulse conversion connection which is established to convert the assisting operator's multifrequency signaling to either dial pulse or to revertive pulse signaling before being transmitted to the distant office.

(d) An intermarker group connection which is established to connect one No. 5 Crossbar office to another No. 5 Crossbar office located in the same building and served by a diferent group of markers.

(e) Special connections such as the connection of the calling subscriber to a busy tone trunk, to a no such number tone trunk or to an intercept operator.

(f) Special calls such as a no-hunt call, a no-test call or a special hunt test call.

In addition to assisting in the various calls and connections the marker will perform the following functions:

(a) When the marker detects a trouble condition the marker will call upon the trouble recorder to record the conditions in the marker circuit and the circuits associated with the marker.

(b) Indicate to the traffic and plant registers the information which is required.

(c) Identify the method of message charging on each call or connection and to perform the marker functions which are necessary for proper message charging.

(d) When the marker encounters a condition, usually when all equipment of the required type is busy, which prevents the marker from completing the call or connection in the required manner the marker will be recycled or will be route advanced. When the marker recycles or route advances, this call or connection will be rerouted thru other equipment in an attempt to complete the call or connection, will be connected to a tone trunk to inform the subscriber that the call cannot be completed at this time or will receive the tone signal from a register or trunk circuit.

When the marker is seized by any circuit requiring the aid of a marker the circuit requiring aid will either inform the marker of the call or connection which it will assist in completing or will transmit information to the marker so that the marker may determine the call or connection which it will assist. The marker in response to this information will set up and perform the necessary operations in the correct sequence to fulfill the functions necessary for completion of that particular call or connection. After completing the functions required the marker will be released.

A marker group may consist of one group of "combined markers" which perform all of the marker functions, or may consist of two marker subgroups, one marker subgroup of "dial tone markers" and one marker subgroup of "completing markers." The "dial tone markers" will perform only the dial tone connection marker functions while the "completing markers" will perform all marker functions except the dial tone connection functions. By providing the circuit with only the equipment and apparatus required for dial tone connection functions a "dial tone marker" may be provided which will assist a dial tone connection but will not assist other types of calls or connections. However, "completing markers" must be provided to assist in the completion of other calls or connections.

6.01 Dial Tone Connection

A subscriber originates a call by removing the receiver from the switchhook which operates the associated line relay. An operated line relay causes the line link frame to engage a marker in competition with other line link frames and other circuits which may be simultaneously requesting markers. Access to the marker is gained through the line link marker connector which connects only leads used for a dial tone connection. The line link frame identifies itself to the marker by its frame number, and the marker connector informs the marker that a dialing connection is to be established. The marker then proceeds to select an originating register and to locate the position of the calling line on the line link frame.

Originating registers are associated with the trunk link frames. By means of test leads, the marker predetermines which trunk link frames are associated with idle registers and which trunk link frames are not occupied by other markers. The marker preferentially selects an idle trunk link frame associated with an idle originating register and connects to the trunk link frame through the trunk link connector. The marker then preferentially selects an idle originating register associated with the selected trunk link frame and connects to the selected originating register.

Location of the calling line is begun when the marker is seized and continues while the marker is selecting an originating register. Line location is made in terms of line link frame, vertical group, horizontal group and vertical file.

A line link vertical group of subscriber lines is five crossbar switch verticals wide and ten crossbar switches high. The combined line and junctor switch contains two vertical groups on its line switch section, each 200-line supplementary bay contains four vertical groups, and each 100-line supplementary bay contains two vertical groups. The largest line link frame contains twelve vertical groups.

Following marker seizure, the marker determines which vertical group contains the line awaiting service. If more than one vertical group has lines awaiting service, the marker preferentially selects one vertical group. The vertical group is associated with a maximum of fifty subscriber lines; therefore, the identification of the vertical group identifies the location of the calling line to be served within fifty of the maximum of 590 subscriber lines associated with the line link frame.

A line link horizontal group of subscriber lines is one crossbar switch high and the width of the supplied line switches, the maximum width being that of a line link frame containing twelve vertical groups. The marker determines which horizontal group contains the subscriber line within the selected vertical group that is awaiting service. If more than one horizontal group has one or more lines within the selected vertical group awaiting service, the marker preferentially selects one horizontal group. The subscriber line to be given dial tone service has been identified as located with the five subscriber lines associated with the selected vertical and the selected horizontal group.

Before the marker can complete the identification of the subscriber line, the marker must seize the line link frame through the line link connector. However, the seizure of the line link frame must await the trunk link frame seizure to prevent markers from blocking each other from the frames.

Following trunk link frame seizure, the marker seizes the line link frame (which has identified itself through its marker connector) in competition with markers which may be completing or awaiting to complete calls to it. The marker connects to the line link frame through the line link connector which connects leads from the line link frame to the marker for vertical file identification and for performing the dial tone connection functions.

A line link vertical file of subscriber lines is one crossbar switch vertical wide and ten crossbar switches high. One vertical group contains five vertical files. The marker tests the five subscriber lines associated with the selected vertical group and selected horizontal group and records the vertical file with which the calling line is associated. If more than one subscriber line within the selected vertical group and selected horizontal group, is awaiting service, the marker preferentially selects one.

The class of service of the calling line is identified by the marker after the calling line has been located. Each vertical file is assigned a class of service, therefore, the marker can determine the class of service after the vertical file is located. The marker will transmit the line link frame number, the selected line location and the class of service to the originating registor

After the horizontal group has been determined and an originating register seized, the marker selects one of the connecting paths which may be available to connect the calling subscriber to the originating register. The marker tests the junctor, line link and trunk link of each possible connecting path to determine which junctors, line links or trunk links are already in use on other calls and therefore unavailable for this dial tone connection. The marker selects the preferred connecting path which is available for use and operates the select and hold magnets on the crossbar switches to establish the connecting path or channel. The marker will then check the connecting path for continuity and will transfer the supervision for holding the connecting path to the originating register.

After the connecting path has been established and checked the marker and associated circuits are released. The originating register will transmit a dial tone to the subscriber as an indication that the dialing of the called subscriber may be initiated.

6.02 Intra-Office Call, Non-Reverting

When a subscriber has dialed the required number of digits, the originating register will request a marker and connect to it through an originating register marker connector. The register transmits to the marker the calling subscriber line location on the line link frame, class of service and the dialed number. From the office code of the called subscriber the marker determines that the call is for a subscriber within the same marker group and proceeds to establish first the connection between the called line and intra-office trunk, and then the connection between the calling line and the intra-office trunk. The talking path is interconnected within the intra-office trunk.

6.021 Connection of Called Line to Intra-Office Trunk

The marker seizes an idle trunk link frame which has idle intra-office trunks. It connects to an idle trunk, the selection being similar to that of an originating register.

While trunk selection is taking place, the marker determines the line location on the line link frame of the called number by consulting the number group circuit. The marker seizes the number group and passes the numerical digits of the called number to it. The number group translates the numerical digits into line location in terms of line link frame number, vertical group, horizontal group, and vertical file. Each number group contains cross connections for one thousand numerical digits, and the marker selects the proper number group from the dialed thousands digit.

The number group also gives the marker information for setting the ringing selection switch for ringing the called number. The marker, after receiving the required information from the number group and after the connecting path has been selected, operates the ringing selection switch to connect the proper individual or party line ringing into the trunk. The marker then disconnects and leaves the switch held by the trunk.

The marker seizes the line link frame after the called number information has been received from the number group and after the trunk link frame has been seized. The called line is then tested for a busy condition. If the called line is idle the marker interconnects the called line and the intra-office trunk thru an available connecting path and then proceeds to establish the connection between the calling line and the intra-office trunk. If the called line is busy, the calling subscriber is connected through a connecting path to a busy tone trunk which will transmit a busy tone to the calling subscriber.

6.022 Connection of the Calling Line to Intra-Office Trunk

After the connection between the called line and the intra-office trunk has been established the marker seizes the line link frame of the calling subscriber and interconnects the intra-office trunk and the calling subscriber thru an available connecting path. The dial tone connection is not released until the marker determines that an idle connecting path exists between the calling subscriber and the intra-office trunk. This allows a busy tone to be returned from the originating register if an all trunks busy or an all connecting paths busy condition prevents the marker from establishing a connection either to the desired trunk or to a busy tone trunk.

The marker has received from the originating register and has recorded the identity of the line link used in the dial tone connection. Since the dialing connection is released before the connection between the calling line and the intra-office trunk is established the marker may therefore reuse that line link as part of the connecting path of the connection between the calling line and the intra-office trunk.

After the subscribers have been interconnected, the marker is released and the originating register and other associated circuits are released. Ringing and supervision is under control of the intra-office trunk. The ringing selection switch is disconnected when the called subscriber answers or the call is abandoned.

6.03 Intra-office Call, Reverting

A call to a subscriber on the same subscriber line as the calling subscriber is a reverting call. The talking connection in the office consists of a connecting path between the subscriber line and an intra-office reverting trunk if the class of service of the calling line is a flat rate class and if reverting trunks are provided in the office. However, if reverting trunks are not provided or if the class of service of this calling line is a message rate class it is necessary to connect the calling subscriber to an operator who will establish a talking connection and who controls the ringing and supervision. For a message rate class of service it is necessary to connect to an operator so that proper charging can be made since a reverting trunk cannot be equipped to provide message charging.

A subscriber making a revertive call receives dial tone and dials in the usual manner. The originating register seizes a marker and transmits to it the calling line location, the called number and the other necessary information. The marker seizes the proper number group to locate the called line and a trunk link frame to select an intra-office trunk. The progress up to this point is the same as a non-reverting intra-office call.

The marker receives the called line location and determines that it is the same as the calling line location, which it has received from the originating register. The two locations being identical causes the marker to drop the selected trunk link frame and the selected intra-office non-reverting trunk. The marker then selects a trunk link frame with an idle intra-office reverting trunk, or if it is required to connect to an operator, an idle special service trunk, and connects to that trunk. The marker establishes a connecting path between the subscriber line and the trunk. After checking the connecting path the marker releases.

6.04 Subscriber Outgoing Call

When the called number has been dialed the originating register engages a marker through its marker connector. The register informs the marker of the calling subscriber line link frame location and class of service, the dialed number, and the number of the line link used in the dialing connection. The marker determines from the office code portion of the called number that the call is for a subscriber in a remote office and that an outgoing sender is required.

The marker proceeds to select an outgoing sender of the proper type to transmit the called number to the distant office. When it has determined that a sender is available it selects a trunk link frame and then selects an outgoing trunk to the distant office. The sender is associated with the marker through the outgoing sender connector and the marker transfers the called number to the sender.

The marker seizes the line link frame of the calling subscriber after the trunk link frame has been seized. An available connecting path is selected and established by the marker between subscriber line and the selected outgoing trunk. The line link used in the dial tone connection may be reused in the outgoing connection in the same manner as for an intra-office connection. The dial tone connection is not released until the marker determines that an idle connecting path exists to the selected outgoing trunk.

The marker releases after the outgoing sender makes a test of the continuity and polarity of the outgoing trunk.

6.05 Terminating Call

A call from a remote office is completed by an incoming register receiving the called number from the remote office and requesting the marker to establish a connecting path between the incoming trunk and the called subscriber.

The incoming trunk recognizes a seizure by a remote office which wishes to complete the call, and connects itself to an incoming register through the incoming register link. The distant office transmits the called numerical digits to the incoming register. The incoming register records the trunk link frame number so that the marker can reach the incoming trunk, registers the called numerical digits from the remote office, and then connects itself to a marker through an incoming register marker connector.

The marker receives the numerical digits and the trunk link frame number from the incoming register and seizes the trunk link frame to gain access to the incoming trunk.

The marker also seizes the proper number group to determine the location of the called line on the line link frame.

After the called line location has been obtained from the number group and the trunk link frame seized, the marker seizes the line link frame and connects to the called number to make the busy line test. If the called line is busy, the marker sets the incoming trunk for busy signal and releases itself and the incoming register.

If the called line is idle, the marker interconnects the incoming trunk and the called line by a connecting path. The marker also receives information from the number group to set the ringing selection switch for the proper ringing combination in the same manner as for an intra-office call.

When the connecting path is established and tested or the incoming trunk set for returning a subscriber busy signal the marker, the incoming register and the register link are released. The supervision of the connecting path is under the control of the incoming trunk.

6.06 Thru Intertoll or Tandem Call

The incoming tandem or incoming toll trunk is seized and connected through the register link to an incoming register. When the called number has been fully recorded in the incoming register a marker is seized and connected to the incoming register thru the register marker connector circuit.

The marker determines that the call is a intertoll or tandem call which should be routed to an outgoing trunk associated with the office of the called subscriber. An arbitrary number of three digits is transmitted to the marker to identify the incoming tandem or toll trunk. The marker then proceeds to a number group to determine the tandem or toll trunk location on the line link frame. Incoming tandem trunks have one appearance on a line link frame while incoming toll trunks have an appearance on two line link frames. Incoming toll trunks have appearances on two line link frames so as to reduce the number of lost calls from inability to find an idle connecting path.

The marker knowing the line link frame location of the incoming tandem or toll trunk will proceed in a manner similar to establishing a connection from a subscriber's line. The marker gains access to a trunk link frame with an outgoing trunk associated with the office of the called subscriber and then proceeds to connect to the line link frame associated with the incoming tandem or toll trunk. At the same time the outgoing trunk will be connected to an outgoing sender. The marker will transmit to the outgoing sender the necessary information required to be transmitted to the office of the called subscriber. The connection between the incoming and outgoing tandem trunks or between the incoming and outgoing toll trunks will then be established by the marker. After the connecting path has been established and checked the marker will release.

6.07 Service Calls

There are three types of service calls which require special operations by a marker.

(a) Manual Subscriber Originating Calls.

(b) Zero Operator Calls.

(c) Special Service Code Calls.

6.071 Manual Call

It is sometimes necessary to serve certain originating traffic in a dial office on a manual basis. Such subscribers are referred to as manual subscribers, and calls from such lines are manual calls. In this system, such lines are given a manual class of service.

A call originating from a manual subscriber is routed to an originating register in the normal dial tone connection manner. The marker when it makes class of service identification, identifies that the call is of the manual class and transmits this information to the originating register, and the marker releases. The originating register does not transmit dial tone but immediately engages a marker and requests that the subscriber be routed to an outgoing trunk to the operator. The operator is notified of the type of call by a tone or by a separate grouping of the trunks on the operator's switchboard. The operator completes the call to the desired number at the request of the subscriber.

6.072 Zero Operator Calls

A subscriber making a call to a zero operator dials zero when dial tone is transmitted from the originating register. The register records the zero digit and does not await further dialing but immediately engages a marker. The marker establishes a connection between the calling subscriber and an outgoing trunk to the operator and releases. No outgoing sender is required for the call.

6.073 Special Service Code Calls

A subscriber making a call to an X11 operator (long distance, repair service, etc.) dials the X11 code when dial tone is transmitted from the originating register. The register records the dialed code and engages a marker without awaiting further digits. The register transmits to the marker the dialed code and also indicates that the call is of the X11 type. The marker establishes a connection between the calling subscriber and an outgoing trunk to the proper X11 operator. No outgoing sender is required for the call.

6.08 Test Calls or Connections

The marker will assist a test connection initiated at the master test frame and will also assist the automatic monitor on calls which are being monitored. The master test frame test connections which the marker will assist are the marker test connections, the register and sender test connections, the trunk test connections, the marker line verification tests and the subscriber line tests. In making marker test calls or connections, the marker is primed with information set up on keys of the master test control circuit and closed thru on leads corresponding to those of the circuit which the test circuit is simulating. The marker functions in accordance with the information with which it is primed, makes required translations, connects to line and trunk link frames, number group, register and senders as required and sets up connections through linkages in as nearly a normal manner as is consistent with avoiding interference with service. Thus in testing a marker, the functions of the frame circuits to which it connects are also tested.

6.09 Pulse Conversion Connection

A subscriber who desires a connection to a subscriber in an area which he cannot dial directly, has been connected to the operator so that the operator may assist in the connection. The operator connects to the outgoing trunk associated with the office of the called subscriber. Usually the operator would then dial the called subscriber's directory number. However, if the operator's position is equipped only with a multifrequency pulsing keyset and the called office requires either dial pulse or revertive pulse signaling it is necessary to set up a pulse conversion connection. With a pulse conversion connection the operator will key, with the multifrequency pulsing keyset, the called directory number into a multifrequency incoming register. A marker will establish a connection to this incoming register and to an outgoing sender circuit and will transfer the called subscriber directory number to the outgoing sender. The marker will also establish a connection between the outgoing trunk which the operator has selected for this call and the selected outgoing sender. The marker and incoming register will then release. The outgoing sender will then transmit the called subscriber number with dial pulse or revertive pulse signaling as required. After the called subscriber directory number has been completely transmitted the outgoing sender will be released from this call.

6.10 INTERMARKER GROUP CONNECTIONS

An intermarker group connection is a connection from one No. 5 crossbar office to another No. 5 crossbar office located in the same building and served by a different group of markers. An intermarker group connection may be required for three types of calls as follows:

a. Subscriber to subscriber intermarker group calls in which the subscribers are associated with different No. 5 crossbar offices located in the same building and served by a different group of markers.

b. Subscriber to outgoing trunk intermarker group calls in which the local subscriber originates a call which requires the use of another No. 5 crossbar office located in the same building as a tandem office so as to be connected to the required outgoing trunk circuit.

c. Incoming trunk to subscriber intermarker group calls in which a call associated with an incoming trunk requires that the office associated with the incoming trunk act as a tandem office so that the call may terminate to a subscriber in another No. 5 crossbar office located in the same building.

6.101 Subscriber to Subscriber Intermarker Group Call

A subscriber to subscriber intermarker group call will require the assistance of a marker in the office of the calling subscriber, that is, in the calling marker group and the assistance of a marker in the office of the called subscriber, that is, in the called marker group. The subscriber to subscriber intermarker group call will be set up thru a subscriber to subscriber intermarker group trunk circuit.

6.1011 Operation of the Marker in Calling Marker Group

The functions performed by the marker in the office of the calling subscriber when associated with a subscriber to subscriber intermarker group call are similar to the functions performed by the marker when assisting a subscriber outgoing call. However, the call will be associated with a subscriber to subscriber intermarker group trunk instead of an outgoing trunk and will be associated with an intermarker group sender instead of an outgoing sender.

The subscriber to subscriber intermarker group trunk will have one termination on a trunk link frame in the calling office and the other termination on a trunk link frame in the called office thus making it possible to interconnect the two offices thru the intermarker group trunk.

The intermarker group sender will receive information from the marker associated with the calling office in the same manner as an outgoing sender receives information from a marker. However, instead of transmitting this information by pulsing over a trunk, the intermarker group sender will connect thru a marker connector to a marker associated with the called office and will transmit this information to this marker in the same manner as for an incoming register circuit. Thus an intermarker group sender will operate, from a marker viewpoint, similar to the outgoing sender when associated with the marker in the calling office and will operate similar to the incoming register when associated with the marker in the called office.

6.1012 Operation of the Marker in Called Marker Group

The functions performed by the marker in the office of the called subscriber when associated with a subscriber to subscriber intermarker group call are simialr to the functions performed by the marker when assisting a terminating call. However, instead of the incoming register initiating the seizure of the marker, the intermarker group sender will initiate the seizure of the marker through the register marker connector.

6.102 Subscriber to Outgoing Trunk Intermarker Group Call

A subscriber to outgoing trunk intermarker group call will be set up thru a subscriber to trunk intermarker group trunk to connect the calling subscriber in one marker group to an outgoing trunk in the other marker group.

6.1021 Operation of the Marker in Calling Marker Group

The functions performed by the marker in the office of the calling subscriber when associated with a subscriber to outgoing trunk intermarker group call are similar to the functions performed by the marker on a subscriber to subscriber intermarker group call. However, instead of selecting a subscriber to subscriber intermarker group trunk for service the marker will select a subscriber to outgoing trunk intermarker group trunk for this call. The subscriber to outgoing trunk intermarker group trunk will have one termination on a trunk link frame in the calling office and another termination on a line link frame in the office associated with the outgoing trunk circuit.

6.1022 Operation of the Marker in the Marker Group Associated with the Outgoing Trunk

The functions performed by the marker in the marker group associated with the outgoing trunk when associated with a subscriber to outgoing trunk intermarker group call are similar to the functions performed by the marker when assisting a tandem call. However, instead of the incoming register initiating the seizure of the marker, the intermarker group sender will initiate the seizure of the marker through the register marker connector. A connection will be established from the subscriber to outgoing trunk intermarker group trunk which is incoming to this marker group and which terminates on a line link frame to the outgoing trunk circuit which terminates on a trunk link frame.

6.103 Incoming Trunk to Subscriber Intermarker Group Call

An incoming trunk to subscriber intermarker group call will be set up thru a trunk to subscriber intermarker group trunk to connect the incoming tandem trunk in one marker group to the called subscriber in the other marker group

6.1031 Operation of the Marker in the Marker Group Associated with the Incoming Trunk

The functions performed by the marker in the marker group associated with the incoming tandem trunk when associated with an incoming trunk to subscriber intermarker group call are similar to the functions performed by the marker when assisting a tandem call. However, the call will be associated with an incoming trunk to subscriber intermarker group trunk instead of an outgoing trunk and will be associated with an intermarker group sender instead of an outgoing sender. The incoming trunk to subscriber intermarker group trunk will have one termination on a trunk link frame in the marker group associated with the incoming trunk and the other termination on a trunk link frame in the called office. A connection will be established from the incoming tandem trunk which terminates on a line link frame to the incoming trunk to subscriber intermarker marker group trunk which is outgoing to this marker group and which terminates on a trunk link frame.

6.1032 Operation of the Marker in Called Marker Group

The functions performed by the marker in the office of the called subscriber when associated with an incoming trunk to subscriber intermarker group call are similar to the functions performed by the marker on a subscriber to subscriber intermarker group call. However, an incoming trunk to subscriber intermarker group trunk will be associated with the call instead of a subscriber to subscriber intermarker group trunk.

6.11 Special Connections

There are three types of special connections which require special operations by a marker.

(a) Intercepted Call Connection

(b) No Such Number Tone Connection

(c) Busy or Overflow Tone Connection

6.111 Intercepted Call Connection

Calls to disconnected numbers, or numbers with the associated line out of service, and calls for which the physical and theoretical office indications do not match, are routed to intercept trunks. These trunks appear at the operator's switchboard. Disconnected numbers have the three associated cross-connections in the number group opened, and the marker routes a call for the number to an intercept trunk. The intercept trunks are associated with the line link frames so that they may be reached by subscribers both in the same office and in a remote office.

Since the intercept trunks are associated with the line link frame in the same manner as subscriber lines the connection to the intercept trunk is similar to a connection to the called subscriber within the office. That is, on intraoffice intercepted calls the connection from the subscriber line to the intercept trunk is established thru an intraoffice trunk on the trunk link frame and on terminating intercepted calls the connection from the incoming trunk circuit to the intercept trunk is established in a manner similar to the terminating call.

Lines out of service are put on "plugging up" shoes on the vertical side of the MDF. A marker will recognize when a called line is on "plugging up" and routes a call for the number to the intercept trunks.

6.112 Busy or Overflow Tone Connection

When the marker cannot complete a connection due to the calling line being busy or due to the fact the marker cannot find an idle connecting path to the calling subscriber line or outgoing trunk circuit, the marker will connect the calling subscriber to a tone trunk so that a busy tone or an overflow tone may be transmitted to the calling subscriber. The tone trunks are associated with the trunk link frames and the connection to the tone trunk being established in manner similar to the subscriber outgoing call except that an outgoing sender is not required.

6.113 No Such Number Tone Connection

Numbers that have no line corresponding to the number may have one of the three cross-connections in the number group. The marker recognizes this and may route a call for such a number to a no such number tone trunk instead of to an intercept trunk.

If the call is a terminating call the marker may route the call to a no-such number tone trunk which is associated with the line link frame. The connection to this no-such number tone trunk being similar to the connection of the intercept trunk. The tone trunk returns no-such-number tone to the calling subscriber. The system may be arranged to route such a call to an operator in a manner similar to regular intercept calls instead of to a tone trunk.

If the call is an intraoffice call the marker may route the call to a no-such-number tone trunk associated with the line link frame.

6.12 Special Calls

There are three types of special calls which require special operations by a marker.

(a) No-Test calls which are originated at the local or central test desk and the local or central DSA board.

(b) No-Hunt calls which are originated at the message register rack and master test frame.

(c) Special Hunt test calls which are originated at the local or central test desk.

For all of these special calls, no subscriber line tests are made by the marker. A marker capable of handling such calls is a "special" marker having additional circuits over the regular markers. Any of the above calls cause the marker connectors to select only a "special" marker.

6.121 No-Test Call

No test calls are made when an operator or test desk man wishes to connect to a given subscriber line over a busy condition. No test trunks appear on the trunk link frame. When a no-test call is originated, the trunk circuit associates itself with an incoming register. The called number is then dialed using only the numericals but preceded by a directing digit if the marker group serves more than one number series. The register engages a special marker and the marker proceeds normally to line-busy test. If the called line is idle, the marker establishes a connection between the line and the trunk using a connecting path as for a terminating call. If the called line tests busy, the marker completes the call through the no-test connector.

The no-test connector is a circuit including a crossbar switch which has a horizontal connected to the no-test trunk and the verticals connected to the no-test verticals of the line link frames. The no-test connector allows a connection directly between the no-test trunk and the line switch containing the called number.

If the called line was to a terminal hunting group, the connection is established to the line whose number was dialed regardless of its being idle or busy, since terminal hunting is not allowed on a no-test call.

6.122 No-Hunt Call

No-hunt calls may be made from the message register rack. The no-hunt trunk uses a "special" marker and causes terminal hunting to be canceled and the omission of the subscriber line tests and the test to determine if a plugging up shoe is connected to the line.

No-hunt calls from the master test frame may be made by the maintenance force for routine tests of subscriber lines, or to verify subscriber line test failures indicated by the trouble recorder before reporting the failure to the test desk man. The trunk closes the tip and ring through to the voltmeter test circuit with which the maintenance force may test the line. Terminal hunting is cancelled to insure reaching the line associated with the dialed number, which may be an intermediate line of a terminal hunting group.

No-hunt calls made from the message register rack are used in connection with the so-called "100-message register operation test". Since a message register may be assigned to an intermediate line of a terminal hunting group, it is necessary that the trunk cancel terminal hunting.

6.123 Special Hunt Test Calls

Special hunt test calls are made from the test desk for making voltmeter and other tests on subscriber lines. The connections are established by a connecting path in the same manner as for a terminating call except that subscriber line tests by the marker are omitted.

A "special" marker is required to establish a "special" hunt test call and terminal hunting is permitted. If a desk man wishes to connect to a particular line of a terminal hunting group, he originates the call over a no-test trunk.

6.13 Marker Trouble Indicating and Recording

Trouble conditions within the marker circuit and in certain cases within the circuits with which the marker circuit is associated are detected by either trouble indicating false cross or ground test or by trouble indicating timers. The trouble indicating false cross or ground tests provide a positive and immediate indication that a trouble condition exists on certain leads or relays. The trouble false cross or ground may exist within the marker or within other circuits which are connected to the marker circuit. The trouble indicating timers detect trouble within the marker or associated circuits by checking that the time required by the marker in performing certain functions is not greater than the maximum time that a marker would require to complete the function. If a trouble condition exists which does not provide a specific false cross or ground test indication but, however, prevents the marker from completing its functions, one of the trouble indicating timers will time-out to indicate a trouble condition.

When the trouble condition is encountered a trouble record card is perforated to indicate the necessary information required. On this trouble record card there are 1080 positions and every point in the central office from which an indication might be expected is given a designation and assigned a position on the trouble record card. As a trouble record is being taken each of these indicating points which might be involved are tested and where a positive signal, a point at ground potential in a majority of cases, is received the trouble recorder perforator will perforate a hole in the corresponding position on the trouble record card. The pattern of these perforations will convey information as to the possible location of the trouble condition.

7. Dial Tone Connection

When a subscriber initiates a call it is necessary to connect the subscriber to an originating register. After the originating register has been connected to the calling subscriber's line a dial tone will be transmitted to the subscriber. When the subscriber hears the dial tone the subscriber may then proceed to dial the number of the called subscriber. The originating register will detect and record the dialed number of the called subscriber so that a connection may be made between the calling and called subscribers.

A marker group may consist of one group of "combined markers" which perform all of the marker functions, or may consist of two marker subgroups, one marker subgroup of "dial tone markers" and one marker subgroup of "completing markers". The "dial tone markers" will perform only the dial tone connection marker functions while the "completing markers" will perform all marker functions except the dial tone connection functions.

The following description of a dial tone connection assumes that the marker is equipped to assist all types of calls or connections and therefore is a "combined marker". A "dial tone marker" equipped to assist only dial tone connections operates in a similar manner to a "combined marker". However, because certain non-dial tone connection functions and apparatus have not been provided the operations and operating paths of certain relays and other apparatus may be simplified.

The following description of a dial tone connection, intra-office call, outgoing call, terminating call, and so on, assumes that the marker is equipped to provide all standard optional features. However, in offices where all optional features are not provided the marker operations will be similar to those described, except that certain operations and apparatus will be eliminated.

The marker circuit when assisting the completion of a dial tone connection performs six major functions as follows:

a. The identification of the call or connection which the marker will assist.

b. The identification of the calling subscriber's line.

c. The selection of an available idle originating register.

d. The selection of an idle connecting path between the calling line and the selected originating register.

e. Connecting the calling line to the selected originating register through the selected connecting path.

f. Release of the marker and associated circuits after the marker has completed the dial tone connecting functions.

7.1 Seizure of the Marker and the Identification of the Call or Connection

The marker in order to anticipate the functions which it will be called upon to perform and to initiate the correct operations in the proper sequence must identify the basic call or connection as a dial tone connection.

When a subscriber removes his receiver from the switchhook the subscriber's line relay and a group start relay are operated in the line link and line link connector circuit on the line link frame. Directly associated with and connecting to each line link frame is one line link marker connector circuit. The operation of the group start relay in the line link and line link connector circuit will seize the line link marker connector circuit associated with this particular line link and line link connector and inform the marker connector that the assistance of a marker is required.

The line link marker connector will test for and select an idle marker which will be seized and associated with this line link marker connector and line link and line link connector. The only basic call or connection which will cause the line link marker connector to seize a marker is the dial tone connection. The marker knowing that it has been seized by the action of a line link marker connector therefore knows that the basic call or connection which it will assist in completing is a dial tone connection.

7.11 Operation of the MS Relay in the Line Link Marker Connector Circuit and the Operation of the Marker OC-1 or OC-2 Relay

When a subscriber removes his receiver from the switchhook the subscriber's line relay L-0/4 operates which in turn operates a vertical group start relay VGS0/11 in the line link and connector circuit. Permanently associated with each line link and connector circuit will be one line link marker connector circuit. The operation of any vertical group start relay VGSO/11 with the lock-out LO relay released in the line link and connector circuit will extend battery potential on the start leads "STA" and "STB" to the line link marker connector circuit.

In the line link marker connector circuit the battery potential will be extended over the "STA" or "STB" lead to the MS relay associated with the preferred marker which is idle thereby operating this MS relay. Ground potential will be supplied to the other side of the MS relay winding by the marker circuit placing ground on the "MSK" lead. In each line link marker connector circuit there is one marker start relay MS for each marker circuit to which the line link marker connector circuit may require access. By the operation of an MS relay associated with an idle and preferred marker the line link marker connector will select the marker circuit from which assistance is desired for this connection.

The operated line link marker connector MS relay will be locked operated to the battery potential placed on the "OC-1" or "OC-2" lead after the marker VTK relay has operated, as described in paragraph 7.225, and when the associated line link marker connector CB relay is released. The "OC-1" or "OC-2" lead will be extended from the line link marker connector MA relay operated to the selected marker circuit, extended through the contacts of the MRL-1 relay non-operated, the DIS-1 relay non-operated and the VTK relay operated and further extended through the marker OC-1 or OC-2 relay winding to battery potential. The resistance of the OC-1 or OC-2 relay winding is such as to permit the line link marker connector MS relay to be held operated in series with the marker OC-1 or OC-2 relay which will be operated. The marker originating call OC-1 or OC-2 relay in operating indicates that the line link marker connector is locked in under direct control of the marker.

The only basic call or connection which will operate the MS relay in the line link marker connector is a dial tone connection, therefore the operation of the MS relay signifies the origination of a dial tone connection.

7.12 Operation of the D, the MF or the MLF Relay

The operation of the MS relay will extend the ground on the "MCK" lead to the "MC-00/39" lead associated with the selected marker extending a ground to the "LF-00/39" cross-connection terminal in the selected marker circuit. The "LF-00/39" cross-connection terminal will be connected to one of the "LFD", "LFMF" or "LFM" cross-connection terminals, thereby operating one of the D, MF or MLF relays in the marker circuit.

The operation of the D, the MF or the MLF relay in the selected marker by the operation of the MS relay in the line link marker connector circuit informs the marker that the basic call or connection is a dial tone connection.

The operation of the D, the MF or the MLF relay will initiate the operations necessary for the identification of the calling line and for the selection of an available idle originating register.

7.13 Operation of the DT-1, DT-2 and DT-3 Relays

The operation of the D, the MF or the MLF relay will operate the DT-1, DT-2 and the DT-3 relay in the marker circuit as auxiliary relays to provide indications to various circuits of the marker of a dial tone connection so that the proper dial tone connection functions may be initiated at the correct time.

7.14 Operation of MA and MB Relays in Line Link Marker Connector Circuit

The operation of the MS relay in the line link marker connector circuit will extend the ground on the "MAK" lead to the "MA" lead associated with the selected marker thereby operating the line link marker connector MA relay and MB relay associated with the selected marker. The operation of the line link marker connector MA and MB relays will extend a large group of leads which are required by the marker for the performance of the dial tone connection functions from the line link marker connector circuit to the marker circuit.

7.15 Operation of the CKG-2, CKG-3, CKG-4, CKG-5, CKG-6, CKG-7, TLC-1, TLC-2, TLC-3, LLC-1, LLC-2, GTL, GTL-2, GTL-3, GTL-4 and ONW Relays

To provide a large number of off-normal grounds and battery potentials to the marker circuit and to interconnect certain functional units in the process of assisting a dial tone connection, the CKG-2, CKG-3, CKG-4, CKG-5, CKG-6, CKG-7, TLC-1, TLC-2, TLC-3, ONW, LLC-1, LLC-2, GTL, GTL-2, GTL-3 and GTL-4 relays in the marker circuit will be operated.

The operation of the line link marker connector MA relay will ground the "CKG" lead in the line link marker connector circuit. The "CKG" lead is extended to the marker circuit and with the TRLA and DIS-1 relays non-operated the ground on the "CKG" lead will be extended to operate the CKG-2 and CKG-3 relays.

The operation of the CKG-3 relay will in turn operate the CKG-5, CKG-6 and CKG-7 relays.

The CKG-4 relay winding is extended over the "CKG-4" lead, thru the contacts of the GP-2, and RAV-2 relays non-operated, over the "CKG-4" lead. The operation of the CKG-3, MF or D relay, with the RCY1 relay non-operated, will place ground on the "CKG-4" lead to operate the CKG-4 relay.

The TLC-1, TLC-2 and TLC-3 relay windings in series are extended over the "TLC-1" lead where the non-operated MRL-1 relay will extend the "TLC-1" lead to the "TLC" lead. The operation of the CKG-3 or DT1 relay with the DIS-1 and the TRLA relays non-operated will extend the "TLC" lead and the released condition of the RCY and RAV-1 relays have placed ground on the "TLC" lead thereby operating the TLC-1, TLC-2, and TLC-3 relays.

The LLC-1, LLC-2 and CNW relay windings in series are extended over the "LLC-1" lead. The released condition of the MRL-1 relay will extend the "LLC-1" lead to the "LLC-A" lead and the DIS-1 and TRLA relays released will extend the "LLC-A" lead to the "LLC" lead. The release condition of the BY and OV relays will extend the "LLC" lead. The operation of the CKG-4 and CKG-5 relays with the LK-1 and RCY-2 relays released will ground the "LLC" lead thereby operating the LLC-1, LLC-2 and CNW relays.

The operation of the CKG-6, RYC and DT-1 relays with the RK-3 relay released will operate the GTL relay which in turn will operate the GTL-2, GTL-3 and GTL-4 relays when the DIS-2 relay is non-operated.

7.16 Operation of the MCB-1/6 Relays

The MCB-1/6 relays will be operated to send an indication to all marker connectors that this marker is busy and unavailable for service.

The FA-1 relay non-operated will extend battery potential to one side of the windings of the MCB-1/6 relays. The other side of the windings will be extended over the "MB" lead to all marker connectors. The operation of the line link marker connector MA relay will place ground on the "MB" lead associated with the selected marker circuit thereby operating the MCB-1/6 relays in the marker selected for service.

7.17 Operation of the CB Relays in the Marker Connectors

The operation of the MCB-1/6 relays will place ground potential on the "CB" leads associated with the marker. The "CB" leads will be extended to all marker connectors to operate the CB relay associated with the selected marker in each marker connector as an indication that this marker is unavailable for future selection or seizure by another marker connector.

7.2 The Identification of the Calling Line

When the marker is informed by the operation of the D, MF, or MLF relays that a dial tone connection awaits service (paragraph 7.12), one of its functions is to identify the calling line.

The identification of the calling line is necessary for the following four major purposes.

a. The connection of an originating register to the calling line requires a knowledge of the location of the termination of the calling line within the office.

b. The identification of the calling line must be sent to the originating register where it is stored for further use by a marker in setting up a call back connection to the calling line.

c. To properly charge the calling subscriber for the call it is necessary to determine the identification of the calling line.

d. In some offices certain subscribers will require a dial pulsing originating register while other subscribers will require a multifrequency pulsing originating register. Therefore, the calling line identification will be required to determine the correct originating register required.

To properly identify the calling line, information is required which will identify the line link frame on which the calling line terminates and the location of the calling line termination on that line link frame.

Each line link frame consists of bays of ten crossbar switches mounted one above another. Each subscriber's line is associated with a hold magnet on a crossbar switch. Therefore the identification of a particular hold magnet on a particular switch will identify the calling line. This identification is accomplished by dividing the line switches into the following groupings.

a. Horizontal groups

The switches on each bay in the line link frame are numbered 0 to 9 from the bottom switch to the top switch Switches of the same number on all bays of the line link frame comprise a horizontal group and are served by the same ten line links.

b. Vertical groups

The hold magnets on each crossbar switch are divided into groups of five adjacent hold magnets, designated line groups. The ten line groups located in the same position in each horizontal group are designated as a vertical group. Therefore, a vertical group consists of fifty subscriber lines associated with the same five adjacent hold magnets in each horizontal group. A minimum of six and a maximum of twelve vertical groups, numbered from 0 to 11, can be equipped.

c. Vertical files

The ten hold magnets in the same position in each vertical group are designated as a vertical file. There are five vertical files, numbered 0 to 4 in each vertical group.

Identification of the calling line can therefore be made in terms of line link frame number, horizontal group number, vertical group number, and vertical file number.

7.21 Line Link Frame Identification

The line link frame identification of the calling line will be obtained by identifying the line link frame tens digit number and by identifying the line link frame units digit number.

When the marker is connected to the line link marker connector the marker connector grounds a combination of three leads of a group of nine leads to identify in the marker, the particular line link marker connector involved in this dial tone connection. Since each line link marker connector is permanently associated with only one line link frame the identity of the particular line link frame involved is also known by the marker serving this connection. Grounding of two leads of a group of five leads will identify the line link frame units digit number and the grounding of one lead of a group of four leads will identify the line link frame tens digit number.

7.211 Operation of the FT-0/3 Relays

In the marker will be four frame tens digit identification relays designated FT-0/3 associated with the "FT-0/3" frame tens digit identification test leads. These FT-0/3 relays will test for the presence of ground on the associated "FT-0/3" identification test leads when the GTL-2 relay is operated. One lead of this group of tens digit number identification test leads will be grounded by the line link marker connector when the MA relay operates, operating an associated FT-0/3 relay in the marker to identify the line link frame tens digit number. Each line link marker connector will place ground on a particular lead to correctly identify the tens digit number of the line link frame with which it is permanently associated according to the following code.

Line Link Frame Tens Digit Number	FT-0/3 Lead Grounded
0	FT-0
1	FT-1
2	FT-2
3	FT-3

7.212 Operation of the FU-0/7 Relays

In the marker will be five frame units digit identification relays designated FU-0, FU-1, FU-2, FU-4 and FU-7 associated with the frame units degit identification test leads designated "FU-0", "FU-1", "FU-2", "FU-4" and "FU-7" which will test for the presence of ground on the associated units digit identification test leads when the GTL-2 relay is operated. Two leads of this group of units digit identification test leads will be grounded by the line link marker connector circuit when the MA relay operates, operating two associated relays in the marker to identify the line link frame units digit number. Each line link marker connector will place ground on two particular leads to correctly identify the units digit number of the line link frame with which it is associated according to the following code.

Line Link Frame Units Digit Number	"FU-0/7" Leads Grounded
0	FU-4 and FU-7
1	FU-0 and FU-1
2	FU-0 and FU-2
3	FU-1 and FU-2
4	FU-0 and FU-4
5	FU-1 and FU-4
6	FU-2 and FU-4
7	FU-0 and FU-7
8	FU-1 and FU-7
9	FU-2 and FU-7

7.22 Vertical Group Identification

The marker in determining the identification of the calling line on the selected line link frame will first identify the vertical group, then identify the horizontal group and finally the vertical file of the calling line.

When a subscriber removes his receiver from the switchhook to originate a call the subscriber's line relay and a vertical group start relay are operated in the line link and line link connector circuit. On each line link frame there is one vertical group start relay associated with each vertical group of line terminations. Any subscriber within a vertical group desiring a dial tone connection operates the associated vertical group relay.

After the marker has been connected to the line link frame of the calling subscriber and informed that a dial tone connection is required the marker will test all vertical group start relays on the line link frame to which the marker is connected and will determine in which vertical group the calling subscriber line is located. If there are calling subscribers waiting for a dial tone connection in more than one vertical group on the line link frame to which the marker is connected the marker will select one vertical group for service and exclude all other vertical groups. When the marker has determined the vertical group identification the calling line identification is known to be within the fifty subscriber lines composing that vertical group.

7.221 Operation of the VGG-1 and VGG-2 Relays

To initiate vertical group identification the operation of the D, MF or MLF relay with the VTK relay released will operate the vertical group gating relays VGG-1 and VGG-2.

The operation of the VGG-1 and VGG-2 relays with the operation of the line link marker connector MA relay associated with the calling subscriber line link frame will extend from the marker to the line link and connector circuit a group of twelve vertical group identification leads designated "VGT-0/11". In some offices where the maximum number of vertical groups on any one line link frame is less than twelve the maximum number of vertical group identification leads may be less than twelve.

7.222 Operation of the GK Relay

To check that the line identification gating relays, the vertical group gating relays VGG-1 and VGG-2, the horizontal group gating relay HGG and the vertical file gating relay VFG, have operated properly the gating check GK relay will be operated.

The operating path for the GK relay is extended from the GK relay winding by the operation of the VGG-1, VGG-2, HGG and VFG relays with the TR2E and HMS-1 relays released over the "TRK" lead to the line link marker connector circuit with which the marker is associated. The "TRK" lead is grounded by the operation of the line link marker connector MA relay when the TR2 relay is in the released condition thereby operating the GK relay in the marker circuit.

The GK relay will lock operated when the line link marker connector MA relay is operated and the HMS-1 and TR2E relays are released.

7.223 Operation of the VGT-0/11 Relay

When a subscriber removes his receiver from the switchhook to originate a call the subscriber line relay L-0/4 operates a vertical group start relay VGS0/11 in the line link and connector circuit. On each line link frame there is one VGSO/11 relay associated with each vertical group of fifty subscriber lines and the operation of any line relay L-0/4 within a vertical group will operate the associated vertical group start relay VGSO/11. The operation of any vertical group start relay VGSO/11 will ground the vertical group identification test lead associated with the operated VGSO/11 relay of a group of twelve vertical group identification test leads designated "VGT-0/11". The grounding of a vertical group identification lead signifies the presence of a subscriber within the vertical group desiring a dial tone connection.

The operation of the line link marker connector MA relay and the vertical group gating relays VGG-1 and VGG-2 in the marker circuit will extend the vertical group identification test leads "VGT-0/11" from the line link and connector circuit through the line link marker connector circuit to the marker circuit. On each of the vertical group identification test leads, "VGT-0/11", in the marker, a vertical group identification relay VGT-0/11 will test for the presence of ground. The presence at this time of calling subscribers desiring a dial tone connection will operate the VGT-0/11 relays associated with the vertical groups of these calling subscribers.

7.224 Operation of the VGR Relay

The operation of any VCT-0/11 relay will extend the ground on the associated "VGT-0/11" identification lead when the gating check GK relay is operated to the vertical group release VGR relay thereby operating the VGR relay as an indication that one or more VGT-0/11 relays have operated. The VGR relay will also monitor for a subscriber disconnect within the selected vertical group.

7.225 Operation of the VTK Relay

To record that one or more VGT-0/11 relays have operated the vertical group test check VTK relay will be operated when the VGR relay operates with one of the D, MF or MLF relays operated.

The VTK relay will lock operated when one of the D, MF or MLF relays are operated.

7.226 Release of VGG-1 and VGG-2 Relays

After an indication has been received that one or more vertical groups of calling subscribers have been identified the vertical group gating relays VGG-1 and VGG-2 will be released to exclude the future operation of a non-operated VGT-0/11 Relay on this dial tone connection in this marker.

The VGG-1 and VGG-2 relays will be released by the operation of the VTK relay which in operating has checked that one or more VGT-0/11 relays have operated to identify a calling subscriber line vertical group. The release of the VGG-1 and VGG-2 relays will open the path between the vertical group identification test leads "VGT-0/11" and the vertical group test relays VGT-0/11 thereby preventing the future operation of any non-operated VGT-0/11 relay from interfering with the selection of the vertical group to be served by this marker.

7.227 Release of Non-Preferred VGT-0/11 Relays

If two or more VGT-0/11 relays have operated indicating subscribers in more than one vertical group desiring a dial tone connection the one VGT-0/11 relay among the operated VGT-0/11 relays with the prior selection preference will be locked operated and all other VGT-0/11 relays will be released. The VGT-0/11 relay remaining operated will select calling subscribers within this vertical group for dial tone connection service.

The operation of the VGR or VTK relay with the TR2D relay released, and one of the MLF, MF or D relays operated has extended ground to lock operated the VGT-2 relay. If the VGT-2 relay is not operated this ground has been further extended through the one operated preference selection SQ0/9 relay to lock operated only the one preferred VGT-0/11 relay. When the VGG-1 and VGG-2 relays released the operating circuits for all of the VGT-0/11 relays were removed thereby releasing all VGT-0/11 relays except the one preferred VGT-0/11 relay which has been locked operated. The selection preference of any VGT-0/11 relay will vary with each connection set up by the marker and will depend upon the particular SQ0/9 relay operated in the selection preference circuit at this time. The one exception to this selection preference is the VGT-2 relay which will be given prior preference at all times, except when the marker is associated with a second trial. In vertical group two will be located police, fire and other emergency lines. The detailed operation of this selection preferency circuit will be found in paragraph 7.25.

7.228 Operation of the VTK-1 Relay

To properly check that all the non-preferred operated VGT-0/11 relays have released the vertical group test check one relay VTK-1 will operate when one and only one VGT-0/11 relay is operated and the VGG-1 and VGG-2 relays are released.

7.23 Horizontal Group Identification

After the marker has identified the vertical group the marker will operate a relay on the line link frame to extend to the marker ten horizontal group identification test leads from the fifty line relays on the line link frame associated with the selected vertical group. The operation of any one of the five line relays within a horizontal group and within the selected vertical group will place ground on the associated horizontal group identification test lead.

The marker will test for ground on the ten horizontal group identification test leads and will determine in which horizontal group of the selected vertical group the calling subscriber line is located. If there are calling subscribers waiting for a dial tone connection in more than one horizontal group of the selected vertical group the marker will select one horizontal group for service and exclude all other horizontal groups. After the marker has determined the vertical group and horizontal group identification the calling line identification is known to be within the five subscriber lines composing the line group within the selected vertical group and horizontal group.

7.231 Operation of the HGG Relay

The operation of the D, MF or MLF relay with the HTK and DTK relays released will operate the horizontal group gating HGG relay.

The operation of the HGG relay with the operation of the line link marker connector MB relay associated with the calling subscriber line link frame will extend from the marker to the line link and connector circuit a group of ten horizontal group identification leads designated "HGT-0/9".

7.232 Operation of the VGA-0/11 Relay in the Line Link Frame

After the vertical group identification circuit has selected one vertical group to be served by the marker by locking operated the associated selected VGT-0/11 relay and has rejected all other vertical groups by releasing all other VGT-0/11 relay the VTK-1 relay will operate to check that only the one selected vertical group VGT-0/11 relay is operated. The operation of the selected VGT-0/11 relay and the VTK-1 relay with the disconnect DIS-1 relay non-operated will place battery potential on the associated "VGA-0/11" lead in the marker. The operation of the line link marker connector MB relay has extended the group of twelve "VGA-0/11" leads from the marker to the line link frame of the calling subscriber therefore the battery potential on the "VGA-0/11" lead in the marker circuit will be extended to the line link frame to operate the associated vertical group auxiliary VGA-0/11 relay in the line link and connector circuit which the marker is associated.

The operation of the vertical group auxiliary VGA-0/11 relay in the line link and connector circuit will further extend ten horizontal group identification test leads "HGT-0/9" to that portion of each associated horizontal group within the selected vertical group.

7.233 Operation of HGT-0/9 Relay

When a subscriber removes his receiver from the switchhook to originate a call the subscriber line relay L-0/4 operates. The operation of any subscriber line relay L-0/4 in a horizontal group and within the selected vertical group with the associated VGA-0/11 relay operated will ground the associated horizontal group identification lead of a group of ten horizontal group identification leads designated "HGT-0/9" in the line link and connector circuit. Therefore the presence of any subscriber desiring a dial tone connection with a horizontal group and within the selected vertical group will ground the associated horizontal group identification lead in the line link and connector circuit.

The operation of the subscriber's line relay, LO/4, the line link and connector VGA-0/11 relay, the line link marker connector MB relay and the horizontal group gating relay HGG in the marker circuit will extend the horizontal group identification test leads, "HGT-0/9", from the line link marker connector circuit to the marker circuit. On each of the horizontal group identification test leads in the marker a horizontal group identification relay HGT-0/9 will test for the presence of ground. The presence at this time of calling subscribers desiring a dial tone connection will operate all the HGT-0/9 relays associated with the horizontal groups of these calling subscribers provided that the subscribers are within the selected vertical group.

7.234 Operation of the HGR Relay

The operation of any HGT-0/9 relay with the GK relay operated will extend the ground on the associated "HGT-0/9" identification lead to the horizontal group release, HGR, relay thereby operating the HGR relay as an indication that one or more HGT-0/9 relays have operated. The HGR relay will also monitor for a subscriber disconnect within the selected horizontal group and within the selected vertical group.

7.235 Operation of the HTK Relay

To record that one or more HGT-0/9 relays have operated the horizontal group test check HTK relay will be operated when the HGR relay operates with one of the D, MF or MLF relays operated.

The HTK relay will lock operated when one of the D, MF or MLF relays are operated.

7.236 Release of the HGG Relay

After an indication has been received that one or more horizontal groups of calling subscribers have been identified the horizontal group gating relay HGG will be released to exclude the future operation of a non-operated horizontal group identification test relay HGT-0/9 on this dial tone connection in this marker.

The HGG relay will be released by the operation of the HTK relay which in operating has checked that one or more HGT-0/9 relays have operated to identify a calling subscriber horizontal group. The release of the HGG relay will open the path between the horizontal group identification test leads "HGT-0/9" and the horizontal group test relays HGT-0/9 thereby preventing the future operation of any non-operated HGT-0/9 relay from interfering with the selection of the horizontal group to be served by this marker.

7.237 Release of Non-Preferred HGT-0/9 Relays

If two or more HGT-0/9 relays have operated indicating subscribers in more than one horizontal group within the select vertical group desiring a dial tone connection, the one HGT-0/9 relay among those operated with the prior selection preference will be locked operated and all other HGT-0/9 relays will be released. The HGT-0/9 relay remaining operated will select calling subscribers within this horizontal group and the selected vertical group for dial tone service.

The operation of the HGR or HTK relay with one of the MLF, MF or D relays operated has extended ground through the one operated preference selection SQ0/9 relay to lock operated only the one preferred HGT-0/9 relay. When the HGG relay released the operating circuits for all of the HGT-0/9 relays were removed thereby releasing all HGT-0/9 relays except the one preferred HGT-0/9 relay which has been locked operated.

The selection preference of any HGT-0/9 relay will vary with each connection set up by the marker and will depend upon the particular SQ0/9 relay operated in the selection preference circuit at this particular time. The detailed operation of this selection preference circuit will be found in paragraph 7.25.

7.238 Operation of the HTK-1 Relay

To properly check that all the non-preferred HGT-0/9 relays have released, the HTK-1 relay will operate when one and only one HGT-0/9 relay is operated and the HGG relay is released.

7.24 Vertical File Identification

Up to this point in the identification of the calling line the marker has been receiving information from the line link frame through the line link marker connector. However, before the marker may proceed with the vertical file identification the marker must seize the line link frame directly and connect to this line link frame the necessary leads for vertical file identification and the other required dial tone connection functions. While vertical and horizontal group identification is being made the marker is selecting an idle trunk link frame with one or more idle originating registers of the required type. After selecting and seizing a trunk link frame the marker will seize the line link frame associated with the calling subscriber. Since a trunk link frame or a line link frame may be seized and occupied by only one marker at a time the marker serving this dial tone connection must compete with other markers for the trunk link frame or line link frame which it desires.

After the marker has identified the vertical group and the horizontal group the marker will operate a relay on the line link frame to extend to the marker five vertical file identification test leads from the five line relays of the selected line group. Each vertical file identification test lead connects to one line relay in the selected line group. The operation of the line relay will place ground on the associated vertical file identification test lead.

The marker will test for ground on the five vertical file identification test leads and will determine in which vertical file of the selected line group the calling subscriber line is located. If there are calling subscribers waiting for a dial tone connection in more than one vertical file of the selected line group the marker will select one vertical file for service and exclude all other vertical files. After the marker has determined the vertical group, the horizontal group and vertical file identification the calling line identification is complete.

7.2401 Operation of the VFG Relay

The operation of the D, MF or MLF relay with the FTK and RCY-1 relays released will operate the vertical file gating VFG relay.

The operation of the VFG relay will extend from the marker to the selected line link and connector circuit a group of five vertical file identification leads designated "VFT-0/4".

7.2402 Operation of the MP, MCA and MCB Relays in Line Link and Connector Circuit

While vertical group and horizontal group identification and selection is being made the marker is also testing for and selecting an idle trunk link frame with one or more idle originating registers of the type required by this dial tone connection. After the trunk link and connector circuit TFK-2 relay has been operated as described in paragraph 7.331, indicating that the selected trunk link frame has been seized by this marker the line link and connector MP relay will be operated which in turn will operate the line link and connector circuit MCA relay. It is necessary on all types of marker connections to select and seize a particular trunk link frame before selecting or connecting to a line link frame so that blocking of the marker access is not possible. Marker access blocking would occur if it were possible for marker "A" to seize trunk link frame -0 for service and to select line link frame -0 for service and at the same time for marker "B" to seize line link frame -0 for service and to select trunk link frame -0 for service. Thus it is impossible for either marker "A" or marker "B" to proceed to handle their respective connections. By making it impossible for a marker to seize and connect to a line link frame until after the marker has selected and has been connected to a trunk link frame this marker access blocking is eliminated.

The line link and connector circuit MP relay winding will be extended when the TR-0/3 relay is non-operated from the line link and connector circuit over the associated "ST" lead to the line link marker connector circuit. The operation of the line link marker connector MA relay associated with the marker selected to serve this dial tone connection will further extend the "ST" lead of the MP relay associated with the selected marker over the "LFS" lead to the marker associated with this MP relay. The operation of the marker TFK-2 and LLC-1 relays operated and the SP relay non-operated will place battery potential on the "LFS" lead thereby operating the MP relay in the line link and connector circuit associated with the marker which is assisting in this dial tone connection.

The operation of the MP relay with the TR-0/3 relay non-operated will operate the line link and connector circuit MCA (bottom) relay. The operation of the line link and connector MCA (bottom) relay with the marker circuit LLC-1 relay operated will operate the MCA (top) relay and the MCB relay in the line link and connector circuit.

The operation of the MCA and MCB relays will extend a large group of leads from the line link and connector circuit to the marker circuit which are required for vertical file identification, class of service identification and other necessary functions.

7.2403 Operation of the HG-0/9 Relay in the Line Link and Connector Circuit

After the horizontal group identification circuit has selected one horizontal group to be served by the marker by locking operated the associated selected HGT-0/9 relay and has rejected all other horizontal groups by releasing all other HGT-0/9 relays the HTK-1 relay will operate to check that only the one selected horizontal group HGT-0/9 relay is operated. The operation of the HTK-1 relay and the selected HGT-0/9 relay with the LLC-1 relay operated will place battery potential on the associated "HG-0/9" lead. With the line link and connector circuit MCA relay operated the group of "HG-0/9" leads will be extended from the marker circuit to the line link and connector circuit where the associated HG-0/9 relay will be operated.

7.2404 Operation of the HGK Relay

As a check that an HG-0/9 relay in the line link and connector circuit has operated the HGK relay in the marker circuit will operate.

The operation of any HG-0/9 relay in the line link and connector circuit will place ground on the "HGK" lead in the line link and connector circuit. With the line link and connector MCA (bottom) relay operated the "HGK" lead is extended from the line link and connector circuit to the marker circuit operating the HGK relay in the marker circuit.

7.2405 Operation of the VGB-0/11 and the LG-0/11 Relay in the Line Link and Connector Circuit

In the line link and connector circuit will be one line group relay designated LG-0/11 associated with each subscriber line group of five subscriber lines. The ten subscriber line groups located on the same line link frame and in the same position in each of the ten horizontal groups have been combined and designated a vertical group. Each vertical group will have associated with it ten line group relays LG-0/11. By identifying the vertical group of the calling subscriber the identity of the subscriber line group is known to be within the ten line groups associated with the selected vertical group. By identifying the horizontal group within the selected vertical group of the calling subscriber line the complete identity of the calling subscriber line group is known.

In the line link and connector circuit will be one VGB-0/11 relay associated with each vertical group. After the vertical group identification circuit has selected one vertical group to be served by the marker the associated VGB-0/11 relay in the line link and connector circuit will be operated. The operation of the marker circuit VTK-1 relay and the VGT-0/11 relay associated with the selected vertical group will place battery potential on the associated "VGB-0/11" identification lead of a group of twelve "VGB-0/11" identification leads in the marker. The "VGB-0/11" identification leads will be extended from the marker circuit to the line link and connector circuit when the line link and connector MCA relay is operated thereby operating the VGB-0/11 relay in the line link and connector circuit associated with the selected vertical group of the calling subscriber line.

After the horizontal group identification circuit has selected one horizontal group within the selected vertical group to be served the associated HG-0/9 relay in the line link and connector circuit will be operated.

The operation of one VGB-0/11 relay and one HG-0/9 relay in the line link and the connector circuit will identify the line group of the calling line operating the associated line group relay LG-0/11 in the line link and connector circuit. The operating path for the LG-0/11 relay will be extended through the contacts of the one operated HG-0/9 relay and the one operated VGB-0/11 relay in the line link and connector circuit, through the contact of the operated line link and connector MCA relay and over the "BS" lead to the marker circuit. In the marker circuit the operation of the HGK relay with the LLC-1 relay operated will place battery potential on the "BS" lead thereby operating the LG-0/11 relay in the line link and connector circuit.

The operation of the LG-0/11 relay will further extend five vertical file identification test leads "VFT-0/4" to the five associated vertical files within the selected vertical and horizontal group.

7.2406 Operation of the VFT-0/4 Relays

When a subscriber removes his receiver from the switchhook to originate a call, the subscriber line relay L-0/4 operates. The operation of any subscriber line relay L-0/4 in a vertical file and within the selected vertical group and selected horizontal group will ground the associated vertical file identification lead "VFT-0/4" of a group of five vertical file identification leads in the line link and connector circuit when the line link and connector LG-0/11 relay associated with the selected vertical and horizontal group is operated. Therefore, the presence of a subscriber desiring a dial tone connection within the selected vertical and horizontal group will ground the associated vertical file identification lead "VFT-0/4" in the line link and connector circuit.

The operation of the line link and connector MCB relay and the vertical file gating relay VFG with the MT-11 released will extend the vertical file identification test leads "VFT-0/4" from the line link and connector circuit to the marker circuit. On each of the vertical file identification test leads "VFT-0/4" in the marker a vertical file identification relay VFT-0/4 will test for the presence of ground. The presence at this time of one or more calling subscribers within the selected vertical group and horizontal group desiring a dial tone connection will operate the corresponding VFT-0/4 relays associated with the vertical files of these calling subscribers.

7.2407 Operation of the FR Relay

The operation of any VFT-0/4 relay with the GK relay operated and the RCY-1 relay non-operated will extend the ground on the associated "VFT-0/4" identification lead to the vertical file release

FR relay thereby operating the FR relay as an indication that one or more VFT-0/4 relays have operated. The FR relay will also monitor for a subscriber disconnect within the selected vertical file, vertical group and horizontal group.

7.2408 Operation of the FTK Relay

To record that one or more VFT-0/4 relays have operated the vertical file test check FTK relay will be operated when the FR relay, operates with one of the D, MF or MLF relay operated and the RCY-1 relay non-operated.

The FTK relay will lock operated when one of the D, MF or MLF relays are operated and the RCY-1 relay non-operated.

7.2409 Release of the VFG Relay

After an indication has been received that one or more vertical groups of calling subscribers have been identified, the vertical file gating relay VFG will be released to exclude the future operation of a non-operated vertical file identification test relay VFT-0/4 on this dial tone connection in this marker.

The VFG relay will be released by the operation of the FTK relay. The release of the VFG relay will open the path between the vertical file identification test leads "VFT-0/4" and the vertical file test relays VFT-0/4 thereby preventing the future operation of any non-operated VFT-0/4 relay from interfering with the selection of the vertical file to be served by this marker.

7.2410 Release of Non-Preferred VFT-0/4 Relays

If two or more VFT-0/4 relays have operated indicating subscribers in more than one vertical file desiring a dial tone connection, the one VFT-0/4 relay among the operated VFT-0/4 relays with the prior selection preference will be locked operated and all other VFT-0/4 relays will be released. The VFT-0/4 remaining operated will select calling subscribers within this vertical file for dial tone connection service.

The operation of the FR or FTK relay with the DT-3 relay operated has extended ground through the one operated preference selection SQ0/9 relay to lock operated only the preferred VFT-1/4 relay. When the VFG relay released the operating circuit for all of the VFT-0/4 relays were removed thereby releasing all VFT-0/4 relays except the only preferred VFT-0/4 relay which has been lock operated.

The selection preference of any VFT-0/4 relay will vary with each connection set up by the marker and will depend upon the particular SQ0/9 relay operated in the selection preference circuit at this particular time. The detailed operation of this selection preference circuit will be found in paragraph 7.25.

The calling line identification is now complete with the identity of the selected vertical group, the selected horizontal group and the selected vertical file. If the calling line is a two-party line, the originating register at a later time will test to determine which subscriber on the line is the calling subscriber.

7.2411 Operation of the FTK-1 Relay

To properly check that all the non-preferred operated VFT-0/4 relays have released the vertical file test check relay FTK-1 will operate when one and only one VFT-0/4 relay is operated and the VFG relay is released.

7.25 Vertical Group, Horizontal Group and Vertical File Selection Preference

If there are calling subscribers waiting for a dial tone connection in more than one vertical group on the line link frame to which the marker is connected the marker will select one vertical group for service and exclude all other vertical groups. In the same manner if there are calling subscribers waiting for a dial tone connection in more than one horizontal group of the selected vertical group the marker will select one horizontal group for service. Also if there are calling subscribers waiting for a dial tone connection in more than one vertical file of the selected line group the marker will select one vertical file for service. When a marker is assisting in any one dial tone connection the preference for this selection of the preferred vertical group, the preferred horizontal group and the preferred vertical file is fixed so that if any conflict occurs between two or more groups or files requiring service one will be preferred. In general, however, over a period of time a particular group is not given a fixed selection preference since this would result in some groups with a high selection preference obtaining the services of a marker to the exclusion of other groups with a low selection preference. Therefore the marker will rotate this selection preference one step for each call or connection handled by this marker giving over a period of time equal service to all subscriber lines in all vertical groups, horizontal groups and vertical files. There is one exception to this rotation of selection preference in that one vertical group is given prior selection preference at all times, except under second trial conditions. In this vertical group will be located police, fire and other emergency subscriber lines.

7.251 Operation of Selection Preference Circuit Upon Initial Application of Power

Before the marker is placed into service all the relays in the preference selection circuit are released thereby requiring a priming operation to operate one selection preference SQ0/9 relay to make ready the marker for the first call or connection.

7.2511 Operation of SQA Relay

Upon the initial application of battery potential when the marker is placed into service, the SQA relay will operate through the released LE, LOD and ONW relay contacts. Under normal operating conditions the LE, LOD and ONW relays will be released only before or upon the initial application of battery potential to the marker circuit.

7.2512 Operation of the SQO Relay

The operation of the SQA relay with the released condition of the LE, LOD and ONW relays will prime the selector preference circuit by operating the preference selection SQO relay. After operating the SQO relay will lock operated with the lock even LE relay released.

7.252 Selection of Odd Numbered Walking Preference

Assuming that before the marker is seized to assist in a connection an even numbered walking preference SQ0/9 relay such as SQO is operated then this even numbered preference relay will be used throughout the subsequent connection by this marker to provide a particular selection preference in the vertical group, the horizontal group and vertical file selection. However, when the marker releases from this connection the next higher numbered preference SQ0/9 relay will be operated and the lower even numbered SQ0/9 relay will be released. The marker will lock operated this higher odd numbered SQ0/9 relay for determining the selection preference on the next connection which the marker will assist.

7.2521 Relays Operated Before Seizure of Marker

Assuming that before the marker is seized an even numbered walking preference SQ0/9 relay is operated and locked operated when the lock even LE relay is released. The operation of an even numbered SQ0/9 relay will operate the lock odd LOD relay. The operation of the even numbered SQ0/9 relay and the LOD relay was performed during the release of the marker from the previous connection.

7.2522 Operation of the ONW and SO Relays

When a marker connects to a line link marker connector in the process of assisting any call or connection the marker circuit ONW relay will be operated as explained in Paragraph 7.15.

The operation of the ONW relay will place ground on the "ON-1" lead and with the lock odd, LOD, relay operated and the sequence even, SE, relay released the sequence odd SO relay will be operated. The SO relay will lock operated with the SE relay released and the LOD relay operated.

7.2523 Operation of Odd-Numbered SQ0/9 Relay

The release of the ONW relay will place ground on the "ON-2" lead and with the SO relay operated will operate the odd numbered SQ0/9 relay which is next higher in number to the even SQ0/9 relay which is operated. The odd numbered operated SQ0/9 relay will lock operated when the LOD relay is released or when the SO relay is operated.

7.2524 Operation of the LE Relay and Release of the Even Numbered SQ0/9 Relay

The operation of an odd numbered SQ0/9 relay will operate the LE relay which in turn will release the operated even numbered SQ0/9 relay by removing its locking path.

7.2525 Release of the LOD and SO Relays

The release of the even numbered SQ0/9 relay will release the lock odd LOD relay. The release of the LOD relay will release the SO relay.

The circuit has now been completely recycled from an even numbered selection preference SQO/9 relay operated to the next higher numbered odd selection preference SQO/9 relay operated. This odd numbered selection preference SQO/9 relay will be held operated to determine the selection preference on the next connection the marker will handle.

7.253 Selection of Even Numbered Walking Preference

Assuming that before the marker is seized to assist in a connection an odd numbered walking preference SQO/9 relay is operated then this odd numbered preference relay will be used throughout the subsequent connection to provide a particular selection preference. However, when the marker releases from this connection the next higher numbered preference SQO/9 relay will be operated and the lower odd numbered SQO/9 relay will be released. The marker will lock operated this higher even numbered SQO/9 relay for determining the selection preference on the next connection which the marker will assist.

7.2531 Relays Operated Before Seizure of Marker

Assuming that before the marker is seized, an odd numbered walking preference SQO/9 relay is operated and locked operated when the lock odd LOD relay is released. The operation of an odd numbered SQO/9 relay will operate the lock even, LE relay. The operation of the odd numbered SQO/9 relay and the LE relay was performed during the release of the marker from the previous connection.

7.2532 Operation of the ONW and SE Relays

When a marker connects to a line link marker connector the ONW relay will be operated as explained in paragraph 7.2522.

The operation of the ONW relay will place ground on the "ON-1" lead and with the lock even LE relay operated and the start odd SO relay released the start even SE relay will be operated. The SE relay will lock operated with the SO relay released and the LE relay operated.

7.2533 Release of the ONW Relay

When the marker releases after assisting a call or connection the ONW relay releases.

7.2534 Operation of the Even Numbered SQO/9 Relay

The release of the ONW relay will place ground on the "ON-2" lead and with the SE relay operated will operate the even numbered SQO/9 relay which is next higher in number to the odd SQO/9 relay which is operated. The even numbered operated SQO/9 relay will lock operated when the LE relay is released or when the SE relay is operated.

The operation of the even numbered operated SQO/9 relay will provide for a different preference of selection on the subsequent connection which the marker will handle.

7.2535 Operation of the LOD Relay and Release of the Odd Numbered SQO/9 Relay

The operation of an even numbered SQO/9 relay will operate the LOD relay which in turn will release the operated odd numbered SQO/9 relay by removing its locking path.

7.2536 Release of the LE and SE Relays

The release of the odd numbered SQO/9 relay will release the lock even LE relay. The release of the LE relay will release the SE relay.

The circuit has now been completely recycled from an odd numbered selection preference SQ0/9 relay operated to the next higher numbered even selection preference SQ0/9 relay operated. This even numbered selection SQ0/9 relay will be held operated to determine the selection preference on the next connection the marker will handle

7.254 Order of Selection Preference for Vertical Group VGT-0/11 Relays

The following table lists the order of preference for the VGT-0/11 relays for each SQ0/9 relay which may be operated. For example, if the SQ0 relay is operated the column under "SQ0" will list the order of preference for the VGT-0/11 relays. In this case, the VGT-2 relay has "1" preference, VGT-0 relays has "2" preference, VGT-7 relay has "3" preference and so on. By reading down any particular "SQ0/9" column the selection preference of each VGT-0/11 relay may be determined. In each case "1" preference is the first preference and "12" preference is the last in preference.

The assumption has been made that the marker circuit is fully equipped to identify the maximum number of vertical groups, that is, twelve vertical groups. Whenever a marker circuit is not equipped to identify the maximum number of vertical groups, the order of selection preference of the VGT-0/11 relays associated with the non-equipped vertical groups should be "jumped".

VGT-0/11	SQ0/9 Relay Operated									
Relay	SQ0	SQ1	SQ2	SQ3	SQ4	SQ5	SQ6	SQ7	SQ8	SQ9
VGT-0	2	11	9	7	6	5	3	12	10	8
VGT-1	4	2	11	9	8	7	5	3	12	10
VGT-2	1	1	1	1	1	1	1	1	1	1
VGT-3	6	4	2	11	10	9	7	5	3	12
VGT-4	8	6	4	2	12	11	9	7	5	3
VGT-5	10	8	6	4	3	2	11	9	7	5
VGT-6	9	7	5	3	2	12	10	8	6	4
VGT-7	3	12	10	8	7	6	4	2	11	9
VGT-8	5	3	12	10	9	8	6	4	2	11
VGT-9	7	5	3	12	11	10	8	6	4	2
VGT-10	12	10	8	6	5	4	2	11	9	7
VGT-11	11	9	7	5	4	3	12	10	8	6

7.255 Order of Selection Preference for Horizontal Group HGT-0/9 Relays

HGT-0/9 Relay	SQ0/9 Relay Operated									
	SQ0	SQ1	SQ2	SQ3	SQ4	SQ5	SQ6	SQ7	SQ8	SQ9
HGT-0	1	10	9	8	7	6	5	4	3	2
HGT-1	2	1	10	9	8	7	6	5	4	3
HGT-2	3	2	1	10	9	8	7	6	5	4
HGT-3	4	3	2	1	10	9	8	7	6	5
HGT-4	5	4	3	2	1	10	9	8	7	6
HGT-5	6	5	4	3	2	1	10	9	8	7
HGT-6	7	6	5	4	3	2	1	10	9	8
HGT-7	8	7	6	5	4	3	2	1	10	9
HGT-8	9	8	7	6	5	4	3	2	1	10
HGT-9	10	9	8	7	6	5	4	3	2	1

7.256 Order of Selection Preference for Vertical File VFT-0/4 Relays

VFT-0/4 Relay	SQ0/9 Relay Operated									
	SQ0	SQ1	SQ2	SQ3	SQ4	SQ5	SQ6	SQ7	SQ8	SQ9
VFT-0	1	5	4	3	2	1	5	4	3	2
VFT-1	2	1	5	4	3	2	1	5	4	3
VFT-2	3	2	1	5	4	3	2	1	5	4
VFT-3	4	3	2	1	5	4	3	2	1	5
VFT-4	5	4	3	2	1	5	4	3	2	1

7.26 Class of Service Identification

To properly charge the calling subscriber for the call it is necessary to determine the identification of the class of service so that subscribers being served under different charging plans may be correctly charged. There will be a maximum of thirty different classes of service in any one office and on any one line link frame. Calling subscriber lines with different classes of service may be grouped on the line link frame in any manner subject to one limitation. This limitation is that all subscriber lines terminating in the same vertical file in the same vertical group must be of the same class of service.

In the marker are located a maximum of thirty class of service identification relays which will determine the class of service of the calling line by examining the vertical group and the vertical file identification of the calling line and the class of service cross-connections on the line link frame. The operation of a class of service identification relay may in turn operate other relays to indicate either to the marker or to the originating register a coin subscriber line, a two party line, a manual line, or a manual coin line.

7.261 Operation of the CS 0/29 Relay

After the marker has identified the vertical group and the vertical file of the selected calling subscriber desiring a dial tone connection the marker will proceed to identify the class of service of the calling subscriber by operating one CS 0/29 relay.

In the marker a maximum of thirty class of service identification CS 0/29 relays will test for the presence of ground on the associated class of service identification leads designated "CS 0/29". With the line link connector MCB relay operated the class of service leads "CS 0/29" will be extended to the line link frame associated with the calling subscriber and will terminate on a group of thirty associated cross-connection terminals designated "CS 0/29".

On each line link frame there will be one group of five cross-connection terminals designated "V 0/4" associated with each vertical group. Each cross-connection terminal "V 0/4" will be associated with a vertical file within the vertical group. Each class of service cross-connection terminal "CS 0/29" will be connected to all vertical file cross-connection terminals "V 0/4" which require the class of service associated with a particular class of service cross-connection terminal "CS 0/29".

The operation of the FTK-1, LLC-1, and DT-1 relays with the MT-11 relay released and with one vertical file identification VFT 0/4 relay operated will place ground on one associated "V 0/4" identification lead of a group of five "V 0/4" identification leads. With the line link and connector MCB relay operated these "V 0/4" identification leads will be extended to the line link frame associated with the calling subscriber line. The one operated line link and connector VGB 0/11 relay associated with the selected vertical group will further extend the group of five "V-0/4" identification leads to the five vertical file cross-connection terminals "V-0/4" associated with the selected vertical group. Therefore a ground will be placed on the vertical file cross-connection terminal "V-0/4" associated with the selected vertical file operating in the marker a class of service CS-0/29 relay associated with the class of service of the calling subscriber.

7.262 Operation of the MCN, MAN, 2P, CN and AO Relays

As an indication to the originating register and to the marker that the calling subscriber line is within a class of service group the MCN, MAN, 2P, CN and AO relays will be operated by cross-connecting the associated cross-connection punching "CS-0/29" to the "MCN", "MAN", "2P", "CN" or "AO" cross-connection punching under the following conditions.

The operation of the GTL-1 relay, described in paragraph 7.2711, with the GTL-4 relay operated will place ground on the "CG-4" lead and the operation of the GTL relay, described in paragraph 7.15, will place ground on the "CG-5" and "CG-6" leads.

The operation of the class of service CS-0/29 relay associated with two party subscriber lines will extend the ground on the "CG-4" lead to operate the 2P relay.

The operation of the class of service CS-0/29 relay associated with manual coin subscriber lines will extend the ground on the "CG-4" lead to operate the MCN relay.

The operation of the class of service CS-0/29 relay associated with manual subscriber lines will extend the ground on the "CG-4" lead to operate the MAN relay or the operation of the MCN relay will extend the ground on the "CG-6" lead to operate the MAN relay.

The operation of the class of service CS-0/29 relay associated with coin subscriber lines will extend the ground on the "CG-4" lead to operate the CN relay or the operation of the MCN relay will extend ground on the "CG-5" lead to operate the CN relay.

As a check relay the AO relay will be operated by any CS-0/29 relay which will not operate the MCN, MAN, 2P or CN relays.

7.27 Forwarding Identification of Calling Line to Originating Register

The identification of the calling line must be sent to the originating register to be stored until its use is necessary in setting up a connection between the calling line and the called line. The identification of the class of service of the calling line must also be sent to the selected originating register to be stored until the connection between calling line and called line is complete after which it will be needed to properly charge the calling subscriber for the call.

After the originating register selected to serve this calling subscriber has been connected to the marker, the marker will ground eleven leads of a group of thirty-three leads to operate eleven recording relays of a group of thirty-three recording relays in the originating register to identify the calling subscriber line and the class of service of the calling line.

The same identification grounds that operate the eleven recording relays in the originating register also operate eleven relays of a group of thirty-three relays in the marker so that the marker mau check the operation of the recording relays in the originating register.

7.271 Forwarding Line Link Frame Identification

By forwarding the line link frame tens digit number and the line link frame units digit number of the calling subscriber line, the line link frame identification will be forwarded to the originating register circuit.

7.2711 Operation of the GTL-1 Relay and GTU Relay

During the period of time in which the marker has been identifying the vertical group, the horizontal group and the vertical file of the selected calling subscriber the marker has selected an idle originating register associated with a trunk link frame to which the marker has access. The selection of a trunk link frame to which the marker has access has operated the trunk link and connector MCD relay connecting the marker to the selected trunk link frame and has operated the MDK relay in the marker circuit. The selection of an idle originating register associated with the selected trunk link frame has operated the originating register F relay, as described in paragraph 7.351, connecting the trunk link and connector circuit to the selected originating register. The operation of the F relay in the originating register circuit will operate the F1 relay in that circuit.

After the vertical group, horizontal group and vertical file of the selected calling subscriber have been identified the FTK-1 relay will operate thereby extending the operating path for the GTL-1 relay through the contacts of the operated MDK and CHA relays and the non-operated DCT-1 relay over the "FK" lead to the trunk link and connector circuit. With the trunk link and connector MCD relay operated the "FK" lead will be further extended to the selected originating register circuit where the operated condition of the register circuit F1 relay has placed ground on the "FK" lead. The operation of the FTK-1 relay will therefore result in the operation of the GTL-1 relay.

The operation of the GTL-1 relay with the OC-1 or OC-2 relay operated will operate the GTU relay.

The operation of the GTL-1 and GTU relays will provide operating paths and grounds for various register relays in the marker circuit and in the originating register circuit.

7.2712 Operation of Originating Register FT-0/3 and FU-0 FU-1, FU-2, FU-4 and FU-7 Relays

The operation of the line link marker connector MA relay, described in paragraph 7.14, and the marker GTL-2 relay, described in paragraph 7.15, have connected ground to one of a group of four leads designated "FT-0/3" and ground to two of a group of five leads designated "FU-0", "FU-1", "FU-2", "FU-4" and "FU-7" from the line link marker connector circuit to the marker circuit for the purpose of line link frame tens digit identification and line link frame units digit identification.

The operation of the GTU relay with the trunk link and connector MCD relay operated will extend the group of four leads designated "FT-0/3" and the group of five leads designated "FU-0", "FU-1", "FU-2", "FU-4" and "FU-7" from the marker circuit to the selected trunk link and connector circuit. With the F1 relay in the selected originating register circuit operated, described in paragraph 7.351, the line link frame identification leads will be extended from the trunk link and connector circuit to the selected originating register circuit.

In the selected originating register will be four relays designated FT-0/3 associated with the "FT-0/3" identification test leads and five relays designated FU-0 FU-1, FU-2, FU-4 and FU-7 associated with the "FU-0", "FU-1", "FU-2", "FU-4" and "FU-7" identification test leads. These relays in the originating register will test for the presence of ground on the associated identification test leads. One lead of the group of four tens digit number identification leads and two leads of the group of five units digit number identification leads will be grounded operating the associated relays in the originating register circuit to record the line link frame number of the calling subscriber. Each line link marker connector will place ground on the line link frame number identification leads according to the code in paragraph 7.211 for the tens digit number and paragraph 7.212 for the units digit number.

The operation of any line link frame number identification relay in the originating register circuit with the register ON and F1 relays operated will ground the associated line link frame number identification lead thereby holding operated the associated relays in both the originating register circuit and the marker circuit.

7.272 Forwarding Subscriber Line Identification

By forwarding the vertical group, the horizontal group and the vertical file of the calling subscriber line the subscriber line identification on the line link frame will be forwarded to the originating register circuit.

7.2721 Operation of the Vertical and Horizontal Group and Vertical File Register Relays in the Marker Circuit

The operation of the GTL-1 relay with one vertical group identification VGT-0/11 relay operated will ground two of a group of six vertical group register leads designated "VG-0", "VG-1", "VG-2", "VG-4", "VG-7" and "VG-10". With the GTL-3 and GTL-4 relays operated the vertical group register leads will be extended to the vertical group register relays in the marker circuit operating two vertical group register relays of a group of six relays designated VG-0, VG-1, VG-2, VG-4, VG-7 and VG-10 according to the following code.

VGT-0/11 Relay Operated	Vertical Group Register Relays Operated
VGT-0	VG-4 and VG-7
VGT-1	VG-0 and VG-1
VGT-2	VG-0 and VG-2
VGT-3	VG-1 and VG-2
VGT-4	VG-0 and VG-4
VGT-5	VG-1 and VG-4
VGT-6	VG-2 and VG-4
VGT-7	VG-0 and VG-7
VGT-8	VG-1 and VG-7
VGT-9	VG-2 and VG-7
VGT-10	VG-0 and VG-10
VGT-11	VG-1 and VG-10

The operation of the GTL-1 relay with one horizontal group identification HGTO/9 relay operated will ground two of a group of five horizontal group register leads designated "HG-0", "HG-1", "HG-2", "HG-4" and "HG-7". With the GTL-3 relay operated the horizontal group register leads will be extended to the horizontal group register relays in the marker circuit operating two horizontal group register relays of a group of five relays designated HG-0, HG-1, HG-2, HG-4 and HG-7 according to the following code.

HGTO/9 Relay Operated	Vertical Group Register Relays Operated
HGT-0	HG-4 and HG-7
HGT-1	HG-0 and HG-1
HGT-2	HG-0 and HG-2
HGT-3	HG-1 and HG-2
HGT-4	HG-0 and HG-4
HGT-5	HG-1 and HG-4
HGT-6	HG-2 and HG-4
HGT-7	HG-0 and HG-7
HGT-8	HG-1 and HG-7
HGT-9	HG-2 and HG-7

The operation of the GTL-1 relay with one vertical file identification VFT-0/4 relay operated will ground one of a group of five vertical file register leads designated "VF-0/4". With the GTL-4 relay operated the vertical file register leads will be extended to the vertical file register relays in the marker circuit operating the one associated vertical file register relay of a group of five relays designated VF-0/4.

7.2722 Operation of the Vertical Group, Horizontal Group and Vertical File Register Relays in the Originating Register Circuit

With the operation of the trunk link and connector MCD relay the group of six vertical group register leads designated "VG-0", "VG-1", "VG-2", "VG-4", "VG-7" and "VG-10", the group of five horizontal group register leads designated "HG-0", "HG-1", "HG-2", "HG-4" and "HG-7" and the group of five vertical file register leads designated "VF-0/4" have been extended from the marker circuit to the selected trunk link and connector circuit. With the selected originating register F1 relay operated these register leads will be further extended to the selected originating register circuit.

In the originating register circuit there are six vertical group register relays designated VG-0, VG-1, VG-2, VG-4, VG-7 and VG-10 testing for the presence of ground on the associated six vertical group register leads, five horizontal group register relays designated HG-0, HG-1, HG-2, HG-4 and HG-7 testing for the presence of ground on the associated five horizontal group register leads and five vertical file register relays designated VF-0/4 testing for the presence of ground on the associated five vertical file register leads.

The operation of the GTL-1 relay with one vertical group identification

VGT-0/11 relay operated and the GTL-3 and GTL-4 relays operated in the marker will ground two of the vertical group register leads in the marker circuit operating in the originating register circuit two vertical group register relays according to the same code as for the marker vertical group register relays in paragraph 7.2721.

The operation of the GTL-1 relay with one horizontal group identification HGT-0/9 relay operated and the GTL-3 relay operated in the marker will ground two of the horizontal group register leads in the marker circuit operating in the originating register circuit two horizontal group register relays according to the same code as for the marker horizontal group register relays in paragraph 7.2721.

The operation of the GTL-1 relay with one vertical file identification VGT-0/4 relay operated and the GTL-4 relay operated in the marker will ground one of the vertical file register leads in the marker circuit operating in the originating register circuit the one associated vertical file register relay.

The operation of any vertical group, horizontal group or vertical file register relays in the originating register circuit with the register ON and F1 relays operated will ground the associated register lead thereby holding operated the associated relays in both the marker circuit and the originating register circuit.

7.273 Forwarding Class of Service Identification

By forwarding the class of service tens digit number and the class of service units digit number of the calling subscriber the class of service identification will be forwarded to the originating register circuit.

7.2731 Operation of the Class of Service Tens Digit and Units Digit Number Register Relays in the Marker

The operation of the GTL-1 relay with the GTL-4 relay operated will place ground on the "CG-1", "CG-2" and "CG-3" leads.

With one class of service CS-0/29 relay operated the ground on the "CG-3" lead will be extended to operate one class of service tens digit number register relay of a group of three relays designated CT-0/2 according to the following code.

CS-0/29 Operated	Class of Service Tens Digit Relay Operated
CS-0/9	CT-0
CS-10/19	CT-1
CS-20/29	CT-2

With one class of service CS-0/29 relay operated the ground on the "CG-1" and "CG-2" leads will be extended to operate two class of service units digit number register relays of a group of five relays designated CU-0, CU-1, CU-2, CU-4 and CU-7 according to the following code.

CS-0/29 Relay Operated	Class of Service Units Digit Relay Operated
CS-0, CS-10 or CS-20	CU-4 and CU-7
CS-1, CS-11 or CS-21	CU-0 and CU-1
CS-2, CS-12 or CS-22	CU-0 and CU-2
CS-3, CS-13 or CS-23	CU-1 and CU-2
CS-4, CS-14 or CS-24	CU-0 and CU-4
CS-5, CS-15 or CS-25	CU-1 and CU-4
CS-6, CS-16 or CS-26	CU-2 and CU-4
CS-7, CS-17 or CS-27	CU-0 and CU-7
CS-8, CS-18 or CS-28	CU-1 and CU-7
CS-9, CS-19 or CS-29	CU-2 and CU-7

7.2732 Operation of the Class of Service Tens Digit and Units Digit Number Register Relays in the Originating Register Circuit

With the operation of the trunk link and connector MCD relay the group of three class of service tens digit register leads designated "CT-0/3" and the group of five class of service units digit register leads designated "CU-0", "CU-1", "CU-2", "CU-4" and "CU-7" have been extended from the marker circuit to the selected trunk link and connector circuit. With the selected originating register F1 relay operated these class of service register leads will be further extended to the selected originating register.

In the originating register circuit there are three class of service tens digit register relays designated CTO/2 testing for the presence of ground on the associated three class of service tens digit register leads and five class of service units digit register relays designated CU-0, CU-1, CU-2, CU-4 and CU-7 testing for the presence of ground on the associated five class of service units digit register leads.

The operation of the GTL-1 relay with one class of service CS-0/29 relay operated and the GTL-4 relay operated in the marker will ground one of the class of service tens digit register leads operating in the originating register circuit one class of service tens digit register relay according to the same code as for the marker class of service tens digit register relay in paragraph 7.2731.

The operation of the GTL-1 relay with one class of service CS-0/29 relay operated and the GTL-4 relay operated in the marker will also ground two of the class of service units digit register leads operating in the originating register circuit two class of service units digit register relays according to the same code as for the marker class of service units digit register relays in paragraph 7.2731.

The operation of any class of service tens digit or units digit register relay in the originating register with the register F1 and ON relays operated will ground the associated class of service tens digit or class of service units digit register lead thereby holding operated the associated relays in both the marker circuit and the originating register circuit.

7.274 Checking the Information Transferred to the Originating Register

To check that the proper register relays in the originating register circuit have operated the marker will remove the operating grounds from the register relays in both the marker circuit and the originating register circuit. As previously stated the operation of any register relay in the originating register circuit will ground the associated register lead thereby holding operated the associated register relays in both the marker circuit and the originating register circuit. After the operating grounds for both the marker circuit and originating register circuit register relay have been removed the operated register relays in both the marker circuit and the originating register circuit will be held operated only by the originating register circuit register relay grounding the associated register leads. If for any reason a register relay in the originating register circuit fails to operate the associated register lead will not be grounded by the operation of this register relay therefore releasing the associated register relay in the marker circuit when the operating grounds for the register relays are removed. The release of an operated register relay in the marker will be an indication to the marker that the associated register relay in the originating register circuit has failed to operate.

7.2741 Operation of the RK-1 and RK-2 Relays

The operation of the RK-1 and RK-2 relays will be a check that all information that is to be forwarded to the originating register circuit register relays has been sent.

The operating path for the RK-1 relay will be extended over the "RK-1" lead and will be extended to the "RK-2" lead with the operation of one of the FT-0/3 relays, two of the FU-0, FU-1, FU-2, FU-4 and FU-7 relays, two of the VG-0, VG-1, VG-2, VG-4, VG-7 and VG-10 relays, two of the HG-0, HG-1, HG-2, HG-4 and HG-7 relays and one of the VF-0/4 relays. The "RK-2" lead will be extended to the "RK-3" lead with the operation of one of the CT-0/2 relays, two of the CU-0, CU-1, CU-2, CU-4 and CU-7 relays and one of the AO, 2P, CN or MAN relays or the MAN, MCN and CN relays all operated. The "RK-3" lead will be extended to the "RK-4" lead and to the RK-2 relay thereby operating the RK-1 and RK-2 relays when two of the LL-0, LL-1, LL-2, LL-4 and LL-7 relays are operated. The LL-0, LL-1, LL-2, LL-4 and LL-7 relays in the marker channel test circuit are operated as described in paragraph 7.461, after the marker has selected an idle connecting path or channel between the calling subscriber line and the selected originating register. The operation of two LL-0, LL-1, LL-2, LL-4 and LL-7 relays will check that information as to the selected line link which the originating register requires has been sent to the originating register.

7.2742 Operation of the RK-3 Relay

Before removing the grounds operating the register relays in both the marker circuit and the originating register circuit the marker must check that all of the necessary information has been transmitted to the originating register and must also check that the originating register circuit register relays may operate and after operating will lock operated in response to the transmitted information. Therefore to operate the RK-3 relay, which will check that all of the information and conditions are as required, the originating register ON and F1 relays, the trunk link and trunk link connector LV and MC relays and the marker RK-1 and RK-2 relay must all be operated.

The operating path of the RK-3 relay will be extended from the RK-3 relay through the operated RK-1 and RK-2 relay contacts, and over the "RC" lead when the OC relay is operated to the selected trunk link and connector circuit. The operated condition of the trunk link and connector MC and LV relays will further extend the operating path of the RK-3 relay to the selected originating register circuit where the operated condition of the originating register F1 and ON relays will place ground on the "RC" lead thereby operating the RK-3 relay in the marker circuit.

The RK-3 relay will lock operated when the RYC relay is operated.

7.2743 Release of the GTL, GTL-2, GTL-3 and GTL-4 Relays

The operation of the RK-3 relay will release the GTL relay which in turn will release the GTL-2, GTL-3 and GTL-4 relays.

The release of the GTL-2, GTL-3 and GTL-4 relays will remove all the operating grounds in the marker circuit operating both the register relays in the marker circuit and the originating register circuit. However, all the operated register relays in both the marker circuit and the originating register circuit will be held operated if the associated originating register circuit register relays have operated correctly to provide the holding grounds. The release at this time of any operated register relay in the marker circuit will be an indication to the marker that the associated register relay in the originating register has failed to operate.

7.3 Originating Register Selection

To select an originating register which will later be connected to the calling line the marker must perform five functions or operations as follows:

a. The identification of the type of originating register required by the calling line.

b. Test and selection of an idle trunk link frame connecting to one or more idle originating registers of the required type. An idle trunk link frame being one to which any marker may gain immediate access.

c. Connection to selected trunk link frame.

d. Test and selection of an idle originating register of the required type connecting to the selected idle trunk link frame.

e. Connection to selected idle originating register.

The originating register selection will be inititated when the marker is seized by the line link marker connector if all subscriber lines associated with the line link frame require the services of a dial pulsing originating register or if all subscriber lines require the services of a multi-frequency originating register. However, if some of the subscriber lines associated with the line link frame require the services of a dial pulsing originating register and others require the services of a multi-frequency originating register the originating register selection must be delayed until after the vertical group selection of the calling line identification has been completed so that identification of the type of originating register required may be determined.

7.31 Identification of the Type of Originating Register Required

In some offices there may be more than one type of originating register required by the subscribers. Those subscribers which may be equipped with a dial pulsing subscriber instrument require the services of a dial pulsing originating register while those subscribers equipped with a multi-frequency pulsing subscriber instrument require the services of a multi-frequency pulsing originating register. Therefore, before an originating register may be selected to serve a calling subscriber requiring a dial tone connection the type of originating register required by the calling subscriber must be determined.

When the marker is connected to the line link marker connector the marker connector will ground a particular lead of a group of three leads to inform the marker that one of the three following conditions exists.

a. All subscribers associated with the line link frame require the services of a dial pulsing originating register.

b. All subscribers associated with the line link frame require the services of a multi-frequency pulsing originating register.

c. Some subscribers associated with the line link frame require the services of a multi-frequency pulsing originating register and other subscribers require the services of a dial pulsing originating register. Therefore when the marker receives this indication the marker must test for the additional information required to identify the type of originating register required by the calling subscriber.

On all line link frames having subscriber lines requiring more than one type of originating register all subscriber lines requiring dial pulsing originating registers will be grouped within certain specified vertical groups on the line link frame while those subscriber lines requiring multi-frequency pulsing originating registers will be grouped within other specified vertical groups on the line link frame. Therefore, when the marker is informed that the calling subscriber line on the line link frame with which the marker is associated may require the services of either a multi-frequency or a dial pulsing originating register the marker will examine the vertical group identification of the calling line and then identify the type of originating register required for this dial tone connection.

7.311 Operation of the D, MF or MLF Relay by the Line Link Marker Connector Circuit

Each line link marker connector has one marker start MS relay associated with each marker circuit. When a marker is seized by the operation of the associated marker start MS relay in the line link marker connector this MS relay will extend the ground on the "MCK" lead from the marker circuit to ground one lead designated "MC-00/39" connecting to the seized marker circuit. There will be one "MC-00/39" lead associated with each line link frame for each marker. This "MC-00/39" lead will be connected to one of three cross-connection terminals in the associated marker circuit designated "LFD", "LFMF", and "LFM" by cross-connection of the "LF-00/39" terminals associated with an "MC-00/39" lead to the "LFD", "LFMF" and "LFM" terminal. If all subscriber lines associated with a line link frame and line link marker connector require the services of a dial pulsing originating register the "MC-00/39" lead associated with this line link frame and line link marker connector will be oonnected to the "LFD" terminal in the marker or if all subscriber lines require the services of a multi-frequency pulsing originating register the "MC-00/39" lead will be connected to the "LFMF" terminal. However if some subscriber lines associated with a line link frame require the services of a dial pulsing originating register and other subscriber lines associated with the same line link frame require the services of a multi-frequency pulsing originating register the "MC-00/39" lead will be connected to the "LFM" terminal.

In the marker are three relays designated D, MF and MLF and connecting to the associated cross-connection terminals "LFD", "LFMF" and "LFM". The grounding of one cross-connection terminal will operate one of the associated marker D, MF or MLF relays.

The operation of the D relay will activate the originating register selection circuit in the marker to select an idle dial pulsing originating register. The operation of the MF relay will activate the originating register selection circuit to select an idle multi-frequency pulsing originating register. The operation of the MLF relay will be an indication to the marker to examine the vertical group selection circuit in the marker to determine the type of register required by the calling subscriber line.

7.312 Operation of the D or MF Relay by the Vertical Group Selection Relay

In the vertical group selection circuit of the marker there is one cross-connection terminal designated "VGR-0/11" associated with each vertical group VGT-0/11 relay. Also in the vertical group selection circuit there are two cross-connection terminals designated "VGD" and "VGMF". A cross-connection terminal "VGR-0/11" associated with a vertical group will be connected to the "VGD" terminal if the subscriber lines associated with this vertical group on the line link frames requiring the services of more than one type of originating register require the services of a dial pulsing originating register. If the subscriber lines within this vertical group require the services of a multi-frequency pulsing originating register the associated "VGR-0/11" cross-connection terminal will be connected to the "VGMF" terminal. The operation of the VTK-1 and one VGT-0/11 relay in the marker vertical group selection circuit will ground the "VGR-0/11" terminal associated with the operated VGT-0/11 relay. The ground on the "VGR-0/11" terminal will ground either the "VGD" or "VGMF" terminal depending upon the cross-connections between the grounded "VGR-0/11" terminal and the "VGD" or "VGMF" terminal. The ground on either the "VGD" or "VGMF" terminal will be extended by lead "D" or "MF" to operate either the D or the MF relay in the marker control circuit when the MLF relay is operated.

The operation of the D relay will activate the originating register selection circuit to select a dial pulsing originating register while the operation of the MF relay will activate the originating register selection circuit to select a multi-frequency pulsing originating register.

7.32 Test and Selection of an Idle Trunk Link Frame Associated with an Idle Originating Register

The marker in connecting a calling subscriber to the selected originating register must have access to the trunk link frame associated with the selected originating register. Only one marker will have access to a part cular trunk link frame at the same time. Therefore in order to prevent subscriber dial tone connection delays and marker delays it is important to select an originating register associated with a trunk link frame which is idle with respect to marker access.

After the marker has determined that a dial pulsing originating register or a multi-frequency pulsing originating register is required the marker will connect two leads from each trunk link and connector circuit to the marker circuit. One lead from each trunk link frame which is designated the trunk link frame busy test lead, will be grounded by the trunk link and connector circuit whenever this trunk link frame is not immediately accessible, that is, busy to the marker. The other lead from each trunk link frame, which is designated the trunk frame test lead, will be grounded by the presence of any idle originating register of the proper type associated with the trunk link frame. The marker will test simultaneously the trunk link frame busy test leads and the trunk link test leads from all trunk link frames to determine which trunk link frames are both accessible to the marker and are associated with idle originating registers of the proper type. The trunk link frame selection preferences of the marker will select to service this dial tone connection with the preferred trunk link frame which is associated with idle originating registers and is accessible to the marker.

7.321 Operation of the BC and BCA Relays

The operation of the D or the MF relay in the marker control circuit with the FML relay non-operated will operate the busy connector BC and BCA relays. The BC and BCA relays will hold operated when the FMI relay is non-operated and the TLC-2 relay is operated.

The BC and BCA relays in operating will extend from the marker circuit one trunk link frame busy test lead designated either "FBE" or "FBO" to each trunk link frame. Test leads designated "FBE" will connect to even numbered markers while test leads designated "FBO" will connect to odd numbered markers.

If the number of trunk link frames is ten or less the BCA relay is not required to be equipped and therefore will not enter into the circuit operation.

7.322 Operation of the FB- Relays

One trunk link frame busy test lead designated either "FBE" or "FBO" has been extended by the operation of the busy connector BC and BCA relays from the marker circuit to each trunk link frame. To indicate that a trunk link frame is busy and not accessible at this time to this marker the associated trunk link frame busy test lead "FBE" or "FBO" has been grounded by the operation of the trunk link and connector MCA relay when the trunk link and connector circuit was connected to any other marker circuit.

In the marker will be a group of trunk link frame busy test relays designated FB-, each FB- relay being associated with one trunk link frame busy test lead "FBO" or "FBE". Ground on any trunk link frame busy test lead "FBO" or "FBE" will operate the associated trunk link frame busy test relay FB-.

7.323 Operation of the Route R- Relay

The operation of the D relay in the marker circuit will operate a route R- relay associated with dial pulsing originating registers while the operation of the MF relay will operate a route R- relay associated with multi-frequency pulsing originating registers.

The route R- relays associated with originating registers will have battery supplied to their windings by connecting the "R" cross-connection punching to the "RB" cross-connection punching. The "RC" cross-connection punching will be connected to the "D" cross-connection punching when the route R- relay is associated with dial pulsing originating registers or to the "MF" cross-connection punching when the route R- relay is associated with multi-frequency pulsing originating registers. The operation of the D relay with the DIS-1 relay non-operated will place ground on the "D" cross-connection punching thereby operating the route R- relay associated with dial pulsing originating registers. The operation of the MF relay with the DIS-1 relay non-operated will place ground on the "MF" cross-connection punching thereby operating the route R- relay associated with multi-frequency pulsing originating registers.

7.324 Operation of the FC-, FCA-, FCK and FCKA Relays

The operation of the D or MF relay with the RCY and DISA relays non-operated will ground the "FC-" lead and operate the frame cut-in FC- and FCA- relays associated with the D or MF relay.

The FC- and FCA- relays in operating will extend from the marker circuit one trunk link frame test lead designated "FTC-" to each trunk link and connector circuit for the purpose of testing for idle originating registers associated with the trunk link frame. The operation of the FC- and FCA- relays which are associated with the dial pulsing originating registers will extend the "FTC-" test leads which are associated with the dial pulsing originating registers. The operation of the FC- and FCA- relays which are associated with the multi-frequency pulsing originating registers will extend the "FTC-" test leads which are associated with the multi-frequency pulsing originating registers.

To check that the FC- relay has operated the frame cut-in check FCK relay will be operated when the FC- relay has operated and to check that the FCA- relay has operated the frame cut-in check FCKA relay will be operated when the FCA- relay has operated.

If the number of trunk link frames is ten or less the FCA- relays are not required to be equipped and therefore will not enter into the circuit operation. Whenever the FCA- relays are not provided the FCKA relay is not equipped.

7.325 Operation of the FTC- Relays, FTCK and FTCK-1 Relays

In the marker circuit will be a group of trunk link frame test relays designated FTC-, each FTC- relay being associated with one trunk link and connector circuit. The operating path for the FTC- relays will be extended to a group of trunk link frame test leads designated "FTC-" associated with the dial pulsing originating registers when the FC- and FCA- relays associated with the dial pulsing originating register are operated. When the FC- and FCA- relays associated with the multi-frequency pulsing originating registers are operated the operating path for the FTC- relays will be extended to the group of "FTC-" test leads associated with the multi-frequency pulsing originating registers.

Within the group of "FTC-" test leads associated with the dial pulsing originating registers there will be one "FTC-" test lead associated with each trunk link frame and connecting to the "FTC" cross-connection terminal in the trunk link and connector circuit associated with the dial pulsing originating registers.

For the group of "FTC-" test leads associated with the multi-frequency originating registers there will be one "FTC-" test lead associated with each trunk link frame and connecting to the "FTC" cross-connection terminal associated with the multi-frequency pulsing originating registers.

Within each trunk link and connector circuit the "FTC" cross-connection terminal associated with the dial pulsing originating registers will be connected to all "FT" cross-connection terminals associated with the dial pulsing originating registers which are associated with this trunk link frame. The "FTC" cross-connection terminal associated with the multi-frequency pulsing originating registers will be connected to all "FT" cross-connection terminals associated with the multi-frequency pulsing originating registers. By means of this cross-connecting of the "FTC" and the "FT" cross-connection terminals the operating path of the FTC- relay associated with a trunk link and connector circuit will be further extended to all dial pulsing originating registers or to all multi-frequency originating registers. The grounding of an "FT" test lead and therefore of an "FTC-" test lead which is connected by the operation of the associated FC- and FCA- relays in the marker to an FTC relay in the marker circuit will operate the associated FTC- relay. Any originating register associated with a trunk link frame will place ground on its associated "FT" test lead as an indication that this originating register is idle and available for service. If more than one trunk link frame has an idle and available originating register of the required type more than one FTC- test relay will also be operated.

To check the operation of at least one FTC- relay the FTCK-1 relay will be operated when one or more FTC- relays are operated and with the MT-1 relay released the FTCK relay will be operated.

7.326 Operation of the FS- Relay

To select a trunk link frame it is necessary to examine all FTC- test relays to determine which trunk link frames are associated with an idle originating register of the required type and it is also necessary to examine the trunk link frame busy FB- relays to determine by the non-operated condition of the FB- relays the trunk link frames which are accessible to the marker at this time. After identifying all available trunk link frames associated with an idle originating register one of these trunk link frames will be selected for service by the operation of the trunk link frame selection FS- relay associated with the selected trunk link frame.

The selection of the trunk link frame and the operation of the associated trunk link frame selection FS- relay is as follows. The "FSG" lead has been grounded by the operation of the FCK and the FCKA relays with the MT-9 and TFK-1 relays released and the FMG relay operated. The ground on the "FSG" lead has been extended to the contacts of the FTC- and FB- relays by the operated condition of one of the frame memory FM- relays. During the previous connection handled by this marker the frame memory FM- relay associated with the trunk link frame selected for service during this previous marker connection has been operated and locked operated for use on the next marker connection. The operated FM- relay will provide the preference of selection of the FS- relays and therefore of the trunk link frame to be selected for this marker connection. The detailed description of the operation of the FM- relay will be found in Paragraph 7.36. With the FM- relay operated the ground on the "FSG" lead will be extended through the contacts of an operated FTC- relay and the contacts of the associated released FB- relay to operate the associated FS- relay. If the FTC relay associated with a prior preferred trunk link and connector circuit is released or if the FB- relay associated with a prior preferred trunk link and connector circuit is operated the operating ground for the FS- relay will be advanced to the contacts of the FTC relay associated with the next preferred trunk link and connector circuit.

After operating, the selected FS- relay will be locked operated by the ground on the "FSL" lead with the TFK1, FCK and FCKA relays operated and the MT-9 relay released.

7.33 Connection to Selected Trunk Link Frame

After the marker has selected the trunk link frame by operating the trunk link frame selection FS- relay associated with the selected trunk link frame the marker will then operate relays in the selected trunk link frame so as to secure access.

7.331 Operation of the Trunk Link and Connector MP Relay and the Marker TFK-1, TFK-2, and TFK-3 Relays

In each trunk link and connector circuit there is one marker preference MP relay associated with each marker circuit to which the trunk link frame has access. In order to secure access to a trunk link frame a marker will operate in the selected trunk link and connector circuit the MP relay associated with this marker. To indicate that the marker has seized the selected trunk link frame the trunk link frame check TFK-1, TFK-2, and TFK-3 Relays in the marker circuit will be operated.

Each trunk link and connector circuit MP relay winding will be extended when the T relay is non-operated from the trunk link and connector circuit over the associated "ST" lead to the marker circuit with which the MP relay is associated. The operation of the trunk link frame FS- relay in the marker circuit will further extend the one "ST" lead associated with the selected trunk link and connector circuit to the "TFS" lead. With the FTCK, TSE-2, TSE-3, NSO and TLC-1 relays operated and the SP relay non-operated the "TFS" lead will be extended to battery potential thereby operating in the selected trunk link and connector circuit the MP relay associated with the marker which is assisting in this dial tone connection.

After the operation of the trunk link frame check TFK-1 relay in the marker circuit battery potential will be placed on the "TFS" lead when the TLC-1 relay is operated and the SP relay is non-operated.

To indicate that this marker has seized the selected trunk link frame the TFK-1, TFK-2, and TFK-3 relays in the marker circuit will check that the selected trunk link and connector circuit MP relay associated with this marker is operated and all other prior preferred MP relays within the same trunk link and connector circuit are non-operated. The operation of the trunk link and connector MP relay will ground the "CK" lead if no MP relay of prior preference in the same trunk link and connector circuit is operated. The grounded "CK" lead will be extended to the marker associated with the operated MP relay and to the marker TFK-1, 2, 3 relays when the marker TER-1 and PCL-3 relays are released. The grounding of the "CK" lead will therefore operate the marker circuit TFK-1, 2, 3 relays as an indication that the selected trunk frame has been seized.

7.332 Operation of the Trunk Link and Connector MC, MCA, MCB, MCC and MCD Relays

The operation of the trunk link and connector MP relay with the associated T relay released will operate the trunk link and connector MC relay associated with the selected trunk link frame and the marker circuit assisting this dial tone connection.

The operation of the trunk link and connector MC relay will extend the associated trunk link and connector circuit MCA, MCB, MCC and MCD relay windings over the "BS-0/4" leads to the marker circuit. Since the marker circuit TLC-1 relay will be in the operated condition battery potential has been placed on the "BS-0/4" leads in the marker circuit thereby operating the trunk link and connector MCA, MCB, MCC and MCD relays.

The operation of the trunk link and connector MC, MCA, MCB, MCC and MCD relays will extend a large group of leads from the trunk link and connector circuit to the marker circuit.

7.333 Operation of the MAK-1 and MDK Relays

The operation of the trunk link and connector MCA relay will ground the "MAK" lead which is extended to the marker circuit to operate the MAK-1 relay as a check that the MCA relay has operated.

The operation of the trunk link and connector MCD relay will ground the "MDK" lead which is extended to the marker circuit to operate the MDK relay as a check that the MCD relay has operated.

7.34 Test and Selection of an Idle Originating Register

When the marker is connected to the selected trunk link and connector circuit a group of twenty busy test leads are extended from the marker circuit to the selected trunk link and connector circuit. The selected trunk link and connector circuit will be controlled by the marker to further extend one of these busy test leads to each originating register of the required type associated with the selected trunk link frame. As an indication to the marker of its availability each originating register of the required type will ground the associated busy test lead if the originating register is in an idle condition and available for service. The marker will test the group of twenty busy test leads, determine which originating registers are available and then select one originating register to provide the dial tone service on this dial tone connection.

The same circuit within the marker which will test for an idle originating register will during some other marker usage also test for idle trunk circuits. The marker circuit while assisting this dial tone connection, however, has means of testing for an idle originating register among only those originating registers of the required type, either dial pulsing originating registers or multi-frequency pulsing originating registers.

7.341 Operation of the TSE-1, TSE-2 and TSE-3 Relays

The operation of the TLC-2 relay will operate the TSE-1, TSE-2 and TSE-3 relays when the TS-0/19, MT-1, PCL-1 and TER-1 relays are released.

The operation of the TSE-1, TSE-2 and the TSE-3 relays will provide off-normal grounds to the marker circuit for the testing and selection of an idle originating register.

7.342 Operation of the Marker Circuit TB-0/5 Relay

Before the marker circuit can test for either idle dial pulsing originating registers or for idle multi-frequency pulsing originating registers the marker must determine the location of all of the originating registers of the required type. The marker must then connect a group of busy test leads from the originating registers of the required type to the marker circuit to test for idle and available originating registers.

In each trunk link frame there are 160 terminations to which originating registers, of every type, or any one of a large variety of trunk circuits may be connected. All of the register and trunk circuits which may be selected by the marker to assist any call or connection and which are associated with one trunk link frame will be divided into trunk block groups containing a maximum of twenty register or trunk circuits. Certain registers, such as incoming register circuits, and certain trunk circuits, such as incoming trunk circuits will not be included within any trunk block group since the marker will not be required to test for an idle register or trunk circuit of this type. There will be a maximum of six of these trunk block groups associated with any one trunk link frame.

Within any one trunk link frame all dial pulsing originating register circuits will be grouped within one trunk block group and all multi-frequency pulsing originating register circuits will be grouped within one trunk block group. However, the trunk block group within which the dial pulsing originating register circuits are located may also contain the multi-frequency pulsing originating register circuits or various trunk circuits. The identification of the trunk block group will identify within which group of twenty register and trunk circuits all of the originating registers of the required type are located.

Identification of the trunk block group will be made within the marker circuit by operating one of a group of trunk block relays designated TB-0/5. The relay winding of the TB-0/5 relay associated with the trunk block group within which the dial pulsing originating registers are located will be extended by connecting the "TBC-0/5" cross-connection terminal associated with this TB-0/5 relay to the "TB" cross-connection terminal associated with the route relay R- which is associated with the dial pulsing originating registers. The relay winding of the TB-0/5 relay associated with the trunk block group within which the multi-frequency pulsing originating registers are located will be extended by connecting the "TBC-0/5" cross-connection terminal associated with this TB-0/5 relay to the "TB" cross-connection terminal associated with the route relay R- which is associated with the multi-frequency pulsing originating registers. The operation of the route relay R- with the RCY and GSI-5 relays non-operated will place ground on the "TB" cross-connection terminal associated with this route relay R- and operate the TB-0/5 relay associated with the trunk block group within which the originating registers are located.

7.343 Operation of the TB-0/5 Relay in the Trunk Link and Connector Circuit and the TBK Relay in the Marker

The operation of a trunk block TB-0/5 relay in the marker circuit will operate an associated trunk block TB-0/5 relay in the selected trunk link and connector circuit by placing battery potential on the "TB-0/5" lead which is extended from the marker circuit to the associated TB-0/5 relay in the selected trunk link and connector circuit when the MC relay in the trunk link and connector circuit is operated.

The operation of the trunk link and connector MCA relay has extended a group of twenty busy test leads designated "BT-0/19" from the marker circuit to the selected trunk link and connector circuit. The operation of a twenty block TB-0/5 relay in the trunk link and connector circuit will further extend these busy test "BT-0/19" leads to the register and trunk circuits located within the trunk block group associated with the operated trunk block TB-0/5 relay. Each busy test "BT-0/19" lead will be extended to one register or trunk circuit within the selected trunk block group to test for idle dial pulsing originating registers or to test for idle multi-frequency pulsing originating registers after the test group TG-0/19 relay has operated.

As an indication that the TB-0/5 relay in the trunk link and connector circuit has operated and the busy test "BT-0/19" leads have been extended to the register and trunk circuits the TBK check relay in the marker circuit will be operated when the marker FTCK-1 relay is operated and the TBTB relay is non-operated and when the "TBK" lead from the trunk link frame is grounded by the operation of the TB-0/5 relay and the MCA relay in the trunk link and connector circuit.

7.344 Operation of the TG-0/19 Relay

The identification of the trunk block group and the operation of the trunk block TB-0/5 relay in the trunk link and connector circuit has extended busy test "BT-0/19" leads to all register or trunk circuits within the associated trunk block group. However, testing for an idle and available register circuit must be confined to dial pulsing originating registers if a dial pulsing originating register is desired or must be confined to multi-frequency pulsing originating registers if a multi-frequency pulsing originating register is desired. Therefore the register and trunk circuits within every trunk block group will be further subdivided into trunk groups. Each trunk group within a trunk block group will contain only originating register circuits which are identical such as dial pulsing originating registers or such as multi-frequency pulsing originating registers or each trunk group within a trunk block group will contain trunk circuits which are identical. All of the dial pulsing originating registers or all of the multi-frequency pulsing originating registers may be identified by specifying in addition to the trunk block group the associated trunk group

The indication that a register or trunk circuit is idle and available will be the presence of ground on the associated busy test "BT-0/19" lead in the register or trunk circuit. The marker circuit by supplying this busy test ground to only those registers within the selected test group will exclude an idle indication from all other register and trunk circuits within the same trunk block group.

Identification of the trunk group will be made within the marker circuit by operating one of a group of trunk test group relays designated TG-0/19. The relay winding of the TG-0/19 relay associated with the trunk group within which the originating registers are located will be extended by connecting the "TGC-0/19" cross-connection terminal associated with this TG-0/19 relay to the "TG" cross-connection terminal associated with the route relay R- which is associated with the originating registers. The operation of the route relay R- associated with the originating registers with the RCY relay non-operated will place ground on the "TG" cross-connection terminal associated with this route relay R- and operate the TG-0/19 relay associated with the trunk group within which the originating registers are located.

7.345 Operation of the TT-0/19 Relays

The operation of one trunk group TG-0/19 relay will select the trunk group to be tested by placing ground on the associated "TG-0/19" lead of a group of twenty trunk group leads when the MAK-1, TBK and CKG-4 relays are operated and the DCT-1 relay is non-operated. With the trunk link and connector MCA relay operated the group of trunk group "TG-0/19" leads are extended from the marker to the selected trunk link and connector circuit and to the associated cross-connection terminal "TG-0/19" in the selected trunk link and connector circuit. Each "TG-0/19" cross-connection terminal is connected to all "F" cross-connection terminals associated with register and trunk circuits located within the associated trunk group number. Generally, a trunk group number may be assigned to one trunk group of register or trunk circuits within each of the trunk block groups. Register and trunk circuits assigned the same trunk group number within different trunk block groups need not be identical register or trunk circuits. The ground on the "TG-0/19" lead which has been extended to the associated "TG-0/19" cross-connection terminal in the trunk link and connector circuit will be further extended to the associated "F" cross-connection terminal and to all register or trunk circuits associated with the same trunk group number as the operated trunk group TG-0/19 relay. If a dial pulsing originating register is desired, the trunk group TG-0/19 relay in the marker associated with the trunk group number of the dial pulsing originating register circuits will be operated placing ground on the "F" lead in all dial pulsing originating register circuits. If a multi-frequency pulsing originating register is desired the trunk group TG-0/19 relay in the marker associated with the trunk group number of the multi-frequency pulsing originating register circuits will be operated placing ground on the "F" lead in all multi-frequency pulsing originating register circuits. Within each dial pulsing or multi-frequency pulsing originating register circuit the idle condition of the originating register will extend ground from the "F" lead through the F relay winding to the associated busy test "BT" lead. The presence of this resistance ground on the busy test "BT" lead signifies that this register circuit is idle and available for service.

In the marker circuit are a group of test relays designated TT-0/19 testing for the presence of ground on the busy test "BT-0/19" leads in the marker circuit when the TSE-2 and TSE-3 relays are operated. With the operation of the trunk link and connector MCA relay the "BT-0/19" leads have been extended from the marker to the selected trunk link and connector circuit and with the operation of the trunk link and connector TB-0/5 relay the busy test "BT-0/19" leads have been extended to the trunk block group of register and trunk circuits within which the desired originating registers are located. The presence of resistance ground on any busy test "BT" lead associated with the selected trunk block group will be extended over the associated "BT-0/19" lead to operate the associated test TT-0/19 relay as an indication to the marker that the associated originating register circuit is idle and available for service. The F relay in the originating register circuit will not operate due to the high resistance of the TT-0/19 relay. All test TT-0/19 relays associated with idle originating register circuits will be operated.

7.346 Operation of the TS-0/19 Relay

The operation of one TS-0/19 relay will select for service one of the originating register circuits which are idle and available.

The operation of the TSE-1 and TLC-2 relays with the TER-1 and PCL-1 relays released has grounded the "TE" lead and with the preference selection SQTO relay either operated or non-operated and one preference selection SQ-0/9 relay operated one of the preference selection "TE-0/19" leads will be grounded. The ground on the "TE-0/19" lead will be extended through the contacts of the prior preferred operated TT-0/19 relay to operate the test selection TS-0/19 relay associated with the prior preferred operated TT-0/19 relay. The TS-0/19 relay will lock operated when all lower numbered TS-0/19 relays are released, the TLC-2 relay operated and the TER-1 and PCL-1 relays released.

The selection preference of any TS-0/19 relay will vary with each connection set up by the marker and will be determined by the "TE-0/19" lead that is grounded by the operation of one preference selection SQ-0/9 relay and the operation or non-operation of the preference selection SQTO relay at this particular time. The detailed operation of this preference circuit will be found in paragraph 7.37.

The operation of a test selection TS-0/19 relay will select for service the originating register associated with this operated TS-0/19 relay and associated with the selected twenty block group.

7.347 Release of the TSE-1, TSE-2, TSE-3 and TT-0/19 Relays

The operation of any TS-0/19 relay will release the TSE-1, TSE-2 and TSE-3 relays. The release of the TSE-2 and TSE-3 relays will remove the operating battery potential from all TT-0/19 relays thereby preventing any non-operated and prior preferred TT-0/19 relay from operating to reselect a new originating register circuit after an originating register has been selected for service.

The release of the TSE-2 and TSE-3 relays will release all operated TT-0/19 relays.

7.35 Connection to Selected Originating Register Circuit

After the marker has selected the originating register circuit by operating the test selection TS-0/19 relay associated with the selected originating register circuit and has checked the operation of the TS-0/19 relay by the release of the TSE-1, TSE-2 and TSE-3 relays the marker will then operate the F relay in the selected originating register circuit so as to secure access to the selected originating register circuit.

7.351 Operation of the Originating Register F Relay

As previously explained the operation of one TG-0/19 relay with the MAK-, TBK and CKG-4 relays operated, the DCT-1 relay released and with the trunk link and connector circuit MCA relay operated will place ground on the "F" lead in all originating register circuits of the selected type. Within each originating register circuit the idle condition of the register circuit extends ground over the "F" lead to one side of the F relay winding in the originating register circuit.

Also as previously explained each busy test lead "BT-0/19" in the marker circuit has been extended with the trunk link and connector circuit MCA relay and one trunk link and connector circuit TB-0/5 relay operated to the other side of the F relay winding in originating register.

The release of the TSE-1 relay with one TS-0/19 relay operated will extend battery potential through 90 ohms resistance to the "BT-0/19" lead associated with the operated TS-0/19 relay thereby operating the F relay in the originating register selected to service this dial tone connection.

7.352 Operation of the FA-, LV-2/9 and LC-0/9 Relays in the Trunk Link and Connector Circuit

After the originating register has been selected and seized it is necessary for the performance of the dial tone connection functions to connect a large group of leads from the selected originating register circuit either to the trunk link and connector circuit or through the trunk link and connector circuit to the marker circuit and to connect a large group of leads in the trunk link and connector circuit associated with the selected originating register to the marker circuit. The operation of an FA- relay and an associated LV-2/9 relay will connect a group of leads from the originating register circuit through the trunk link and connector circuit to the marker circuit. The operation of an LC-0/9 relay will connect a group of leads in the trunk link and connector circuit associated with the selected originating register circuit to the marker circuit.

In each trunk link and connector circuit there is one FA- relay associated with each originating register circuit which is associated with the trunk link frame. All originating register circuits are associated with the "A" trunk appearance on the trunk link frame trunk switch and therefore with an FA- relay. Also, there are FA- and FB- relays associated with the various trunk circuits associated with the trunk link and connector circuit which will be required on other connections but not on a dial tone connection. The operation of the F relay in the selected originating register circuit will place ground on the "FA" lead associated with the selected originating register. The ground on the "FA" lead will be extended to the trunk link and connector circuit associated with the selected originating register operating the FA- relay associated with the selected originating register circuit.

In each trunk link and connector circuit there are eight LV-2/9 relays. Each LV-2/9 relay is associated with one of the ten horizontal levels, except horizontal levels 0 and 1, on all ten trunk switches of the trunk link frame. Any LV-2/9 relay is associated with the same horizontal level on each of the ten trunk switches on the trunk link frame. An LV-2/9 relay is not associated with either horizontal level 0 or 1 of the trunk switches since these horizontal levels are required for switching purposes only and are not associated with register or trunk circuits. The operation of the FA- relay will operate the LV-2/9 relay associated with the horizontal level of the trunk switch which is associated with the selected originating register circuit.

Associated with each trunk switch on the trunk link frame is one LC-0/9 relay. The released condition of the LK-1, and TX relays in the marker circuit will place battery potential on the "ALC" lead which will be extended to the trunk link and connector circuit with the trunk link and connector MCB relay in the operated condition. The operation of an LV-2/9 relay with an associated FA- relay operated will extend the battery potential on the "ALC" lead to operate an LC-0/9 relay. The particular LC-0/9 relay which will be operated will be associated with the trunk switch on the trunk link frame which is associated with the selected originating register.

7.353 Operation of the FAK and LCK Relays

To indicate and to check that an FA- and an associated LC-0/9 relay has operated in the selected trunk link and connector circuit, the marker circuit FAK and the LCK relays will be operated. The operation of an LV-2/9 relay, an associated FA- relay and the MCB relay in the trunk link and connector circuit will place ground on the FAK lead which is extended to the marker circuit. The released condition of the ITR-2 relay in the marker will further extend the ground on the "FAK" lead to operate the FAK relay.

The operation of an LC-0/9 relay with the MCB relay in the trunk link and connector circuit in the operated condition will place ground on the "LCK" lead which will be extended to the marker circuit to operate the marker LCK relay.

7.354 Operation of the Originating Register S1 Relay

The originating register S1 relay will be operated when the trunk link and connector LV-2/9 relay is operated, when the trunk link and connector MCB relay is operated and when ground potential is placed on the "S1" lead by the non-operated condition of the marker TOG-2 relay.

7.36 Trunk Link Frame Selection Preference

If there is more than one trunk link frame accessible and associated with idle originating registers of the required type the marker will select the preferred trunk link frame to assist in this dial tone connection. Over a period of time a particular trunk link frame must not be given a fixed selection preference since this would result in an uneven distribution of load between the trunk link frames. Therefore the selection preference will, in general, be rotated for every call or connection, except for incoming calls, handled by the marker. This selection preference rotation will not be of the usual stepping sequence type where the rotation is stepped forward one step for each marker usage but will be a selection preference rotation determined by the particular trunk link frame selected by this marker on the previous call or connection. In general terms, the selection preference will be rotated so that the preference of selection on the next call which this marker will be called upon to assist will not reselect the previous selected trunk link frame unless no other trunk link frames are available.

The preference of selection of any trunk link frame will depend upon the particular frame memory FM- relay operated when the trunk link frame selection is made.

7.361 Relay FM- Operated Before Seizure of Marker

During the previous call or connection assisted by this marker the one frame memory FM- relay associated with the particular trunk link frame selected for service during this previous connection has been operated. After operating, the FM- relay was locked operated for use on the subsequent connection which this marker will assist. If none of the FM- relays are operated, as upon the initial application of power to the marker circuit, the FM- relay associated with the last trunk link frame will be operated thru the contacts of all other FM- relays and the TFK-1 relay in the non-operated condition. Therefore, when this marker is seized to assist in this connection one frame memory FM- relay will be in the operated condition to provide a particular selection preference to each trunk link frame.

7.362 Operation of the FMK and FMG Relays

When the marker is seized to assist in this connection the operation of the TLC2, D, MF or CKG-4 relays with the operation of any FM- relay will operate the frame memory check FMK relay.

The operation of the FMK relay with the TFK-1 relay released and one of the CKG-3, D or MF relays operated will operate the frame memory guard FMG relay. After operating the FMG relay will lock operated when the FMK and one of the CKG-3, D or MF relays are operated.

The FMK and FMG relays in operating will provide an indication that an FM- relay is operated.

7.363 Operation of the TFK-1 and TFK-2 Relays

After a trunk link frame has been selected to serve this connection and the selected trunk link frame has been seized the trunk frame check TFK-1 and TFK-2 relays will be operated as described in paragraph 7.331, as an indication that the selected trunk link frame has been seized.

7.364 Release of the FM-, FMK and FMG Relays

After the trunk link frame has been selected and seized the operated FM- relay which has determined the preference of selection of the trunk link frames during this connection will be released so that the preference of selection may be recycled.

The operation of the TFK-1 relay with the FMG relay operated will remove the locking ground of the operated FM- relay thereby releasing the operated FM- relay. The operated FM- relay in releasing will release the FMK relay which in turn will result in the FMG relay releasing. The release of the FMG relay will indicate that all FM- relays are released and that the circuit is ready for setting up a new preference of selection.

7.365 Operation of the FM-, FMK and FML Relays

After the FM- relay which has provided the preference of selection of the trunk link frames on this connection has been released and the FMK and FMG relays have been released the FM- relay associated with the trunk link frame selected to serve this connection will be operated to provide the preference of selection of the trunk link frames during the subsequent connection assisted by this marker if required.

The release of the FMG relay with the FML relay non-operated and the TFK-1 relay operated and with the trunk frame selection FS- relay associated with the selected trunk link frame operated will operate the frame memory FM- relay associated with the operated FS- relay and the selected trunk link frame. After operating the FM- relay will lock operated when the FMG relay is released.

The operation of the FM- relay will operate the FMK relay as an indication that the FM- relay has operated.

The operation of the FMK relay with the FMG relay non-operated and the TFK-1 relay operated will operate the FML as an indication that the preference of selection has been completely recycled. The FML relay will lock operated when the TFK-1 relay is operated and the FMG relay is released.

The preference of selection of the trunk link frame has now been completely recycled. When this marker circuit is released from assisting this dial tone connection the FMK relay and the FML relay will be released but the operated FM- relay will be held operated to provide the preference of selection of the trunk link frames on the subsequent call or connection which this marker will assist.

7.37 Originating Register Selection Preference

If there is more than one idle originating register circuit of the required type associated with the selected trunk link frame the marker must select one of these idle originating register circuits for service at this time. The marker must not give a particular originating register a fixed selection preference since the manner of selection must be such as to distribute the traffic as uniformly as possible over all originating registers of the same type for any number of originating registers associated with a trunk link frame.

The method of rotating the preference of originating register selection is the same as previously described for the selection preference of the vertical group, horizontal group and vertical file selection of the calling line except in order to extend the ten-step selection preference to obtain the required twenty-step selection preference the auxiliary relays SQTO and SQT1 are provided.

7.371 Operation of the SQ0/9 Relays

The SQ0/9 relays providing the originating register selection are the same as the SQ0/9 relays which provided the selection preference for the vertical group, horizontal group and vertical file selection of the calling line identification the operation of which was described in paragraph 7.25.

7.372 Operation of the SQTO and SQT1 Relays

The auxiliary relays SQTO and SQT1 have been added to expand the ten-step selection preference necessary for the vertical group, horizontal group and vertical file selection to a twenty-step selection preference which is required for the originating register selection.

The SQTO relay in the operated condition will indicate the first group of ten-steps while the SQTO relay in the released condition will indicate the second group of ten-steps within the twenty-step selection preference.

The operation of the SQO relay with the SQT1 relay released will operate the SQTO relay which will be locked operated with the SQO relay in the released condition.

The operation of the SQ2 relay with the SQTO relay operated will operate the SQT1 relay which will be locked operated with the SQ2 relay in the released condition.

7.373 Order of Selection Preference for Operating the TS-0/19 Relays

Preference of Selection		With the SQTO Relay Operated and the Following SQ0/9 Relay Operated									
		SQ0	SQ1	SQ2	SQ3	SQ4	SQ5	SQ6	SQ7	SQ8	SQ9
1 for TS-		0	1	2	3	4	5	6	7	8	9
2 for TS-		10	11	12	13	14	15	16	17	18	19
3 for TS-		5	6	7	8	9	2	3	4	0	1
4 for TS-		15	16	17	18	19	12	13	14	10	11
5 for TS-		2	3	4	0	1	7	8	9	5	6
6 for TS-		12	13	14	10	11	17	18	19	15	16
7 for TS-		7	8	9	5	6	4	0	1	2	3
8 for TS-		17	18	19	15	16	14	10	11	12	13
9 for TS-		4	0	1	2	3	9	5	6	7	8
10 for TS-		14	10	11	12	13	19	15	16	17	18
11 for TS-		9	5	6	7	8	1	2	3	4	0
12 for TS-		19	15	16	17	18	11	12	13	14	10
13 for TS-		1	2	3	4	0	6	7	8	9	5
14 for TS-		11	12	13	14	10	16	17	18	19	15
15 for TS-		6	7	8	9	5	3	4	0	1	2
16 for TS-		16	17	18	19	15	13	14	10	11	12
17 for TS-		3	4	0	1	2	8	9	5	6	7
18 for TS-		13	14	10	11	12	18	19	15	16	17
19 for TS-		8	9	5	6	7	0	1	2	3	4
20 for TS-		18	19	15	16	17	10	11	12	13	14
"TE-0/19" Lead Grounded	"TE-	0	1	2	3	4	5	6	7	8	9"

Preference of Selection		With the SQTO Relay Non-Operated and the Following SQ0/9 Relay Operated									
		SQ0	SQ1	SQ2	SQ3	SQ4	SQ5	SQ6	SQ7	SQ8	SQ9
1 for TS-		10	11	12	13	14	15	16	17	18	19
2 for TS-		5	6	7	8	9	2	3	4	0	1
3 for TS-		15	16	17	18	19	12	13	14	10	11
4 for TS-		2	3	4	0	1	7	8	9	5	6
5 for TS-		12	13	14	10	11	17	18	19	15	16
6 for TS-		7	8	9	5	6	4	0	1	2	3
7 for TS-		17	18	19	15	16	14	10	11	12	13
8 for TS-		4	0	1	2	3	9	5	6	7	8
9 for TS-		14	10	11	12	13	19	15	16	17	18
10 for TS-		9	5	6	7	8	1	2	3	4	0
11 for TS-		19	15	16	17	18	11	12	13	14	10
12 for TS-		1	2	3	4	0	6	7	8	9	5
13 for TS-		11	12	13	14	10	16	17	18	19	15
14 for TS-		6	7	8	9	5	3	4	0	1	2
15 for TS-		16	17	18	19	15	13	14	10	11	12
16 for TS-		3	4	0	1	2	8	9	5	6	7
17 for TS-		13	14	10	11	12	18	19	15	16	17
18 for TS-		8	9	5	6	7	0	1	2	3	4
19 for TS-		18	19	15	16	17	10	11	12	13	14
20 for TS-		0	1	2	3	4	5	6	7	8	9
"TE-0/19" Lead Grounded	"TE	10	11	12	13	14	15	16	17	18	19"

7.4 Selection of the Connecting Path

To select a connecting path the marker must perform five functions as follows:

(a) Selection of the ten line links to be tested.

(b) Selection of the subgroup of junctors to be tested.

(c) Selection of the ten trunk links to be tested.

(d) Test and selection of an idle connecting path.

(e) Forwarding identification of selected connecting path to the originating register.

Selection of the connecting path will be initiated when the trunk link frame is seized by the marker, as described in paragraphs 7.32 and 7.33 of the originating register selection. However, the marker will be unable to test and select an idle connecting path until the originating register selection and seizure has been completed and until horizontal group identification of the calling line has been determined.

Before it is possible to set up a connecting path or channel between the calling subscriber line and the selected originating register it is necessary to determine those channels or paths thru which it may be possible to connect the calling subscriber line to the selected originating register, to test for idle channels within this group of channels and then select one of these idle and available channels for service.

The connecting path between the calling subscriber line and the selected originating register will be set up by closing one crossbar switch crosspoint on the line switch of the line link frame associated with the calling subscriber line, by closing one crosspoint on a junctor switch of the same line link frame, by closing one crosspoint on a junctor switch of the trunk link frame associated with the selected originating register or trunk circuit and by closing two crosspoints on the trunk switch of the same trunk link frame. The closing of the crossbar switch crosspoint on the line switch of the line link frame will extend the calling line termination on the line link frame through the line switch to a line link frame line link. The line link frame line links are conductors connecting the line switches to the junctor switches on the same line link frame and will extend the calling subscriber line from the line switch to a junctor switch. The closing of the crosspoint on a line link frame junctor switch will further extend the calling subscriber line from the link link frame line link through the junctor switch to a junctor. The junctors are conductors connecting the line link frame junctor switches to the trunk link frame junctor switches and will extend the calling subscriber line from a line link frame junctor switch to a junctor switch on the trunk link frame associated with the selected originating register or trunk circuit. The closing of the crosspoint on the trunk link frame junctor switch will extend the calling subscriber line from the junctor through the junctor switch to a trunk link frame trunk link. The trunk link frame trunk links are conductors connecting the junctor switches to the trunk switches on the same trunk link frame and will extend the subscriber line to a trunk switch. The closing of the two crosspoints on the trunk link frame trunk switch will extend the subscribers line from the trunk link through the trunk switch to the selected originating register (or trunk circuit) thereby completing the connecting path or channel from the calling subscriber line selected for service to the originating register selected to service this dial tone connection.

The line link frame line links are connected to the line switches and to the junctor switches in the same manner for any size of office as follows:

(a) Each line link has one end connecting to a horizontal termination of a line switch and the other end connecting to a horizontal termination of a junctor switch located within the same line link frame.

(b) A line link connecting to the line switch horizontal termination on line switch "A" and on the horizontal level "B" within the line switch "A" is terminated on the junctor switch horizontal termination on junctor switch "B" and on the horizontal level "A" within the junctor switch.

The line switches and junctor switches within one line link frame are designated from 0 to 9 with the switch lowest in physical position on the line link frame designated 0 and progressing to the switch highest in physical position being designated 9. Likewise the horizontal levels within any switch are designated 0 to 9 with the horizontal level lowest in physical position on the switch designated 0 and progressing to the horizontal level highest in physical position being designated 9.

The trunk link frame trunk links are connected to the junctor switches and to the trunk switches in the same manner for any size of office as follows:

a. Each trunk link has one end connecting to a vertical termination of a junctor switch and the other end connecting to a vertical termination of a trunk switch located within the same trunk link frame.

b. Each trunk link which connects to the left section of a junctor switch will connect to the left section of the trunk switch and each trunk link which connects to the right section of a junctor switch will connect to the right section of the trunk switch.

Each trunk link frame junctor switch is divided into two sections, a left section consisting of the left ten vertical files of the crossbar switch and a right section consisting of the right ten vertical files. On the junctor switches each horizontal file is split so that the right section of a horizontal file and the left section of a horizontal file are not multipled together. Therefore, the left section and the right section of a junctor switch have no internal multiple connecting them together.

Each trunk link frame trunk switch is divided in a manner similar to the junctor switch except that each horizontal file is not split. Therefore on the trunk link frame trunk switch the right section of each horizontal file and the left section of the associated horizontal file are multipled.

c. A trunk link connecting to vertical file "B" within the left section of junctor switch "A" is terminated on vertical file "A" within the left section of the trunk switch "B".

A trunk link connecting to the right section of junctor switch "A" and vertical file "B" is terminated on the right section of trunk switch "B" and on vertical file "A".

d. Whenever the trunk link frame junctor switches are associated with extension junctor switches, all trunk links terminate on both the non-extension junctor switches and extension junctor switches. Access to the trunk links from the extension junctor switches is accomplished by the multiple between the associated vertical files of the non-extension junctor switch and the associated extension junctor switch.

The manner in which the junctors are connected to the line link frame junctor switches and to the trunk link frame junctors switches will vary for every size of office. There is no simple scheme for determining the detailed pattern of connections of the junctors for an office of any size. This detailed pattern of connections can only be obtained by consulting BSP AA241.209. However, there are certain general features as follows:

a. The total number of junctors connecting to the junctor switches on a particular line link frame and to the junctor switches on a particular trunk link frame will vary from 50 junctors, in an office equipped with 2 trunk link frames, to 10 junctors, in an office equipped with either 10 or 20 trunk link frames. All of the junctors connecting to the junctor switches within one line link frame and within one trunk link frame are designated a junctor group. Within each junctor group the junctors are divided into junctor subgroups of ten junctors or less.

Whenever the number of line link frames exceed 20 frames or whenever the office is equipped to expand to a number of line link frames greater than 20 frames the extension junctor switches will be required as junctor terminations.

b. Within a junctor subgroup consisting of a full subgroup of 10 junctors there will be one junctor connecting a vertical termination on each line link frame junctor switch to a horizontal termination on the like numbered junctor switch or to the like numbered extension junctor switch on the trunk link frame. Where the junctor subgroup consists of less than a full subgroup of ten junctors certain line link frame junctor switches will not be connected by junctors within this subgroup to the like numbered trunk link frame junctor switch.

c. All junctors within the same junctor subgroup will connect either to the right section of the junctor switches, to the left section of the junctor switches, to the right section of the extension junctor switches or to the left section of the extension junctor switches of the trunk link frame.

d. Within the same junctor subgroup all junctors will be connected to the same horizontal level within the ten trunk link frame junctor switches or extension junctor switches.

e. Where extension junctor switches are equipped all trunk link frames are grouped into pairs of two trunk link frames. The two trunk link frames which are grouped together are designated paired trunk link frames. Where extension junctor switches are equipped each junctor is terminated on a horizontal termination on either the regular junctor switch or on the extension junctor switch and is then multipled to a horizontal termination of a junctor switch or extension junctor switch on the other paired trunk link frame. The multiple between the paired trunk link frames terminates on the same horizontal level on the same junctor switch level and on the same section of the junctor switch of the paired trunk link frames.

To determine if a particular connecting path or channel thru which it is possible to connect a calling subscriber line to an originating register or to a trunk circuit is idle and available for use it is necessary to test the particular line link junctor and trunk link associated with this channel for an idle condition. If the line link, the junctor and the trunk link associated with a channel are all idle and available the entire channel is available for use but if the line link, the junctor or the trunk link are busy and unavailable the entire channel is unavailable for use.

The marker is equipped to simultaneously test ten separate channels between a particular subscriber line and an originating register or trunk circuit. To do this the marker will test the line link, the junctor and the trunk link associated with each of the ten channels. However, before it is possible to test for an idle channel the marker must determine which ten channels in the office should be selected for channel testing and must then determine the ten line links, the ten junctors and the ten trunk links associated with these ten selected channels. After the line link, the junctor and the trunk link associated with each channel have been determined the marker may proceed to test for an idle channel.

In certain cases the number of channels to be tested will be less than ten. However, in this case the marker will consider those channels that are non-existent as non-available channels.

7.41 Selection of the Group of Line Links

The group of ten line links associated with the ten channels to be tested terminate within the same horizontal switch level on the line frame line switch and within the same line link frame as the calling subscriber line. The calling subscriber line has access to any one of the ten horizontal levels on the line link frame line switches within the horizontal group associated with the calling subscriber line.

Associated with and connecting to each sleeve conductor of the line link frame line links will be a line link test lead designated "LL-0/9". After the horizontal group identity of the calling subscriber line has been determined the line link and connector circuit HG-0/9 relay associated with the horizontal group of the calling line has been operated. The operation of the HG-0/9 relay with the MCA relay in the line link and connector circuit operated will extend to the marker circuit for testing the group of ten line link test leads "LL-0/9" connecting to the sleeve conductor of the ten line links to which the calling subscriber has access.

The selected group of ten line links are assigned to the channels in a manner such that the numerical designation of the channel of which the line link is a part is identical with the numerical designation of the line link test lead "LL-0/9", with the numerical designation of the line link frame junctor switch to which the line link connects and with the numerical designation of the horizontal level within the line link frame line switch to which the line link connects.

7.42 Selection of the Subgroup of Junctors

The number of junctors in a junctor group will vary from a maximum of fifty junctors to a minimum of ten junctors. Since the marker is equipped to simultaneously test a maximum of ten channels and therefore to test a maximum of ten junctors each junctor group is subdivided into junctor subgroups consisting of ten or less junctors. Therefore, the marker will select those junctors within one junctor subgroup when testing for an idle channel. The selection of the subgroup of ten or less junctors will in general, be determined by the following factors.

a. The office size of the installation.

b. The numerical designation of the line link frame involved.

c. The numerical designation of the trunk link frame involved.

d. The junctor sequence position during this connection. The junctor sequence position will be varied for each connection or call which this marker will assist so as to distribute the traffic to the junctor subgroups.

e. The junctor step position which will normally be in the first junctor step position. However, if the marker determines that the selected subgroup of ten or less channels are busy the junctor step position will be advanced to the second step thereby selecting a different subgroup of ten channels which will be tested in the process of channel retest.

The number of junctors within a junctor group and within a junctor subgroup for various office sizes is shown in the accompanying junctor distribution table.

Junctor Distribution Table

For Non-Paired Trunk Link Frame Offices

Number of Line Link Frames In Office	Number of Trunk Link Frames In Office	Number of Junctor Groups From Each Line Link Frame	Number of Junctors Within Subgroup of Junctors Connecting to One Trunk Link Frame From Each Line Link Frame Junctor Subgroup Numerical Designation				
			0	1	2	3	4
4	2	2 grps of 50	10	10	10	10	10
4	2-3	-	10	10	10		
6	3	2 grps of 33 and	10	10	10	3	
		1 grp of 34	10	10	10	4	
8	4	4 grps of 25	10	10	5		
10	5	5 grps of 20	10	10			
12	6	4 grps of 17 and	10	7			
		2 grps of 16	10	3	3		
14	7	2 grps of 15,	10	5			
		3 grps of 14 and	10	4			
		2 grps of 14	10	2	2		
16	8	4 grps of 13 and	10	3			
		4 grps of 12	10	2			
18	9	1 grp of 12 and	10	2			
		8 grps of 11	10	1			
20	10	10 grps of 10	10				

Junctor Distribution Table

For Paired Trunk Link Frame Offices

Number of Line Link Frames In Office	Number of Trunk Link Frames In Office	Number of Junctor Groups From Each Line Link Frame	Number of Junctors Within Subgroup of Junctors Connecting to One Trunk Link Frame From Each Line Link Frame — Junctor Subgroup Numerical Designation: 0	1	2	3	4
8	4	2 groups of 50	10	10	10	10	10
8	4-6	-	10	10	10		
12	6	2 grps of 33 and	10	10	10	3	
		1 grp of 34	10	10	10	4	
16	8	4 grps of 25	10	10	5		
20	10	5 grps of 20	10	10			
24	12	1 grp of 18,	10	4	4		
		2 grps of 17 and	10	7			
		3 grps of 16		3	3		
28	14	2 grps of 15	10	5			
		3 grps of 14 and	10	4			
		2 grps of 14	10	2	2		
32	16	4 grps of 13 and	10	3			
		4 grps of 12		2			
36	18	1 grp of 12	10	2			
		8 grps of 11	10	1			
40	20	10 grps of 10	10				

The selected subgroup of junctors are assigned to the ten channels in a manner such that the numerical designation of the junctor switch on either the line link frame or the trunk link frame to which the junctor connects is also the numerical designation of the channel of which the junctor is a part.

7.421 Identification of the Office Size

When the trunk link frame is connected to the marker circuit the selection of the subgroup of junctors and the identification of the office size will be initiated. The office size associated with the junctor distribution of the selected trunk link frame will be identified by determining if the trunk link frame is a non-paired or a paired trunk link frame and by determining the number of trunk link frames in an office associated with the junctor distribution of the selected trunk link frame.

7.4211 Operation of the STF or PR Relay

To determine if the selected trunk link frame is a non-paired or a paired trunk link frame the non-paired (single frame) STF relay or the paired PR relay is operated in the marker circuit.

The operation of the TLC-3 relay will extend ground to the "SPF" cross-connection terminal. If the trunk link frames associated with the office are all non-paired trunk link frames the grounded "SPF" cross-connection terminal will be cross-connected to the "SF" cross-connection terminal thereby operating the STF relay in the marker. If the trunk link frames are paired trunk link frames the grounded "SPF" cross-connection terminal will be cross-connected to the "PR" cross-connection terminal thereby operating the PR relay in the marker.

7.4212 Operation of the 2TLF/10TLF Relay

To determine the junctor distribution associated with the selected trunk link frame one of the 2TLF/10TLF relays will be operated in addition to the operation of the STF or PR relay.

The operating path of each 2TLF/10TLF relay will be extended to an associated "SZ-2/10" cross-connection terminal in the marker circuit. The "SZ-2/10" cross-connection terminal will be cross-connected to either the "SZA", "SZB", "SZC" or "SZD" cross-connection terminal in the marker circuit according to the following code.

Number of Trunk Link Frame Office — Non-Paired Frames	Paired Frames	"SZ-2/10" Terminal Cross-Connected	2TLF/10TLF Relay Operated
2	4	"SZ-2"	2TLF
2-3	4-6	"SZ-2-3"	2-3TLF
3	6	"SZ-3"	3TLF
4	8	"SZ-4"	4TLF
5	10	"SZ-5"	5TLF
6	12	"SZ-6"	6TLF
7	14	"SZ-7"	7TLF
8	16	"SZ-8"	8TLF
9	18	"SZ-9"	9TLF
10	20	"SZ-10"	10TLF

Normally the one "SZ-2/10" cross-connected terminal associated with the office size is cross-connected to the "SZD" cross-connection terminal. The operation of the TLC-3 relay will ground the "SZD" cross-connection terminal to operate the 2TLF/10TLF relay.

However, when the office is in the process of expansion from one office size to another office size there may be certain trunk link frames with a junctor distribution associated with the original office size, certain trunk link frames with a junctor distribution associated with the new office size and certain trunk link frames with a junctor distribution associated with an intermediate office size. To provide for this condition the "SZA, "SZB" and "SZC" cross-connection terminals are provided. Therefore, in this case, the "SZ-2/10" cross-connection terminal associated with the original office size is cross-connected to one of the "SZA", "SZB" or "SZC" cross-connection terminals, the "SZ-2/10" cross-connection terminal associated with the new office size is cross-connected to some other "SZA", "SZB" or "SZC" cross-connection terminal and the "SZ-2/10" cross-connection terminal associated with the intermediate office size is cross-connected to some other "SZA", "SZB" or "SZC" cross-connection terminal. In this case the operation of the trunk link and connector circuit MCC relay will extend the operating path for the 2TLF/10TLF relay to the "SZA", "SZB" or "SZC" cross-connection terminal in the selected trunk link and connector circuit. The grounded "G" cross-connection terminal in the selected trunk link and connector circuit will be cross-connected to one of the "SZA", "SZB, or "SZC" cross-connector terminals in the trunk link and connector circuit in a manner to operate in the marker circuit the 2TLF/10TLF relay associated with the office size and junctor distribution of the selected trunk link frame according to the code in paragraph 7.4212. Therefore, it is possible, in the transition period of office expansion, to have certain trunk link frames in service which have a junctor distribution associated with one office size, certain trunk link frames in service which have a junctor distribution associated with another office size and certain trunk link frames in service which have a junctor distribution associated with some intermediate office size. This will facilitate the making of additions to the office and will reduce the number of junctors which will be out of service simultaneously.

7.4213 Operation of the 20F, 40F, 7Q and RQ Relays

To provide an auxiliary indication if the office size consists of twenty or less line link frames the 20F relay will be operated if one of the 2TLF, 2-3TLF, 4TLF or 5TLF relays operate or if one of the 6TLF, 7TLF, 8TLF, 9TLF or 10TLF relays operate with the STF relay operated.

To provide an auxiliary indication if the office size consists of more than twenty line link frames the 40F relay will be operated if one of the 6TLF, 7TLF, 8TLF, 9TLF or 10TLF relays operate with the PR relay operated. To provide an auxiliary indication if the office size consists of either seven or fourteen trunk link frames the 7Q relay will be operated if the 7TLF relay operates. To provide an auxiliary indication if the office size consists of six, eight, nine, twelve, sixteen or eighteen trunk link frames, the RQ relay will be operated if the 6TLF, 8TLF or 9TLF relay operates.

7.422 Identification of the Junctor Subgroup and the Junctor Subgroup Pattern

After the identification of the office size has been completed the marker will proceed to identify both the junctor subgroup selected for service and the selected junctor subgroup junctor distribution pattern.

7.4221 Operation of the FTB-0/3 and FUT-0/9 Relays

One line link frame tens digit number auxiliary relay designated FTB-0/3 will be operated to identify the line link frame tens digit number when the associated FT-0/3 relay is operated, as described in paragraph 7.211, with the CBD-1 and DT-1 relays operated.

One line link frame units digit number relay designated FUT-0/9 will be operated to identify the line link frame units digit number when two of the FU-0, FU-1, FU-2, FU-4 and FU-7 relays operate, as described in paragraph 7.212, and the CBD and DT-1 relays are operated. The FUT-0/9 relays will be operated according to the following code.

FUT-0/9 Relay Operated	FU-0/7 Relays Operated
FUT-0	FU-4 and FU-7
FUT-1	FU-0 and FU-1
FUT-2	FU-0 and FU-2
FUT-3	FU-1 and FU-2
FUT-4	FU-0 and FU-4
FUT-5	FU-1 and FU-4
FUT-6	FU-2 and FU-4
FUT-7	FU-0 and FU-7
FUT-8	FU1 and FU-7
FUT-9	FU-2 and FU-7

7.4222 Operation of the PNR, PA, PB or PC Relay and the P-0/9 Relay

The number of junctors within a junctor subgroup will vary from a maximum of ten junctors to a minimum of one junctor depending upon the office size and the selected junctor subgroups. The marker circuit is equipped to simultaneously test ten separate channels therefore the marker must determine those channels which are incomplete because of non-existent associated junctors within the selected junctor subgroup. The marker must then consider these incomplete channels unavailable so that the marker will not select one of these incomplete channels for service.

As an indication that the selected junctor subgroup consists of a full group of ten junctors the pattern normal PNR relay will be operated in the marker circuit. However, when the selected junctor subgroup consists of less than a full group of ten junctors one of the junctor pattern tens digit number PA, PB or PC relays and one of junctor pattern units digit number P-0/9 relays will be operated to identify the junctor subgroup pattern and to identify the junctors within the junctor subgroup which are available. The PNR, PA, PB, PC and P-0/9 relays are operated according to the following table to identify the junctor subgroup pattern of the selected junctor subgroup. The operating path of the PNR, PA, PB and PC relays will vary with each office size since the junctor subgroup patterns vary with office size. For certain office sizes the operating paths for the

Junctor Subgroup Patterns
Table A

Pattern Number	Pattern Tens Digit Relay Operated	Pattern Units Digit Relay Operated	Junctor Channels Available Within the Junctor Subgroup
Pattern Normal	PNR	--	0, 1, 2, 3, 4, 5, 6, 7, 8 and 9
P0	PA	P0	0, 7
P1	PA	P1	1, 8
P2	PA	P2	2, 4, 6
P3	PA	P3	3, 5, 9
P4	PA	P4	0, 1, 7, 8
P5	PA	P5	1, 3, 5, 9
P6	PA	P6	2, 4, 6, 8
P7	PA	P7	1, 3, 5, 7, 9
P8	PA	P8	0, 2, 4, 6, 8
P9	PA	P9	0, 1, 3, 5, 7, 8, 9
P10	--	--	--
P11	PB	P1	1
P12	PB	P2	2
P13	PB	P3	3
P14	PB	P4	4
P15	PB	P5	5
P16	PB	P6	6
P17	PB	P7	0, 7
P18	PB	P8	8
P19	PB	P9	9
P20	PC	P0	0, 2, 4, 6, 8
P21	PC	P1	1, 3, 5, 7, 9

Junctor Subgroup Patterns
Table B

For Non-Paired Trunk Link Frames

Number of Trunk Link Frame Office	Junctor Subgroup Pattern / Junctor Subgroup Selected				
	0	1	2	3	4
2	PNR	PNR	PNR	PNR	PNR
2-3	PNR	PNR	PNR		
3	PNR	PNR	PNR	P2, P3 or P4	
4	PNR	PNR	P7 or P8		
5	PNR	PNR			
6	PNR	P2 or P9	P2		
7	PNR	P0, P5, P6 P7, or P8	P0		
8	PNR	P0, P1, P2 or P3			
9	PNR	P11, P12, P13, P14, P15, P16, P17, P18 or P19			
10	PNR				

Junctor Subgroup Patterns
Table B
For Paired Trunk Link Frames

Number of Trunk Link Frame Office	Junctor Subgroup Pattern — Junctor Subgroup Selected 0	1	2	3	4
4	PNR	PNR	PNR	PNR	PNR
4-6	PNR	PNR	PNR		
6	PNR	PNR	PNR	P2, P3 or P4	
8	PNR	PNR	P7, P8, P20 or P21		
10	PNR	PNR			
12	PNR	P2, P3, P4 or P9	P2, P3 or P4		
14	PNR	P0, P5, P6, P7 or P8	P0		
16	PNR	P0, P1, P2 or P3			
18	PNR	P11, P12, P13, P14, P15, P16, P17, P18, or P19			
20	PNR				

Junctor Subgroup Patterns
Table C

Number of Trunk Link Frame Office		Junctor Subgroup Selected											
		Junctor Step STP-1 Relay Operated						Junctor Step STP-2 Relay Operated					
		Junctor Sequence Relay JSQ-0/5 Operated						Junctor Sequence Relay JSQ-0/5 Operated					
Non-Paired Frames	Paired Frames	0	1	2	3	4	5	0	1	2	3	4	5
2	4	0	1	2	0	1	2	3	4	3	4	3	4
2-3	4-6	0	1	2	0	1	2	1	2	0	1	2	0
3	6	0	1	2	0	1	2	3	3	3	3	3	3
4	8	0	1	0	1	0	1	2	2	2	2	2	2
5	10	0	1	0	1	0	1	1	0	1	0	1	0
6	12	0	0	0 or 1	0	0	0 or 1	1	1 or 2	0 or 1	1 or 2	1	0 or 2
7	14	0	0	0	0	0	0 or 1	1	1 or 2	1	1 or 2	1	0 or 2
8	16	0	0	0	0	0	0	1	1	1	1	1	1
9	18	0	0	0	0	0	0	1	1	1	1	1	1
10	20	0	0	0	0	0	0	-	-	-	-	-	-

PNR, PA, PB and PC relays involves only the STP-1 or STP-2, the FMP, the LK2 and one of the 2TLF/10TLF relays. For other office sizes the operating paths may also involve the JSQ-0/5, the P-0/9, the 2G and the 3G relays. The operation of the JSQ-0/5 and the STP-1/2 relays are described in paragraph 7.424.

The operating path of each pattern units digit P-0/9 relay will be extended by means of the "P-0/9" lead to an associated pattern "P-0/9" cross-connection terminal in the trunk link and connector circuit when the marker PTC relay is non-operated and when the trunk link and connector MCC relay is operated. These pattern "P-0/9 cross-connection terminals are cross-connected to the "L-0/8" cross-connection terminals in the trunk link and connector circuit in accordance with the requirements of BSP-AA241.209. The cross-connections of the "P-0/9" and "L-0/8" cross-connection terminals are made in a manner so as to operate the required pattern relay in the marker and will vary for each office size. For certain office sizes where all junctor subgroup patterns are normal pattern (PNR relay operated), there will be no cross-connections required. The operation of the 20F or 40F relay and the operation of one line link frame tens digit FTB-0/3 relay and one line link frame units digit FUT-0/9 relay in the marker circuit will extend ground over one "L-0/8" lead to ground the associated "L-0/8" cross-connection terminal in the trunk link and connector circuit in accordance with the following code.

"L-0/8" Lead or Cross-Connection Terminal Grounded	Line Link Frame Number: Twenty or less Line Link Frame Office	Line Link Frame Number: More than twenty Line Link Frame Office
L0	0, 1	0, 1, 2, 3
L1	2, 3	4, 5, 6, 7
L2	4, 5	8, 9, 10, 11
L3	6, 7	12, 13, 14, 15
L4	8, 9	16, 17, 18, 19
L5	10, 11	20, 21, 22, 23
L6	12, 13	24, 25, 26, 27
L7	14, 15	28, 29, 30, 31
L8	16, 17	32, 33, 34, 35

The operation of one pattern units digit P-0/9 relay with the operation of one pattern ten digit PA, PB or PC relay will identify the junctor subgroup pattern number. If the pattern normal PNR relay operates the junctor subgroup pattern will be identified, therefore, although a P-0/9 relay may also operate, the operated P-0/9 relay will not determine the pattern units digit number.

7.4223 Operation of the 2G or 3G Relay

As an indication that a six or seven non-paired trunk link frame office or a twelve or fourteen paired trunk line frame office junctor group consists of two junctor subgroups the two subgroup 2G relay will be operated and as an indication that the junctor group consists of three junctor subgroups the three subgroup 3G relay will be operated.

The operation of the 6TLF or 7TLF relay with one of the P5, P6, P7, P8 or P9 relays operated will operate the 2G relay.

The operation of the 6TLF or 7TLF relay with one of the P0, P2, P3 or P4 relays operated will operate the 3G relay.

7.4224 Operation of the TCH-0/9 and TCHK Relays

The test channel TCH-0/9 relays associated with those channels or connecting paths which are associated with existent junctors, within the selected junctor subgroup, will be operated to prepare the marker circuit for the selection of an idle channel. The non-operated condition of those TCH-0/9 relays associated with the channels which are associated with non-existent junctors, within the select junctor subgroup, will indicate to the marker circuit that these channels are unavailable for service and the marker circuit should select the next preferred and idle channel for service.

The operation of the pattern normal PNR relay with the MT-7 relay in the release condition will operate all TCH-0/9 relays. The operation of the pattern tens digit PA, PB or PC relay and one of the pattern units digit P-0/9 relays with the MT-7 relay in the release condition will operate the TCH-0/9 relays associated with channels associated with existent junctors.

As an indication that one or more TCH-0/9 relays have operated the test channel check TCHK relay will be operated.

7.4225 Operation of the JG-0/4 Relay

As an indication of the numerical designation of the selected junctor subgroup within the selected junctor group, the subgroup, JG-0/4 relay associated with the numerical designation of the selected junctor subgroup will be operated. These relays will be operated in accordance with the code in paragraph 7.422 on Table C of the "Junctor Subgroup Patterns".

The operation of one 2/10TLF relay and where required the 2G or 3G relay with one JSQ-0/5 relay operated, the LLC2, and the STP-1 or STP-2 relay operated will operate JG-0/4 relay associated with the numerical designation of the selected junctor subgroup within the junctor group. The particular JSQ-0/5 relay and the particular STP-1/2 relay operated will be determined by the junctor subgroup preference of selection circuit described in paragraph 7.424. Normally, unless a channel retest occurs, as described in paragraph 7.45, the STP-1 relay will be operated and the STP-2 relay will be non-operated.

7.423 Connection of Selected Junctor Test Leads to Marker

After the office size and junctor subgroup has been identified the marker circuit will operate connector relays in the trunk link and connector circuit to extend from the selected trunk link frame to the marker circuit the ten junctor test leads designated "J-0/9" associated with the sleeve conductors of the junctors within the selected junctor subgroup. The marker will identify the location and the termination of the junctors within the selected subgroup and will extend the junctor test leads from these selected junctors to the marker circuit by determining if the selected junctors terminate on the left section or on the right section of the trunk link frame junctor switch and by determining the horizontal level on each trunk link frame junctor switch on which the selected junctors terminate.

If the junctors associated with the selected junctor subgroup terminate on the right section of the trunk link frame junctor switch or extension junctor switch the marker will operate the right section R relay and if extension switches are provided the marker will also operate the extension right section ER relay in the trunk link and connector circuit. If the junctors terminate on the left section the marker will operate the left section L relay and if the extension switches are provided the extension left section EL relay will be operated in the trunk link and connector circuit.

The marker circuit will operate in the selected trunk link and connector circuit, one junctor connector relay JC-0/9 or JC-10/19 relay associated with the horizontal level on the trunk link frame junctor switch of the junctors of the selected junctor subgroup. The marker will operate one JC-0/9 relay if the selected junctor subgroup is associated with the non-extension trunk link frame junctor switches or will operate one JC-10/19 relay if the selected junctor subgroup is associated with the extension trunk link frame junctor switches. In this circuit description the trunk link frame junctor switches associated with the JC-0/9 relays will be considered non-extension trunk link frame junctor switches and the trunk link frame junctor switches associated with the JC-10/19 relays will be considered extension trunk link frame junctor switches.

The operation of the junctor connector JC-0/19 relay with either the R and ER or the L and EL relays operated will extend from the trunk link frame to the marker circuit the ten junctor test leads "J-0/9" associated with the sleeve conductors of the junctors within the selected junctor subgroup.

The selected subgroup of junctors are assigned to the channels in a manner such that the numerical designation of the channel of which the junctor is a part is identical with the numerical designation of the junctor test lead "J-0/9" and with the numerical designation of the trunk link frame junctor switch to which the junctor connects.

The identification of the JC-0/19 relay and the determination of a right or left section termination of the junctors associated with selected junctor subgroup may be determined by consulting BSP AA241.209. The identification of a non-extension or extension trunk link frame junctor switch termination of the junctors may be determined by associating the JC-0/9 relays with the non-extension and the JC-10/19 relays with the extension junctor switches.

7.4231 Operation of the L, EL, R and ER Relays in the Trunk Link and Connector Circuit and the Marker LK and RK Relays

The operating path of the L relay, and the EL relay if equipped, will be extended over the "L" lead to the marker circuit when the trunk link and connector MCC relay is operated. The marker will place battery potential on the "L" lead thereby operating the L and EL relays when the JG0 or JG3 relay is operated, an even numbered FUT-0/9 relay is operated and the LK-2 and the TX relays are non-operated. The marker circuit will also place battery potential on the "L" lead when one of the JG1, JG2, or JG4 relays are operated, an odd numbered FUT-0/9 relay is operated and the LK-2 and the TX relays are non-operated. The operating path of the R and ER relay if equipped, will be extended over the "R" lead to the marker circuit when the trunk link and connector MCC relay is operated. The marker circuit will place battery potential on the "R" lead thereby operating the R and ER relays when the JG0 or JG3 relay is operated, an odd numbered FUT-0/9 relay is operated and the LK-2 and the TX relays are non-operated or when one of the JG1, JG2 or JG4 relays are operated, an even numbered FUT-0/9 relay is operated and the LK-2 and the TX relays are non-operated.

To check the operation of the L and EL relays in the trunk link and connector circuit the LK relay in the marker circuit will be operated when the L and EL relays are operated with the trunk link and connector MCC relay operated. The check, the operation of the R and ER relays the RK relay will be operated when the R and ER relays are operated with the trunk link and connector MCC relay operated.

7.4232 Operation of the G-0/4 Relay in the Trunk Link and Connector Circuit

The operation of the marker JG-0 relay will operate the G-0 relay in the trunk link and connector circuit by extending battery potential from the marker to the "G-0" lead in the trunk link and connector circuit when the marker TR-2 and TX relays are non-operated, the GC relay is operated and the trunk link and connector MCC relay is operated. The operation of one of the JG-1/4 relays in the marker will operate the associated G-1/4 relay in the trunk link and connector circuit by extending battery potential from the marker to the associated "G-1/4" lead in the trunk link and connector circuit.

7.4233 Operation of the RF or EF Relay in the Trunk Link and Connector Circuit

The marker circuit will operate the regular frame RF relay in the trunk link and connector circuit if the selected junctor subgroup is associated with the non-extension trunk link frame junctor switches or if the selected junctor subgroup is associated with the extension junctor switches the marker will operate the extension frame EF relay.

The operation of one JG-0/4 relay, one FTB-0/3 relay, one P-0/9 relay, either the 20F or 40F relay and either the STF or FR relay with the TX relay non-operated will place battery potential on the "RF" lead or on the "EF" lead in the marker circuit. With the trunk link and connector MCC relay operated the "RF" and "EF" leads have been extended to the trunk link and connector circuit. The battery potential placed on either the "RF" lead or "EF" lead in the marker circuit will therefore be extended to operate either the RF relay or the EF relay in the trunk link and connector circuit.

By consulting BSP AA241.209 it is possible to determine whether the RF relay or the EF relay should be operated. The BSP AA241.209 will identify the JC-0/19 relay associated with the selected junctor subgroup. If a JC-0/9 relay is associated with the selected junctor subgroup the RF relay will be operated since the JC-0/9 relays are associated with non-extension trunk link frame junctor switches. If a JC-10/19 relay is associated with the selected junctor subgroup the EF relay will be operated since the JC-10/19 relays are associated with extension junctor switches.

7.4234 Operation of the JC-0/19 Relay in the Trunk Link and Connector Circuit

One junctor connector JC-0/19 relay in the trunk link and connector circuit will be operated to extend from the selected trunk link frame to the marker circuit the ten junctor test leads designated "J-0/9."

The operation in the marker circuit of one JG-0/4 relay, one FUT-0/9 relay, one FTB-0/3 relay, the 20F or 40F relay and where required the 7Q or RQ relay with the LK-2 and the TX relays non-operated will place battery potential on one of the "JC-0/9" leads in the marker circuit according to the following code.

"JCO/9" Lead	Line Link Frame Number: Twenty or Less Line Link Frame Office	More than Twenty Line Link Frame Office: Junctor Subgroup 0	Junctor Subgroup 1 & 2: 14 Trunk Link Frames	Junctor Subgroup 1 & 2: Other Sizes
0	0,1	0,1,20,21	0,1,4,5	0,1,4,5
1	2,3	2,3,22,23	2,3,6,7	2,3,6,7
2	4,5	4,5,24,25	8,9	8,9,12,13
3	6,7	6,7,26,27	10,11	10,11,14,15
4	8,9	8,9,28,29	12,13	16,17,20,21
5	10,11	10,11,30,31	14,15	18,19,22,23
6	12,13	12,13,32,33	16,17,20,21	24,25,28,29
7	14,15	14,15,34,35	18,19,22,23	26,27,30,31
8	16,17	16,17,36,37	24,25	32,33
9	18,19	18,19,38,39	26,27	34,35

The battery potential on the marker circuit "JC-0/9" lead is extended to the trunk link and connector circuit with the trunk link and connector MCC relay operated. With the operation of one of the RF or EF relays, the operation of one of the G-0/4 relays and the "JC-0/9" cross-connection terminals cross-connected to the "G-10/19", "G-20-29", "G-30/35" and "G-40/43" cross-connection terminals as required in the trunk link and connector circuit the battery potential on the "JC-0/9" lead will be further extended to operate the junctor connector JC-0/19 relay associated with the selected junctor subgroup. The BSP AA241.209 specifies the cross-connection information for cross-connecting the "JC-0/9" and "G-10/19", "G-20/29", "G-30/35", "G-40/43" cross-connection terminals and also specifies the trunk link and connector JC-0/19 relay associated with each junctor subgroup.

7.4235 Operation of the JCK-0 and JCK-1 Relays

To check that the trunk link and connector JC-0/19 relay has operated the JCK-0 and JCK-1 relays will be operated. The operating path of the JCK-0 relay will be extended over the "JS-0" lead to the trunk link and connector circuit and the operating path of the JCK-1 relay will be extended over the "JS-1" lead to the trunk link and connector circuit. The operation of one of the JC-0/19 relays with the trunk link and connector MCC relay operated will extend the "JS-0" lead and the "JS-1" lead to ground potential thru the low resistance winding of the J-0/9 trunk link frame junctor switch select magnets thereby operating both the marker JCK-0 and JCK-1 relays. The J-0/9 trunk link frame junctor switch select magnets will not be operated because of the high resistance of the JCK-0 and JCK-1 relays.

7.424 Preference of Selection of the Junctor Subgroup

The marker circuit must distribute the connecting path traffic to all junctor subgroups within the junctor group. This distribution of traffic to the various junctor subgroups will be accomplished by rotating the selection of the junctor subgroups for each call or connection assisted by this marker. The junctor subgroup selection will be determined by the following factors.

a. The junctor sequence selection position during this connection.

b. The junctor step position.

The junctor subgroup selected may be determined from the table "Junctor Subgroup Patterns - Table C" in paragraph 7.422.

7.4241 The Junctor Sequence Selection

The junctor sequence position will be varied for each connection or call which this marker will assist and will be determined by the particular JSQ-0/5 relay which is operated.

7.42411 Operation of the JSQ-0/5, JLE, JLO, JSE and JSO Relays

There are six junctor sequence JSQ-0/5 relays to provide six junctor sequence selection positions the operation of one of the JSQ-0/5 relays determining the junctor sequence selection position.

The circuit operation of the JSQ-0/5, JLE, JLO, JSE and JSO relays is identical with the circuit operation of the SQ-0/9, LE, LOD, SE and SO relays of paragraph 7.25.

7.4242 The Junctor Step Selection

The junctor step selection position will be provided by the operation of either the STP-1 relay or the STP-2 relay. Normally, unless a channel retest occurs as described in paragraph 7.45, the STP-1 relay will be operated, and the STP-2 relay will be non-operated.

7.42421 Operation of the STP-1 Relay

The operation of the LLC-1 relay, as described in paragraph 7.15, with the STP and STP-3 relays non-operated will operate the STP-1 relay.

7.42422 Operation of the STP-2 Relay

The STP-2 relay is operated only when a channel retest is required. The detailed operation of the STP-2 relay is described as a part of the channel retest functions of paragraph 7.45.

7.43 Selection of the Group of Trunk Links

The group of ten trunk links associated with the ten channels to be tested terminate on the trunk link frame trunk switch associated with the selected originating register and terminate on either the left section or the right section of this trunk link frame trunk switch. If the junctors associated with the selected junctor subgroup terminate on the left section of the trunk link frame junctor switch the ten trunk links associated with the selected ten channels will terminate on the left section of the trunk link frame trunk switch. If the selected junctors terminate on the right section of the trunk link frame junctor switch the ten trunk links will terminate on the right section of the trunk link frame trunk switch.

Associated with and connecting to each sleeve conductor of the trunk link frame trunk links will be a trunk link test lead designated "RLH-0/9" if the trunk link is associated with the right section of the trunk link frame trunk switch or designated "LLH-0/9" if the trunk link is associated with the left section of the trunk link frame trunk switch. After the trunk link frame trunk switch associated with the selected originating register has been identified the trunk link and connector LC-0/9 relay associated with this trunk link frame trunk switch has been operated as described in paragraph 7.352. Also, after the junctor subgroup has been selected the marker has determined if the junctors associated with the selected junctor subgroup are associated with the right section or with the left section of the trunk link frame junctor switch and has operated the right section R relay or the left section L relay in the trunk link and connector circuit as described in paragraph 7.4231. The operation of the trunk link and connector LC-0/9 relay with the R relay operated will extend the ten "RLH-0/9" trunk link test leads connecting to the trunk links associated with the selected ten channels to the ten "LH-0/9" trunk link test leads. The operation of the trunk link and connector LC-0/9 relay with the L relay operated will extend the ten "LLH-0/9" trunk link test leads to the ten "LH-0/9" trunk test leads. The operation of the trunk link and connector MCB relay will extend to the marker circuit for testing the group of ten trunk link test leads "LH-0/9" connecting to the sleeve conductors of the ten trunk links associated with the selected ten connecting paths or channels.

The selected group of ten trunk links are assigned to the channels in a manner such that the numerical designation of the channel of which the trunk link is a part is identical with the numerical designation of the trunk link test lead "LH-0/9" and with the numerical designation of the trunk link frame junctor switch to which the trunk link connects.

7.44 Test and Selection of an Idle Connecting Path

To test for an idle connecting path the marker will test the line link, the junctor and the trunk link associated with each connecting path channel. If the line link, the junctor and the trunk link associated with a channel are all idle the entire channel is available for use but if either the line link, the junctor or the trunk link is busy the entire channel is unavailable for use and is considered busy. As an indication that a line link, a junctor or a trunk link is busy the sleeve conductor associated with a busy line link, junctor or trunk link will be grounded.

With the selection of the desired ten line links a group of ten line link test leads are extended from the marker circuit to the ten sleeve conductors associated with the selected line links, each line link test lead extending to one sleeve conductor. With the selection of a subgroup of junctors a group of junctor test leads are extended from the marker circuit to the sleeve conductors associated with the selected junctors. With the selection of the ten trunk links a group of ten trunk link test leads are extended from the marker circuit to the ten sleeve conductors associated with the selected trunk links.

The marker circuit will simultaneously test the line link test lead, the junctor test lead and the trunk link test lead associated with each channel to determine which channels are idle and available for use. A ground on either the line link test lead, the junctor test lead or the trunk link test lead associated with a channel will indicate a busy or unavailable channel. If the selected subgroup of junctors associated with channels being tested consist of a full subgroup of ten junctors the marker will test all channels of the ten available channels. However, if the selected subgroup of junctors consist of less than ten junctors the marker circuit will consider those channels associated with the non-existent junctors as channels which are unavailable for service and therefore will not be selected.

After the marker has determined the channels which are idle the marker will select the one preferred channel through which to connect the calling subscriber line to the selected originating register. The preference of channel selection is permanent and non-rotating as it has been found that a higher grade of service with less delay due to no channels available is given at peak traffic when the connecting path channels are "packed" in a definite order.

7.441 Operation of the TLL-0/9, TJ-0/9 and TTL-0/9

The test line link TLL-0/9 relays will test the sleeve conductors of the selected line links for a busy condition, the test junctor TJ-0/9 relays will test the sleeve conductors of the selected junctors for a busy condition and the test trunk link TTL-0/9 relays will test the sleeve conductors of the selected trunk links for a busy condition. A busy condition will be indicated by the presence of ground potential on the sleeve conductor.

The operation of the DT-1 relay will operate the STX relay. The operation of the STX relay will apply battery potential to one side of the windings of the TLL-0/9, TJ-0/9 and TTL-0/9 relays. The other side of the windings of the TLL-0/9 relays, with the associated LL-0/7 relays released and the associated CH-0/9 relays released, will be extended to the line link test leads "LL-0/9" in the marker. The line link test leads "LL-0/9" have been extended with the line link and connector HG-0/9 and MCA relays operated, from the marker to the line link frame sleeve conductors associated with the selected line links, as described in paragraph 7.41. A busy condition ground on a line link sleeve conductor will operate the associated TLL-0/9 relay in the marker as an indication of this busy condition.

The other side of the windings of the TJ-0/9 relays, with the associated CH-0/9 relays released, will be extended to the junctor test leads "J-0/9" in the marker. The junctor test leads "J-0/9" have been extended, with one of the JC-0/19 relays and the R and ER or the L and EL relays operated, in the trunk link and connector circuit from the marker to the trunk link frame sleeve conductors associated with the selected junctors, as described in paragraph 7.42. A busy condition ground on a junctor sleeve conductor, will operate the associated TJ-0/9 relay in the marker.

The other side of the windings of the TTL-0/9 relays, with the associated CH-0/9 relays released, will be extended to the trunk link test leads "LH-0/9" in the marker. The trunk link test leads "LH-0/9" have been extended, with one of the LC-0/9 relays, the MCB relay and the R or L relay operated in the trunk link and connector circuit, from the marker to the "LLH-0/9" or "RLH-0/9" leads in the trunk link and connector circuit and to the sleeve conductors associated with the selected trunk links, as described in paragraph 7.43. A busy condition ground on a trunk link sleeve conductor will operate the associated TTL-0/9 relay in the marker.

7.442 Operation of the TK Relay

To indicate that the marker has performed the preliminary functions before the selection of an idle connecting path can be initiated, the test check TK relay will be operated. The TK relay in operating will initiate the marker functions for the selection of an idle connecting path.

The TK relay will be operated when the FAK, RK or LK, CHE, TCHK, HGK, LCK, JCK-0, and the JCK-1 relays are operated and the SOG-2 and SCB relays are non-operated. The TK relay will be held operated by the operation of the HMS-1 relay.

7.443 Operation of the CHT Relay

It is necessary to delay the action of the channel selection CH-0/9 relay until all TLL-0/9, TJ-0/9 and TTL-0/9 relays have had a sufficient time in which to operate. This delay function is performed by the channel timer CHT relay.

The operation of the CKG-5 relay with the TK relay released has biased the secondary winding of the CHT relay to the non-operated position. Also the operation of the CKG-5 relay has biased the primary winding of the CHT relay to the operated position. However, the effect of the secondary winding predominates and the CHT relay will remain in the non-operated position. When the TK relay operates the effect of the secondary winding is eliminated and the CHT relay operates. However, because of the momentary current flow in the secondary winding caused by the condenser CHT discharging, the CHT relay operation is delayed.

7.444 Operation of the CH-0/9 Relay and the CHA Relay (Fig. 29 & 31)

Following the operation of the CHT relay the one preferred channel selection CH-0/9 relay will be operated to select the connecting path associated with an idle line link, an idle trunk link and an idle junctor.

The operating path for the CH-0/9 relay is completed by the operation of the CHT relay. The operation of the LLC-1 relay with the STP, SPL-1 and FMP relays non-operated will place ground potential on the "CHE" lead which is extended to the "CH" lead, with all CH-0/9 relays non-operated, to the "CHT" lead with the CHT relay operated, to the "CHT" lead with the NTT relay non-operated, to the "CHT" lead with the LOT, DTK and CBD-1 relays operated and to the "S" cross-connection terminal with the TR2-B relay non-operated. The original cross-connection of the "S" terminal will be to the "IN-0" cross-connection terminal. The operating ground for the CH-0/9 relay will be further extended to the "A-0" lead to the "FC" lead when the TCH-0 relay is operated, and with the TLL-0, TJ-0 and TLL-0 relays non-operated to the winding of the CH-0 relay and then to the winding of the CHA relay. After operating the CH-0 and CHA relays will lock operated with all higher numbered CH-0/9 relays released, the FMP relay released, the LLC-1 relay operated and the STP and SPL-1 relays non-operated.

If the TCH-0 relay is non-operated or if any one of the TLL-0, TJ-0 or TTL-0 relays are operated the ground on the "A-0" lead will not be extended to operate the CH-0 relay. Instead the ground on the "A-0" lead will be extended to operate the prior preferred CH-0/9 relay that is associated with an operated TCH-0/9 relay and with non-operated TLL-0/9, TJ-0/9 and TLL-0/9 relays. In this manner the ground on the "A-0" lead will be extended to operate the one prior preferred CH-0/9 relay associated with an available and idle channel.

If no available channel is idle, within the selected group of ten channels, the ground potential for operating the CH-0/9 relay will be further extended to ground the "E" cross-connection terminal and the all busy "AB" lead. Grounding the "AB" lead will initiate channel retest as described in paragraph 7.45.

The original preference of the selection of the connecting path will be from the CH-0 relay being the most preferred, thru the CH-1 to CH-8, to the CH-9 relay being the least preferred. This preference will exist when the following cross-connections are made.

"S" terminal	cross-connected	to	"IN-0"
"M" terminal	"	"	"OT-4"
"M1" "	"	"	"IN-5"
"E" "	"	"	"OT-9"

To equalize life of equipment the original preference of selection of the CH-0/9 relays will be rotated so that the preference will be from the CH-5 relay being the most preferred, thru the CH-6 to CH-9, thru the CH-0 to CH-3, to the CH-4 relay being the least preferred. This preference will exist when the following cross-connections are made.

"S"	terminal	cross-connected	to	"IN-5"
"M"	"	"	"	"OT-9"
"M1"	"	"	"	"IN-0"
"E"	"	"	"	"OT-4"

7.445 Release of the CHE Relay

When the marker was seized by the line link marker connector the operation of the LLC-1 relay with the MN and CHA relays released has operated the CHE relay. The operation of the CHA relay will release the CHE relay. The release of the CHE relay will initiate the marker hold magnet operation functions, as described in paragraph 7.52.

7.45 Channel Retest

All office sizes except the ten non-paired trunk link frame office size and the twenty trunk link frame office size have available more than one subgroup of junctors within each junctor group and therefore more than one group of channels available for the dial tone connection. However, the marker is only equipped to test a maximum of ten channels at one time.

If the office size is associated with more than one subgroup of junctors within each junctor group and if the marker tests and determines that the selected group of connecting paths or channels are all busy or non-existent the marker will recycle those relays, both in the marker and trunk link and connector circuit, that have selected the subgroup of junctors and the group of trunk links associated with the selected group of channels. After recycle of these relays the marker will reselect another subgroup of junctors and another group of trunk links in the same manner as for the first junctor and trunk link selection. The marker will then proceed to test and select an idle connecting path in the same manner as for the first test and selection of an idle connecting path. However, if the marker determines that the second selected group of channels are non-available, the marker will not reselect a third group of ten channels but instead will indicate a "failure-to-match." For those office sizes associated with only one group of channels a "failure-to-match" indication will be given when the marker determines that all channels within the first selected group of ten channels are non-available.

The determination and the testing of the first selected group of channels is called step 1 and the determination and testing of the second selected group of ten channels is called step 2.

7.451 Operation of the STP and STP-3 Relays and Release of the STP-1 Relay

When all of the channels associated with the first selected group of channels have been tested and found non-available the "AB" lead is grounded, as described in paragraph 7.444. The grounded "AB" lead is extended, with the 10TLF relay released and the STP-1 relay operated, to operate the STP relay. The STP relay will be held operated with the LLC-1 relay operated. The operation of the STP relay will release the GC relay which in turn will operate the STP-3 relay.

The operation of the STP-3 relay will release the STP-1 relay thereby recycling those relays that have selected the subgroup of junctors and the group of trunk links associated with the selected group of channels.

7.452 Release of the Test and Selection of the Idle Connecting Path Functions

The release of the STP-1 relay will release in the marker either directly or in sequence, the operated PNR, PA, PB or PC relay, the operated TCH-0/9 relays, the TCHK relay, the operated JG-0/4 relay, the operated LK or RK relay, the JCK-0 and JCK-1 relays, the TK relay and the CHT relay.

The release of the STP-1 relay and the marker relays will release in the trunk link and connector circuit the G-0/4 relay, the operated L and EL or R and ER relays, the EF or RF relay, and the operated JC-0/19 relay.

7.453 Operation of the STP-2 Relay

The operation of the STP-2 relay will initiate the selection of another subgroup of junctors and another group of trunk links associated with the second group of channels to be tested.

The STP-2 relay will be operated when the RK, the LK, the TCHK, the JCK-1 and JCK-0 relays have released with the STP and LCK relays operated. The STP-2 relay will hold operated with the ONW relay operated.

7.454 Reoperation of the Test and Selection of an Idle Connecting Path Functions

The operation of the STP-2 relay will operate in the marker, either directly or in sequence, one of the PNR, PA, PB or PC relays, the TCH-0/9 relays, the TCHK relay, one of the JG-0/4 relays, the LK or RK relay, the JCK-0 and JCK-1 relays, the TK relay and the CHT relay. The operation of the STP-2 relay will also operate in the trunk link and connector circuit, either directly or in sequence, the L and EL or R and ER relays, one of the G-0/4 relays, the RF or EF relay and one of the JC-0/19 relays. All of these relays will be operated as described in paragraphs 7.422 and 7.423.

The marker will then proceed to test and to select an idle connecting path within the second selected group of channels in the same manner as a marker testing and selecting an idle connecting path within the first selected group of ten channels, as described in paragraph 7.44.

7.46 Forwarding Identification of the Selected Line Link Numerical Designation to the Originating Register Circuit

The identification of the selected line link numerical designation must be sent to the originating register selected to serve the calling subscriber to be stored until its use is necessary in the selection of an idle connecting path, as described in paragraph 8.115 for an intraoffice call.

7.461 Operation of the Line Link Register LL-0/7 Relays in the Marker Circuit

The operation of the CH-0/9 relay with the GTL-1, the GTL-2 and DT-3 relays operated will operate two of the line link register relays of a group of five line link register relays in the marker circuit designated LL-0, LL-1, LL-2, LL-4 and LL-7 according to the following code.

CH-0/9 Relay Operated	Line Link Register Relays Operated
CH-0	LL-4 and LL-7
CH-1	LL-0 and LL-1
CH-2	LL-0 and LL-2
CH-3	LL-2 and LL-1
CH-4	LL-4 and LL-0
CH-5	LL-4 and LL-1
CH-6	LL-4 and LL-2
CH-7	LL-7 and LL-0
CH-8	LL-7 and LL-1
CH-9	LL-7 and LL-2

7.462 Operation of the Line Link Register Relays in the Originating Register Circuit

With the operation of the trunk link and connector MCD relay a group of five line link register leads designated "LL-0" "LL-1", "LL-2", "LL-4" and "LL-7" have been extended from the marker circuit to the selected trunk link and connector circuit and with the selected originating register F1 relay operated these line link register leads have been further extended to the associated line link register relay in the originating register circuit.

The operation of the CH-0/9 relay with the GTL-1 and GTL-2 relays operated will, in addition to operating the line link register relays in the marker, place ground on two of the line link register leads of a group of five line link register leads designated "LL-0", "LL-1", "LL-2", "LL-4" and "LL-7" thereby operating in the originating register circuit the two associated line link register relays of a group of five line link register relays designated LL-0, LL-1, LL-2, LL-4 and LL-7 according to the code in paragraph 7.461.

The operation of any line link register relay in the originating register circuit, with the originating register ON and F1 relays operated will ground the associated line link register lead thereby holding operated the associated line link register relays in both the originating register circuit and the marker circuit.

7.463 Checking the Information Transferred to the Originating Register

To check that the proper line link register relays in the originating register circuit have operated, the information transferred to the originating register will be checked as described in paragraph 7.274.

7.5 Setting Up the Selected Connecting Path

After the selection of an idle connecting path has been made the marker circuit will set up this selected connecting path by initiating or performing the following functions.

a. Operation of the select magnets on both the line link frame and the trunk link frame which are associated with the selected connecting path.

b. Operation of the hold magnets associated with the selected channel after the select magnets are operated.

c. A false cross and ground, a continuity and a double connection test will be made on the selected connecting path to determine if the channel is in a proper condition for service.

d. Extending the selected channel from the trunk link frame to the selected originating register and transferring the ground for holding operated the hold magnets associated with the selected channel from the marker circuit to the originating register circuit. The originating register will transmit dial tone to the subscriber as an indication that the dialing of the called line may be started.

After the marker has determined the connecting paths which are idle and has selected one preferred connecting path or channel, by the operation of the preferred channel selection relay, the marker will initiate the operations necessary for connecting the calling subscriber line to the selected originating register thru the selected connecting path. The marker circuit will set up that part of the connecting path from the calling subscriber line, thru the line link frame line and junctor switches and thru the trunk link frame junctor and trunk switches by operating the select magnets and hold magnets associated with the selected connecting path. The marker circuit will further extend the selected connecting path from the trunk link frame trunk switch to the selected originating register after the marker has performed certain tests on the selected connecting path to determine that the connecting path is in a proper condition for service. As an indication that the connecting path has been extended to the selected originating register and as an indication that the calling subscriber may dial the called line number the originating register circuit will transmit a dial tone to the subscriber.

7.51 Select Magnet Operation

The operating paths for the line link frame line switch and junctor switch select magnets associated with the selected group of ten channels have been extended to the marker circuit in the same manner and at the same time as the ten line link test leads were extended to the marker for channel testing. Also the operating paths for the trunk link frame junctor switch select magnets associated with the selected group of ten channels were extended to the marker circuit at the same time as the junctor test leads were extended to the marker for channel testing.

After the selection of one connecting path for service, by the operation of the one preferred channel selection CH-0/9 relay, as described in paragraph 7.443, the marker will operate on the line link frame one to three line switch select magnets designated L-0/9 and one or two combined line and junctor switch select magnets designated LJ-0/9 and on the trunk link frame one junctor switch select magnet designated J-0/9 associated with the the selected connecting path. The two select magnets designated T-2/9 and A or B on the trunk link frame trunk switch which are associated with the selected originating register will be operated after an originating register circuit has been selected and seized for service.

7.511 Operation of the Line Link Frame Line Switch Select Magnets L-0/9

Associated with each horizontal level on the line link frame line switches will be one to three select magnets designated L-0/9. The numerical designation of a L-0/9 select magnet corresponds to the numerical designation of the line switch horizontal level with which the L-0/9 select magnet is associated.

The operating path for each of the select magnets L-0/9 associated with the ten horizontal levels of the horizontal group within which the calling subscriber is located have been extended from the winding of the L-0/9 select magnet, over the associated "LS-0/9" lead, thru the operated line link and connector HG-0/9 relay contacts, thru the operated line link and connector MCA relay and over the associated "SM-0/9" leads to the marker circuit. The operation of the channel selection CH-0/9 relay associated with the preferred channel with the MT-19 relay non-operated and the ONX relay operated, will place battery potential on the one associated "SM-0/9" lead in the marker circuit thereby operating in the line link frame all line switch L-0/9 select magnets associated with the selected connecting path.

The L-0/9 select magnets are associated with the connecting path channels in a manner such that the numerical designation of the channel with which a L-0/9 select magnet is associated is identical with the numerical designation of the L-0/9 select magnet.

7.512 Operation of the Line Link Frame Combined Line and Junctor Switch Select Magnets LJ-0/9

Associated with each horizontal level on the line link frame combined line and junctor switches will be one select magnet designated LJ-0/9. The numerical designation of a LJ-0/9 select magnet corresponds to the numerical designations of the combined line and junctor switch horizontal level with which the LJ-0/9 select magnet is associated.

After the connecting path channel has been selected it will be necessary to operate all select magnets on the line link frame associated with the selected channel line link. When the selected line link is associated with two line and junctor switch select magnets, one select magnet being associated with one termination of the line link on a line link frame crossbar switch and the other select magnet being associated with the other termination of the line link, two LJ-0/9 select magnets must be operated. Where the same LJ-0/9 select magnet is associated with both terminations of the line link only one LJ-0/9 select magnet must be operated.

In the line link frame the windings of those LJ-0/9 select magnets associated with the same line link are connected in parallel. Also, the LJ-0/9 select magnet windings are extended, with one HG-0/9 relay operated, thru the "JS-0/9" leads to the associated "SM-0/9" leads. The battery potential on the one "SM-0/9" lead associated with the selected channel which has operated one or more L-0/9 select magnets will be extended to the associated "JS-0/9" lead thereby operating either one or two LJ-0/9 select magnets associated with the selected channel line link.

7.513 Operation of the Trunk Link Frame Junctor Switch Select Magnet J-0/9

Associated with each horizontal level on the trunk link frame junctor switches will be one select magnet designated J-0/9. The numerical designation of a J-0/9 select magnet corresponds to the numerical designation of the junctor switch horizontal with which the J-0/9 select magnet is associated.

The operating path for each of the J-0/9 select magnets associated with the junctors within the selected junctor subgroup have been extended from the winding of the J-0/9 select magnet, thru the one operated JC-0/19 relay, over the "JS-0/9" leads in the trunk link and connector circuit thru the operated trunk link and connector MCB relay and over the associated "JS-0/9" leads to the marker circuit. The operation of the channel selection CH-0/9 relay associated with the preferred channel, with the ONX relay operated, will place battery potential on the one associated "JS-0/9" lead in the marker circuit thereby operating in the trunk link frame the one J-0/9 select magnet associated with the selected connecting path.

7.514 Operation of the Trunk Link Frame Trunk Switch Select Magnet A or B and T-2/9

After the originating register circuit has been seized for servicing this dial tone connection the two trunk link frame trunk switch select magnets, one A or B select magnet and one T-2/9 select magnet, associated with the selected originating register circuit will be operated.

Originating register circuits and trunk circuits connect to the horizontal levels on the trunk switches. There are two trunk appearances for each horizontal level for levels 2 to 9 on each trunk switch. The two appearances for each horizontal level are obtained by using a 6-wire crossbar switch and operating an A or B select magnet (horizontal level 0 and 1 on the trunk switch) in addition to operating one T-2/9 select magnet on the trunk switch associated with the horizontal level on which the originating register or trunk circuit appears. The A or B select magnet control crosspoints which connect the trunk link to one or the other of two vertical multiples, each multiple consisting of a tip, a ring and a sleeve conductor. The trunk switch select magnet T-2/9 which operates controls crosspoints which connect the two vertical multiples to the two associated horizontal multiples, each multiple consisting of a tip, a ring and a sleeve conductor. The operation of either the A or the B select magnet and one of the T-2/9 select magnets will therefore connect the trunk link to any one of 16 originating register and trunk appearances.

Appearances connected by the A select magnet are called "A" appearances and those connected by the B select magnet are called "B" appearances. Since the originating registers are associated with "A" appearances the A select magnet on the trunk switch associated with the selected originating register must be operated.

The operation of the FAK relay with the ONX relay operated will place battery potential on the "ASM" lead in the marker. The battery potential on the "ASM" lead will be extended to the trunk link and connector circuit, thru the contacts of the operated trunk link and connector MCB, LV-2/9 and FA- relays to the winding of the A select magnet on the trunk link frames trunk switch on which the selected originating register has an appearance. The operation of the marker FAK relay will therefore operate this trunk switch A select magnet.

The release of the TSE-1 relay with the ONX relay ~~operated~~ has placed ground potential on the "TSX" lead in the marker. The operated condition of the trunk link and connector MCA relay will extend the ground potential on the "TSX" lead to one side of all the "T-2/9" select magnet windings of the selected trunk link frame. The other side of the T-2/9 select magnet associated with the selected originating register has been extended to the battery potential on the "ASM" lead with the trunk link and connector FA-, LV-2/9 and MCB relays operated. The operation of the FAK relay in the marker will therefore operate the T-2/9 select magnet associated with the selected originating register.

7.52 Hold Magnet Operation

When the line group of five lines within which the calling subscriber is located has been identified, the operating paths for the line link frame line switch hold magnets associated with this line group have been extended to the marker circuit. During light traffic conditions a false cross and ground test will test the tip and ring conductors after the line link frame junctor switch hold magnet and the trunk link frame junctor and trunk switch hold magnets have been operated. After allowing a sufficient time period for the false cross and ground test the marker will operate the line link frame line switch hold magnet associated with the calling line.

During heavy traffic conditions the false cross and ground test will be eliminated and the marker will operate without any delay the line link frame line switch hold magnet associated with the calling line at the same time that the other hold magnets are operated. The false cross and ground test and the determination of a light or heavy traffic condition is explained in paragraph 7.531.

The operating paths for the line link frame junctor switch hold magnets and the trunk link frame junctor and trunk switch hold magnets associated with the selected group of channels were extended to the marker circuit at the same time as the junctor test leads or the trunk link test leads were extended to the marker for channel testing. After the operation of the select magnets the marker will operate on the line link frame one junctor switch hold magnet and on the trunk link frame one junctor switch hold magnet and one trunk switch hold magnet associated with the selected channel.

Before the marker circuit is released the originating register circuit will place ground potential on the sleeve conductor of the selected channel. This ground potential on the sleeve conductor associated with the selected channel will hold operated the hold magnets on both the line link frame and the trunk link frame associated with this selected channel. The connecting path will therefore be held under the supervision of the originating register circuit after and during the release of the marker circuit from this dial tone connection.

7.521 Operation of the HMT Relay, Release of the HMT-1 Relay, Operation of the HMS-1 Relay and Operation of the JT Relay

After the selection of a connecting path the marker will delay the operation of the hold magnets for a period of time sufficient to allow the select magnets to fully operate and for a period of time sufficient to allow for the full release of any previously operated hold magnet which has released just prior to the operation of the CH-0/9 relay and which will be reoperated in setting up this connecting path. The time delay in the operation of the hold magnets is to prevent double connections caused by closing two cross-points by the operation of one hold magnet. This time delay function is performed by the condenser timed hold magnet timing HMT relay and the hold magnet timing auxiliary HMT-1 relay.

The operation of the CKG-5 relay has extended battery potential to both the primary and secondary windings of the HMT relay. With the CHE relay operated ground potential has been extended to bias the secondary winding of the HMT relay to the non-operated position and with the CB-5 relay non-operated ground potential has been extended through 300 ohms resistance to bias the primary winding of the HMT relay to the operated position. However, the effect of the secondary winding predominates and the HMT relay will remain in the non-operated position. When the channel end CHE relay releases the effect of the secondary winding is eliminated and the HMT relay operates. However, because of the momentary current flow in the secondary winding caused by the HMT condenser charging, the HMT relay operation is delayed for a short period of time.

The hold magnet timing auxiliary HMT-1 relay was operated when the CKG-2 relay was operated, with the HMT relay released. The operation of the HMT relay will open the operating path of the HMT-1 relay which will be released.

The release of the HMT-1 relay will operate the hold magnet start auxiliary HMS-1 relay. The winding of the HMS-1 relay will be extended with the LXP-1 relay operated through the non-operated SP relay contacts, through the operated HMS relay contacts, the non-operated HMT-1 relay contacts, the operated HMC relay contacts, through the non-operated LB, NT-5 and LBT relay contacts, through the operated LLC-2 relay contacts to the ground potential for operating the HMS-1 relay.

After operating the HMS-1 relay will lock operated with the HMC relay operated and the LLC-2 relay operated. The operation of the HMS-1 relay will initiate the operation of the JT relay and the trunk link frame hold magnets and the line link frame junctor switch hold magnet. The operation of the HMS-1 relay will also initiate the operation of the line link frame line switch hold magnet under a heavy traffic load condition.

The operation of the HMS-1 relay will operate the junctor test JT relay. The operation of the LLC-2 relay with the XSL relay non-operated has extended ground potential to the primary winding of the JT relay. The operation of the HMS-1 relay will extend the other side of the primary winding through the non-operated GT-1 relay contacts, through the operated CH-0/9 relay contacts, over one of the "J-0/9" leads to the trunk link frame. The "J-0/9" leads have been extended to the trunk link frame junctor sleeve conductors associated with the selected junctor subgroup with the trunk link and connector MCB relay operated, the trunk link connector JS0/9 jack non-operated, the trunk link connector L and EL or R and ER relays operated, and the trunk link and connector JC-0/19 relay operated. The junctor sleeve conductor associated with the selected connecting path will be extended from the trunk link frame to the line link frame and to the line link frame junctor switch J-0/9 hold magnet, associated with selected connecting path, through the line link frame junctor switch J-0/9 hold magnet winding to battery potential. Therefore battery potential, in series with the line link frame J-0/9 hold magnet, will be placed on the line link frame junctor sleeve conductor associated with the selected connecting path to operate the marker JT relay. The marker JT relay will be operated, by the primary winding, in series with the line link frame junctor switch J-0/9 hold magnet. The line link frame junctor switch J-0/9 hold magnet may or may not operate in series with the JT relay when the JT relay is operated.

After operating the JT relay will lock operated on the current flow in the tertiary winding of the JT relay. The operation of the TLC-2 relay has extended battery potential to one side of the tertiary winding of the JT relay and the other side of the tertiary is extended to ground potential, with the SL, GLT, and XSL relays non-operated and the JT, HMC, DT-2, RK-3 and LLC-2 relays operated, to bias the tertiary winding of the JT relay in the operated position. The operation of the JT relay will initiate the operation of the trunk link frame hold magnets.

7.522 Operation of the Trunk Link Frame J-0/9 and T-0/9 Hold Magnets

The operation of the JT relay will operate the one trunk link frame junctor switch J-0/9 hold magnet (when extension trunk link frame junctor switches are provided two J-0/9 hold magnets will be operated) and the one trunk link frame trunk switch T-0/9 hold magnet associated with the selected connecting path.

The windings of the trunk link frame J-0/9 and T-0/9 hold magnets which are associated with the same trunk link frame trunk link are inter-connected by means of the associated trunk link frame trunk link sleeve conductor. The ten trunk link frame trunk link sleeve conductors associated with the ten selected channels have been extended, as described in paragraph 7.43 with one trunk link and connector LC-0/9 relay operated, with the trunk link and connector L and EL or R and ER relays operated and with the trunk link and connector MCB relay operated, to the marker circuit over the "LH-0/9" leads. Within the marker circuit the one "LH-0/9" lead associated with the selected connecting path will be extended through the one operated CH-0/9 relay contacts, through the non-operated GT-1 relay contacts, through the operated HMC, DT-2 and RK-3 relay contacts through the non-operated GTL relay contacts, through the JT coil, through the operated JT relay contacts, through the operated LLC-2 relay contacts to ground potential. Therefore ground potential will be placed on the sleeve conductor of the trunk link frame trunk link associated with the selected channel to operate the trunk link frame J-0/9 and T-0/9 hold magnets associated with the selected connecting path.

7.523 Operation of the Line Link Frame Junctor Switch J-0/9 Hold Magnet

The line link frame junctor switch J-0/9 hold magnet associated with the selected connecting path may be operated in series with the primary winding of the marker JT relay as described in paragraph 7.521. If, however, the line link frame junctor switch J-0/9 hold magnet does not operate in series with the marker JT relay the line link frame J-0/9 hold magnet will be operated when the trunk link frame junctor switch J-0/9 hold magnet has operated. The operation of the trunk link frame junctor switch J-0/9 hold magnet will close the trunk link frame junctor switch crosspoints and extend the ground on the trunk link frame trunk link sleeve conductor to the trunk link frame junctor sleeve conductor and to the line link frame junctor sleeve conductor of the selected connecting path. Since the winding of the line link frame junctor switch J-0/9 hold magnet associated with the selected connecting path is connected to the line link frame junctor sleeve conductor of the selected connecting path, the one line link frame J-0/9 hold magnet associated with the selected connecting path will be operated.

7.524 Operation of the SL Relay, Release of the JT Relay and the Operation of the LB-0/9 Relay

To check the trunk link frame trunk switch T-0/9 hold magnet crosspoint closure the SL relay will be operated, to check the trunk link frame junctor switch J-0/9 hold magnet crosspoint closure the JT relay will be released and to check the operation of the line link frame junctor switch J-0/9 hold magnet crosspoint closure the LB-0/9 relay will be operated.

The winding of the marker sleeve SL relay, with the HMT-1, relay non-operated and the FAK relay operated, will be extended over the "AST" lead to the trunk link and connector circuit. The "AST" lead will be further extended with the trunk link and connector MCB, LV-2/9 and FA- relays operated to the sleeve conductor associated with the "A" appearance of the trunk link frame trunk switch horizontal level which is associated with the selected originating register circuit. The operation of the trunk link frame trunk switch T-0/9 hold magnet and the closure of the associated crosspoint contacts will extend this sleeve conductor to the trunk link frame trunk link sleeve conductor. The ground potential which has been placed on the trunk link sleeve conductor to operate the trunk link frame J-0/9 and T-0/9 hold magnets will therefore be extended, when the T-0/9 hold magnet crosspoint contacts close, to operate

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the marker SL relay as a check that the T-0/9 hold magnet crosspoint contacts have closed.

In addition to checking the operation of the trunk link frame T-0/9 hold magnet crosspoint contacts, the operation of the SL relay will provide a ground potential on the "LH-0/9" lead associated with the selected channel. This ground potential on the "LH-0/9" lead is to hold operated the line link frame and trunk link frame hold magnets associated with the selected channel after the JT relay has released and until the ground potential for holding these hold magnets operated has been transferred to the originating register circuit. The "LH-0/9" lead associated with the selected channel will be extended through the operated CH-0/9 relay contacts, over the "TLH" lead, through the non-operated GT-1 relay contacts, over the "TLH" lead, through the operated HMC and SL relay contacts, over the "G2" lead, through the operated LLC-2 relay contacts to the holding ground potential for the hold magnets associated with the selected channel.

The primary winding of the JT relay has been biased to operate the JT relay by extending the primary winding to the line link frame junctor sleeve conductor which is at battery potential in series with the line link frame junctor switch J-0/9 hold magnet. The operation of the trunk link frame junctor switch J-0/9 hold magnet has extended the ground potential, which has been placed on the trunk link frame trunk link sleeve conductor to operate the trunk link frame trunk switch J-0/9 hold magnet, over the junctor sleeve conductor to place ground potential on the line link frame junctor sleeve conductor. The ground potential on the line link frame junctor sleeve conductor has eliminated the bias current in the primary winding of the JT relay since now both sides of the primary winding of the JT relay are connected to ground potential. The ground potential on the junctor sleeve conductor will also be extended to the secondary winding of the JT relay to bias the secondary winding in a non-operated polarity. Therefore when the operation of the SL relay opens the tertiary winding of the JT relay, which has held the JT relay operated, the JT relay will release thereby checking the operation of the trunk link frame trunk switch J-0/9 hold magnet crosspoint contacts.

The winding of each link busy LB-0/9 relay has been extended from the marker to the line link and connector circuit and to the sleeve conductor of the associated line link frame line link within the selected group of ten line links. As previously described, ground potential has been placed on the sleeve conductor of the junctor associated with the selected connecting path. The operation of the line link frame junctor switch J-0/9 hold magnet and the closure of the associated crosspoint will extend the ground on the sleeve conductor of the junctor to the sleeve conductor of the line link associated with the selected connecting path. The ground on the sleeve conductor of the line link will be extended from the line link and connector circuit, over the "LB-0/9" lead, to the marker circuit thereby operating the one LB-0/9 relay associated with the line link of the selected connecting path as an indication that the associated line link frame junctor switch J-0/9 hold magnet has operated.

7.525 Operation of the LTR, GLH and GLH-1 Relays and the Operation of the Line Link Frame L Hold Magnet Under Light Traffic Conditions

During light traffic conditions, that is, light load on the available markers, the marker will perform a false cross and ground test on the tip and ring conductors of the selected connecting path, as described in paragraph 7.531. A light traffic condition will be indicated by the HTR relay being non-operated. This false cross and ground test is made after the line link frame junctor switch J-0/9 hold magnet and the trunk link frame J-0/9 and T-0/9 hold magnets have operated but before the line link frame line switch L hold magnet is operated. After the line link frame junctor switch J-0/9 hold magnet and the trunk link frame J-0/9 and T-0/9 hold magnets have operated, a sufficient time delay must be provided for the false cross and ground test before the line link frame line switch L hold magnet operation may be initiated.

After the SL relay has operated, after the JT relay has released and after the LB-0/9 relay has operated the light traffic LTR relay will be operated to indicate that a light traffic condition exists and to indicate that the line link frame junctor switch J-0/9 hold magnet and the trunk link frame J-0/9 and T-0/9 hold magnets have operated. The winding of the LTR relay will be extended through the non-operated OBS-1 and OBS-2 relay contacts through the operated HMS-1 and SL relay contacts, through the operated LB-0/9 and associated CH-0/9 relay contacts, through the non-operated JT relay contacts, through the operated LLC-2 relay contacts to the ground potential which will operate the LTR relay. The heavy traffic HTR relay is in the non-operated condition to indicate a light traffic condition. The operation of the HTR relay is described in paragraph 7.531.

The operation of the LTR relay will extend the ground potential which has operated the LTR relay to the winding of the ground line hold magnet GLH relay thereby operating the GLH relay. The operation of the GLH relay will operate the GLH-1 relay.

The LTR relay is a slow operating relay so that if there is a false cross of the tip and ring conductors, a false ground potential on the ring conductor or a false battery potential on the tip conductor the false cross and ground detection FCG relay will have sufficient time in which to operate. The operation of the GLH and GLH-1 relays will remove the false cross and ground detection FCG relay from the tip and ring conductors and the operation of the GLH-1 relay will then initiate the operation of the line link frame line switch L hold magnet.

The GLH-1 relay is a slow operating relay so that after the operating on the GLH relay but before the GLH-1 relay operates a ground potential will be placed on the ring conductor to discharge it and to prevent a trapped battery potential on the ring conductor.

The operation of the GLH-1 relay will operate the line link frame line switch L hold magnet associated with the calling subscriber. The windings of the five line link frame line switch L hold magnets associated with the subscribers within the selected line group of five lines have been extended, with the operation of the line link and connector LG-0/13 and MCB relays, to the marker circuit over the "LH-0/4" leads. Within the marker circuit the one "LH-0/4" lead associated with the selected vertical file of the calling subscriber will be extended through the one operated VFT-0/4 relay contacts, through the operated FTK-1 relay contacts and the non-operated MT11 relay contacts through the non-operated NTT relay contacts, through the non-operated HMT-1 relay contacts, through the non-operated GT-1 relay contacts, through the operated HMS-1 and DT-3 relay contacts through the operated LHT and GLH relay contacts through the operated GLH-1 relay contacts through the primary winding of the LXP relay, through the operated FCGA relay contacts, through the operated LLC-2 relay contacts to the ground potential which will operate the line link frame line switch L hold magnet.

7.526 Operation of the GLH and GLH-1 Relays and the Operation of the Line Link Frame L Hold Magnet Under Heavy Traffic Conditions

During heavy traffic conditions the false cross and ground test will be eliminated and the marker will operate without any delay the line link frame line switch L hold magnet associated with the calling line at the same time that the other hold magnets are operated.

During heavy traffic conditions the GLH relay and in turn the GLH-1 relay will be operated by the operation of HMT relay. The winding of the GLH relay will be extended through the non-operated LTR relay contacts, through the operated HTR relay contacts, through the non-operated LK-2 relay contacts, through the HMT coil, through the operated HMT relay contacts, and through the operated CKG-2 relay contacts to the ground potential which will operate the GLH relay.

The operation of the HMS-1 relay will operate the line link frame line switch L hold magnet associated with the calling subscriber. The operating path for the line link frame line switch L hold magnet under a heavy traffic condition is identical with the operating path under a light traffic condition with the exception that instead of the operating path being completed through the operated GLH-1 relay contacts the operating path for a heavy traffic condition will be completed through the operated HTR and GLH relay contacts.

7.527 Operation of the LXP Relay and Release of the LXP-1 and LXP Relays

To check the continuity of the line link frame line switch L hold magnet the line crosspoint LXP relay will be operated and the LXP-1 relay will be released. To check the closure of the crosspoint associated with the operated line link frame L hold magnet the LXP relay will be released.

When the operating path for the line link frame line switch L hold magnet is closed, as described in paragraphs 7.525 and 7.526, the LXP relay will operate, by means of the LXP relay primary winding, in series with the line link frame line switch L hold magnet, The operation of LXP relay will release the operated LXP-1 relay to record that the LXP relay has operated. The operating paths for the LXP relay will be the same as described in paragraphs 7.525 and 7.526.

The closure of the crosspoints associated with the operated line link frame L hold magnet will extend the ground potential on the sleeve conductor of the line link frame line link to the winding of the operated line link frame line switch L hold magnet thereby placing ground potential on both sides of the primary winding of the LXP relay. The same ground potential that was extended to the winding of the operated line link frame line switch L hold magnet will be further extended to one side of the secondary winding of the LXP relay. The other side of the secondary winding of the LXP relay being extended to battery potential, with the TLC-2 relay operated, the secondary winding of the LXP relay will bias the LXP relay to the non-operated position.

7.53 False Cross and Ground, Continuity and Double Connection Tests

To determine if the connecting path is in a proper condition for service a false cross and ground test, a continuity test and a double connection test will be made on the selected connecting path.

7.531 False Cross and Ground Test

The false cross and ground test will be made only under light traffic conditions. With heavy traffic conditions the false cross and ground test will not be made.

Before the line link frame line switch crosspoint is closed the false cross and ground test will test for false ground potential on the ring conductor, false battery potential on the tip conductor or a false short between the ring conductor and the tip conductor on the central office tip and ring leads. The tip and ring leads will be tested from the trunk link frame trunk switch end of these conductors up to the line link frame line switch crosspoints.

7.5311 Determination of Light or Heavy Traffic Conditions

To determine if the marker circuit is operating under a light or under a heavy traffic condition the marker will measure the time interval from the time the marker is released on the previous call until the marker is reseized for dial tone connection. Under a heavy traffic condition this time interval will be small and under a light traffic condition this time interval will be long. If the time interval between the marker release on the previous connection or call and the reseizure of the marker for this dial tone connection is less than approximately one second the marker will be considered to be operating under a heavy traffic condition. If the time interval is greater than one second the marker will be operating under a light traffic condition.

To indicate to the marker that a heavy traffic condition exists the heavy traffic HTR relay will be in the operated condition when the false cross and ground test is to be made and to indicate that a light traffic condition exists the HTR relay will be in the non-operated condition.

When the marker was seized to assist the previous connection or call handled by this marker the over-all timing OAT relay was operated which in turn operated the over-all timing auxiliary OAT-1 relay. When the marker was released from the previous connection or call the OAT relay was released which in turn released the OAT-1 relay. However, during the release of the OAT-1 relay, the HTR relay will be operated with the OAT relay non-operated and the OAT-1 relay operated. After operating, the HTR relay will lock operated with the heavy traffic timer HTT relay released.

The release of the OAT-1 relay when the marker was released from the previous connection or call has removed the ground potential, through the HTT-3 resistances, from one side of the HTT condenser thereby permitting the +130 volts potential to slowly charge the HTT condenser through the HTT-1 resistance and to slowly raise the potential, through the HTT-2 resistance, on the control anode (terminal #1) of the HTT electronic tube. When the potential on the control anode reaches approximately +72 volts the breakdown of the control anode gap (terminal #1 and terminal #4) will take place. The breakdown of the control anode gap will break down the main anode gap (terminal #2 and terminal #4) and result in the HTT electronic tube becoming conductive.

The conducting current of the HTT electronic tube will flow from the +130 volt potential, from the main anode in the tube (terminal #2) to the cathode (terminal #4) over the "HTT" lead, through the operated HTR relay contacts, over the "HT" lead, through the non-operated HTT relay contacts, through the winding of the HTT relay, over the "HTF" lead, through the operated HTR relay contacts and over the "HTA" lead to ground potential.

If the interval of time between the marker release from the previous call or connection and the reseizure of the marker to assist this dial tone connection is greater than approximately 1.0 to 1.5 seconds, the released condition of the OAT-1 relay during this period of time,will change the HTT condenser to a potential great enough to break down the control anode gap of the HTT electronic tube. The breakdown of the control anode gap will result in the main anode gap of the HTT electronic tube becoming conductive and operating the HTT relay. The operation of the HTT relay will indicate that this marker is operating under a light traffic condition.

However, if the interval of time between the marker release from the previous call or connection and the reseizure of the marker to assist this dial tone connection is less than approximately 1.0 to 1.5 seconds, the reoperation of the OAT relay will discharge the HTT condenser before the potential across the condenser becomes +72 volts. Therefore the

HTT electronic tube will not become conductive and the HTT relay will not operate.

When the marker HTT relay operates the operating path for locking operated the HTR relay will be opened thereby releasing the HTR relay to indicate a light load traffic condition. However, if the HTT relay does not operate the HTR relay will be held operated to indicate a heavy load traffic condition.

7.5312 Testing for False Cross or Ground

In light-load traffic conditions, the line link frame hold magnet operation is delayed, as described in paragraph 7.52, so that the false cross and ground test may be performed.

The test for a false ground potential on the ring conductor, false battery potential on the tip conductor or a false cross between the ring conductor and the tip conductor will be made by the false cross and ground FCG relay. The operation of the FCG relay will indicate a false cross between the ring and tip conductors, a false battery potential on the tip conductor or a false ground potential on the ring conductor.

One side of the primary winding of the FCG relay is extended, with the TLC-1 relay operated, to battery potential. The other side of the primary winding of the FCG relay is extended through the non-operated GLH relay contacts, through the operated FAK relay contacts, over the "ART" lead from the marker to the trunk link frame, through the operated trunk link frame MCB, LV-2/9 and FA- relay contacts, over the ring conductor, through the operated trunk link frame T-0/9 and J-0/9 hold magnet crosspoint contacts, over the ring conductor of the junctor to the line link frame, through the operated line link frame J-0/9 hold magnet crosspoint contact, and over the ring conductor of the line link to the non-operated line link frame L hold magnet crosspoint contacts.

One side of the secondary winding of the FCG relay is extended to ground potential. The other side of the secondary winding of the FCG relay is extended through the non-operated GLH-1 relay contacts, through the operated FAK relay contacts, over the "ATT" lead from the marker to the trunk link frame, through the operated trunk link frame MCB, LV-2/9 and FA- relay contacts, over the tip conductor, through the operated trunk link frame T-0/9 and J-0/9 hold magnet crosspoint contacts, over the tip conductor of the junctor to the line link frame, through the operated line link frame J-0/9 hold magnet crosspoint contact, and over the tip conductor of the line link to the non-operated line link frame L hold magnet crosspoint contacts.

If there is a false ground potential on the ring conductor at any point from the non-operated line link frame L hold magnet crosspoint contacts to the primary winding of the FCG relay the FCG relay will be operated by a current flow in the primary winding. If there is a false battery potential on the tip conductor at any point from the non-operated line link frame L hold magnet crosspoint contacts to the secondary winding of the FCG relay the FCG relay will be operated by a current flow in the secondary winding. If there is a false cross between the tip conductor and the ring conductor at any point from the non-operated line link frame L hold magnet crosspoint contacts to the windings of the FCG relay the FCG relay will be operated by a current flow in both the primary and secondary windings.

However, if there is no false ground potential on the ring conductor, no false battery potential on the tip conductor or no false cross between the ring and tip conductors the FCG relay will not operate thereby indicating a successful false cross and ground test.

If the FCG relay does not operate, the operation of the GLH and GLH-1 relays, as described in paragraph 7.52 for a light traffic condition, will remove the FCG test before operating the line link frame line switch L hold magnet. The GLH and GLH-1 relays are operated by the slow operate LTR relay so as to allow sufficient time for the FCG relay to operate if a false cross or ground is to be detected. The operation of the FCG relay will release the operated FCGA relay. If the FCGA is released, the path for operating the line hold magnet will be opened to prevent the operation of the line hold magnet. This will cause the marker to time out, and record the failure on the trouble recorder.

7.532 Continuity Test

The continuity test is made to check that all crosspoints of the selected channel are closed and <u>does not</u> check that a continuous pair of tip and ring conductors extend to the calling subscriber. The continuity test is made on the ring conductor with the tip conductor grounded. With the calling subscriber receiver off the hook a continuous path should be established for the continuity test current of 20 cycle frequency through the ring conductor and crosspoints from the trunk link frame trunk switch to the subscriber set, through the subscriber set contacts and over the tip conductor and crosspoints to the ground potential which has been placed on the tip conductor of the trunk link frame trunk switch by the marker. Under certain conditions of subscriber line capacity and leakage the continuity test current of 20 cycle frequency will flow to give a continuity test check even though the tip or ring conductor may be open at the subscriber set. However, this will not interfere with the continuity test in checking that the crossbar switch crosspoints of the channel are closed.

The operation of the line link frame and trunk link frame hold magnets extend the tip and ring conductors of the subscriber line through the selected channel in the office to the marker and initiates the continuity test. Ringing voltage of 20 cycle frequency is applied to the primary of the CON repeating coil, which by its transformer action, steps up the voltage. This voltage from the secondary is applied to a series circuit consisting of the CON 2 capacitor, the channel crosspoints, and the line. Before the line switch crosspoints are closed by the operation of the line hold magnet the series circuit is open, therefore, no current flows in the repeating coil secondary circuit and the voltage drop across the CON 2 capacitor is zero. The operation of the line hold magnet to close the line switch crosspoints completes the path for the CON repeating coil secondary, therefore alternating current flows from its secondary circuit through the CON 2 capacitor, and through the channel crosspoints and the line.

The current flowing in the CON 2 capacitor, repeating coil secondary, channel crosspoints and line causes the voltage of the secondary to be divided across the CON 2 capacitor and the line, the amount of voltage across each being determined by the impedance of each. The impedance of the subscriber line is relatively low compared with the impedance of the CON 2 capacitor, and therefore the greater portion of the voltage from the CON repeat coil secondary will appear across capacitor CON 2. This voltage across the CON 2 capacitor is sufficient to break down the control gap of the CON tube, which is connected across capacitor CON 2. The breakdown of the control gap results in the main gap becoming conductive and the CON and CON 3 relays operating in series with the main gap of the CON tube. If one of the channel crosspoints fails to close, the current through capacitor CON 2 is determined by leakage in the central office local cabling and other circuit elements but is insufficient to cause the breakdown of the control gap of the CON tube.

For the condition of a false subscriber start the continuity test must not result in a false continuity test failure if at the time of the continuity test the subscriber's receiver is on the switchhook. When the receiver is off the switchhook a continuity test current is extended from the ring conductor to the tip conductor through the operate switchhook contacts. However, if the receiver is on the switchhook, because of a false subscriber start, the continuity test current may be extended from the ring conductor to the tip conductor through the subscriber ringer. If the calling party keeps the receiver off the switchhook, the continuity test will check on individual subscriber lines and on multi-party subscriber lines regardless of which party is calling. If the receiver is not off the switchhook when the continuity test is made, because of a false subscriber start, the continuity test will check on individual subscriber lines or if there is a ring station on a two-party subscriber line. To check the continuity of a two-party subscriber line with only a tip station under a condition of a false subscriber start, the failure of the continuity test to check when the continuity test is applied to the ring conductor with the tip conductor grounded will apply the continuity test to the tip conductor with the ring conductor grounded.

7.5321 Operation of the CON, CON-1, and CON-3 Relays

The CON and CON-3 relays, by operating will check and will indicate that a successful continuity test has been performed. The windings of the CON and CON-3 relays are in series and are in the anode circuit of the CON electronic tube. When the CON electronic tube becomes conductive the CON and CON-3 relays will operate on the current flow from the +130 volt potentials, through the CON-8 resistance, through the operated GLH relay contacts, through the non-operated GT-2 relay, through the windings of the CON and CON-3 relays, from the CON vacuum tube anode (terminal #2) to the cathode (terminal #4) and to ground potential. The CON electronic tube will become conductive if the voltage on the control anode (terminal #1) exceeds approximately +72 volts. Therefore to indicate a successful continuity test a voltage will be applied to the control anode of greater than +72 volts. If the continuity test fails a voltage of less than +72 volts will be applied to the control anode.

The operation of the FA-, the LV-2/9 and the MCB relay in the trunk link and connector circuit have extended the tip conductor of the selected channel over the "ATT" lead and the ring conductor of the selected channel over the "ART" lead from the trunk link frame trunk switch to the marker circuit. The tip conductor and the "ATT" lead is extended to ground potential in the marker. The "ATT" lead is extended in the marker through the operated FAK relay contacts, through the operated GLH-1 and RCT relay contacts, through the non-operated GT-2, CON and FLG-2 relay contacts, through the operated GLH relay contacts, and through the operated LLC-1 relay contacts to ground potential. The ring conductor and the "ART" is extended in the marker through the operated FAK relay contacts, through the operated GLH, GLH-1 and RCT relay contacts, through the released GT-2 relay contacts and through the CON-6 resistance, through the non-operated CON-3 and CCT relay contacts, through the CON retarding coil, through the secondary windings of the CON repeating coil and through the CON-2 condenser (for a 20 cycle frequency ringing current) to ground potential.

The operation of the CHA relay has applied ringing potential to the primary windings of the CON repeating coil which by transformer action has induced a 20 cycle voltage across the secondary winding of the CON repeating coil. The operation of the line link frame and trunk link frame hold magnets has extended the tip and ring conductors over the calling subscriber line to the subscriber set. With the subscriber switchhook off-hook the tip and ring conductors will be connected together thru the switchhook contacts. Therefore, after the line link frame and trunk link frame hold magnet crosspoints have closed, the 20 cycle voltage induced in the secondary winding of the CON repeating coil will result in a current flow through the CON-2 condenser, through the CON repeating coil, through the previously described path to the "ART" lead and to the trunk link frame, through the closed trunk link frame and line link frame crosspoints, over the ring conductor of the subscriber line, through the subscriber set switchhook contacts, back over the tip conductor, through the closed line link frame and trunk link frame crosspoints to the marker "ATT" lead, and through the previously described contact path in the marker to ground potential.

The 20 cycle frequency ringing current flowing in the CON-2 capacitor, the COB repeating coil secondary and suvscriber tip and ring line conductors produces a voltage drop across the CON-2 condenser and another voltage drop across the subscriber line and other circuit elements to divide between the CON-2 capacitor and the subscriber line conductors the CON repeating coil secondary voltage. The voltage drop across the CON-2 capacitor is determined by the impedance of CON-2 capacitor is compared to the impedance of the subscriber line. With continuity over the continuity check path the impedance of the tip and ring conductors, both within the offices and on the subscriber line, is relatively low as compared with the impedance of the CON-2 capacitor at an alternating current frequency of 20 cycles and therefore the greater portion of the voltage of the CON repeating coil secondary is impressed across the CON-2 capacitor. This voltage across the CON-2 capacitor is sufficient to breakdown the control anode gap (terminal #1 to terminal #4) of the CON tube, which is connected across the CON-2 capacitor. The breakdown of the control anode gap results in the main anode gap (terminal #2 to terminal #4) becoming conductive and the CON and CON-3 relays operate in series with the tube conducting current. The operation of the CON-3 relay removes the continuity test current.

If there is an open condition at any of the crosspoints or in any of the cabling within the office in the continuity check path the 20 cycle ringing current which will flow will be very low, being controlled by the capacity and leakage of the switches and cables. Therefore, the voltage drop across the CON-2 capacitor due to this current flow will be very low and will be less than the voltage required to cause the breakdown of the control anode gap of the CON electronic tube and the CON and CON-3 relays will not operate.

If there is an open condition at the subscriber's set however, the continuity test may or may not be satisfied and the CON tube may or may not break down depending upon the capacity and leakage of the subscriber's line.

The operation of the CON relay with the GLH and LLC-1 relays operated, and the FLG-2 relay non-operated, will close an operating path through the CON coil to operate the CON-1 relay. After operating the CON-1 relay will lock operated with the LLC-1 relay operated.

7.5322 Operation of the RCTB and Release of the RCTA and RCT Relay

Continuity test of the calling subscriber line is made by the marker when it establishes the dialing connection. The marker is not informed which side of the line should be tested (for example, the originating subscriber may have 2-party flat rate service with the subscriber ringer assigned to the tip side of the line). Therefore continuity test is initially made over the ring side of the line with the marker supplying the return ground on the tip side. This arrangement generally gives successful continuity test because the originating subscriber has the receiver off the switchhook. However, the subscriber may have abandoned the call after the marker has been engaged by the line link marker connector. The abandoned call cannot be recognized until the channel is cut through to the register and its L relay fails to operate. Thus the marker makes continuity test to the line after the d-c bridge of the transmitter has been opened. If the line is individual class of service (bridged ringer) or is a party line with ring stations, continuity test will be successful, but if the calling subscriber is a tip party on a line with no ring stations assigned, the continuity test circuit, testing on the ring, will find no return to ground and the CON tube may not operate. The operation of the RCTB and the release of the RCT and RCT1 relays change the test from the ring to the tip side of the line for such a condition.

The release of the LXP relay with the LLC-1, DT2 and SL relays operated and with the LXP-1, SP and CON-1 relays released will operate the RCTB relay.

The operation of the RCTB starts the slow release of the RCTA. During this slow release the continuity test is applied to the ring side of the line as previously described. If continuity test is not successful because of an abandoned call as outlined above, the marker awaits the release of the RCTA. The release of the RCTA releases the RCT to transfer the continuity test to the tip conductor and the ground to the ring conductor of the line. Such an arrangement is to prevent false continuity failure records.

7.5323 Cancel Continuity Test and Operation of the CCT and CON-1 Relay

If it is desired, the continuity test may be cancelled by operating the CCT key on the Jack, Lamp and Key Circuit. The operation of the CCT key will operate in the marker to cancel the continuity test CCT relay. When the CCT relay is operated, the operation of the GLH relay, with the LLC-2 relay operated and the FLG-2 relay non-operated, will operate the CON-1 relay without the marker performing the continuity test. After the CON-1 relay has operated the marker will proceed in the same manner as if continuity test had been completed.

7.533 Double Connection Test

The double connection test will test the sleeve conductor associated with the selected connecting path for false ground potential as an indication of a double connection. If a double connection exists between the sleeve conductor associated with the selected connecting path and the sleeve conductor associated with some other busy channel the ground on the sleeve conductor of this busy channel will also place ground on the sleeve conductor of the selected channel. The double connection test isinitiated after the continuity test has been successfully completed.

7.5331 Operation of the GT-1 and GT-2 Relays

The operation of the CON-1 relay will operate the ground test GT-1 relay in series with the GT-2 relay. The operating path of the GT-1 relay is extended through the operated CON-1 relay contacts, through the non-operated SP relay contacts, through the operated SL relay contacts, through the non-operated LXP-1 and LXP relay contacts and through the operated LLC-1 relay to the ground potential which will operate the GT-1 and GT-2 relays.

7.5332 Operation of the DCT and DCT-1 Relays

The double connection test is made by the double connection test DCT relay which is operating checks that the sleeve conductor associated with the selected channel is grounded only by the ground potential supplied by the marker circuit.

The operation of the GT-1 relay has tranferred the holding ground for the hold magnets associated with the selected channel to a hold ground which has in series with it the primary winding of the DCT relay. The operation of the GT-1 relay has removed the ground potential which the marker has extended to the trunk link frame over the "LH-0/9" lead to ground the trunk link sleeve conductor and to operate and to hold operated the trunk link frame J-0/9 and T-0/9 hold magnets associated with the selected channel. The operation of the GT-1 relay has removed the ground potential, in series with the primary winding of the JT relay, which the marker had extended to the trunk link frame over the "J-0/9" lead to ground the junctor sleeve conductor and to operate the line link frame J-0/9 hold magnet associated with the selected channel. Also, the operation of the GT-1 relay has removed the ground potential, in series with the primary winding of the LXP relay, which the marker had extended to the line link frame over the "LH-0/4" lead to ground the sleeve conductor and to operate the line link frame L hold magnet associated with the calling subscriber. However, before removing the ground on the "LH-0/4" lead which has operated the line link frame L hold magnet the marker will place a ground, in series with the primary winding of the DCT relay, on the same "LH-0/4" lead to hold operate the line link frame and trunk link frame hold magnets associated with the selected channel.

One side of the primary winding of the DCT relay will be extended to ground potential with the LLC-2 relay operated and the XSL relay non-operated. The other side of the primary winding of the DCT relay will be extended through the operated HMS-1 relay contacts, through the operated GT-1 relay contacts, through the non-operated HMT-1 relay contacts, through the non-operated NTT relay contacts, through the operated FTK-1 relay contacts and the non-operated MT-11 relay contacts, through the operated VFT-0/4 relay contacts to place ground potential, in series with the primary winding of the DCT relay, on the one "LH-0/4" lead. This ground potential in series with the primary winding of the DCT relay, will be extended to hold operated the line link frame L hold magnet and extended over the sleeve conductor, with the line link frame L and J-0/9 hold magnet crosspoints closed and the trunk link frames J-0/9 and T-0/9 hold magnet crosspoints closed, to hold operated the line link frame J-0/9 hold magnet and the trunk link frame J-0/9 and T-0/9 hold magnets associated with the selected channel.

The hold magnet holding current will operate the DCT relay if the sleeve conductor associated with the selected channel has not been falsely grounded because of a double connection or any other cause. If the sleeve conductor associated with the selected channel has been falsely grounded, ground potential will be extended from the sleeve conductor to one side of the primary winding of the DCT relay. Since the other side of the primary winding of the DCT relay will also be connected to ground through the operated LLC-2 relay contact the DCT relay will fail to operate if the sleeve conductor is falsely grounded. The false ground will also be extended, to the secondary winding of the DCT relay to bias the DCT relay in the non-operated position.

The operation of the DCT relay will operate the DCT-1 relay which will lock operated to record a successful double connections test. The winding of the DCT-1 relay has been extended through the non-operated LK-1 relay contacts, through the operated RK-1 and RK-2 relay contacts, through the operated DT-2 relay contacts, through the non-operated SP relay contacts, through the DCT coil, through the non-operated MT-14 relay contacts, through the operated DCT, GT2, and CKG-4 relay contacts, through the non-operated GT-5, GT, and PU relay contacts to the ground potential which will operate the DCT-1 relay.

After operating the DCT-1 relay will lock operated with the CKG-4 relay operated.

7.54 Transfer of Connecting Path Supervision to Originating Register

After the selected connecting path channel has been set up by operating the associated select magnets and hold magnets and after the marker has performed the false cross and ground test if required, the continuity test and the double connection test on the selected connecting path, the marker circuit will release the operated trunk link and connector FA- relay. The release of the trunk link and connector FA- relay will extend the tip, ring and sleeve conductors of the selected connecting path from the trunk link frame to the selected originating register. When the sleeve conductor is extended to the originating register circuit the originating register will place ground potential on this sleeve conductor to hold operated the line link frame and trunk link frame hold magnets associated with the selected connecting path. Therefore the control of the connecting path will be transferred to the originating register circuit.

7.541 Release of the Originating Register F Relay and the Trunk Link and Connector FA- Relay

After the marker has completed successfully the false cross and ground test, if required, and the continuity test the marker will perform the double connection test which if satisfactory will operate the DCT-1 relay. The operation of the marker DCT-1 relay will release the F relay in the selected originating register circuit by removing the ground on the test group lead "TG-0/19" in the marker which has been extended from the marker, through the trunk link and connector circuit "TG-0/19" and "F" cross-connection terminals, over the "F" lead to operate the F relay in the originating register circuit, as described in paragraph 7.351.

The release of the originating register F relay will in turn release the trunk link and connector circuit FA- relay associated with the selected originating register circuit. The release of the FA- relay in the trunk link and connector circuit will transfer the tip, ring and sleeve conductors of the selected connecting path to the selected originating register circuit.

The release of the trunk link and connector FA- relay will extend from the originating register a ground potential thru a ten ohm resistance to the sleeve conductor thereby holding operated the dial tone connection hold magnets associated with the selected connecting path.

7.542 Release of the SL Relay and the DCT Relay

As a check that the FA- relay has released the SL relay will be released. The operation of the SL relay is described in paragraph 7.524.

Before releasing the ground potential supplied by the marker to hold operated the hold magnets associated with the selected path the marker will check that a holding ground has been extended from the register circuit to hold these hold magnets operated after the marker has released. When the hold magnet holding ground has been extended from the originating register circuit and over the sleeve conductor to the line link frame sleeve conductor the DCT relay will be released. The DCT relay has been operating in series with the hold magnets therefore the holding ground on the sleeve conductor will release the DCT relay by shunting its operating path. The release of the DCT relay will indicate that the holding ground has been extended from the register circuit to the hold magnets associated with the selected connecting path.

7.55 Transmitting Dial Tone to Subscriber

The originating register circuits will transmit a dial tone to the calling subscriber, if the calling subscriber is associated with a non-manual subscriber line, as an indication that the subscriber line has been extended to an originating register circuit which is providing supervision from the dial tone connection. The dial tone will be an indication to the calling subscriber to dial the called number. On coin-first subscriber lines the dial tone will not be transmitted until the originating register circuit has performed the coin test functions. On party subscriber lines the dial tone will not be transmitted until the party test functions have been performed by the originating register.

7.6 Release of the Marker and Associated Circuits

After the marker circuit has completely performed the dial tone connection functions, the marker circuit will be released from this dial tone condition and will be recycled to the idle condition so as to be available for assistance to other calls or connections.

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously, this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

7.61 Recycle of the Marker Release Control

7.661 Operation of the Linkage Check LK-1 Relay

Before the marker will give a release indication the marker will check that the connecting path or channel linkage between the calling subscriber line and the selected originating register circuit has been set up and has been tested to determine that it is in a condition for service.

The linkage check LK-1 relay will be operated when the DCT relay is released with the DCT-1, the CKG-4 and the GT-2 relays operated and the DCT-2 and TOG-2, ITR-2, GT-5, GT and PU relays released. The LK-1 relay will be locked operated with the CKG-4 relay operated.

After the linkage path has been checked the marker will be released to the idle condition.

7.612 Release of the LLC-1, LLC-2 and ONW Relays and the Operation of the DIS-1, DIS-2 and DISA Relays. (Fig. 32)

The operation of the linkage check LK-1 relay will release the LLC-1, LLC-2 and ONW relays. The operation of the LK-1 relay will also operate the disconnect DIS-1 and DIS-2 relays. The operating path for the DIS-1 and DIS-2 relays in series is extended from the winding of the DIS-1 relay over the "DIS-1" lead to the "DIS-1" lead with the MT-1, MON-1, TRL-1, TRR and TR1 relays non-operated, to the "TG" lead with the TG relay non-operated, to "DIS-1" lead if the HTR relay is either operated or non-operated, to the "DIS-1" lead with the RRK and RRC relays non-operated, to the "DIS-1" lead with the PSR relay non-operated, to the "LKK-2" lead with the TRS relay non-operated, to "LKK-1" lead with the GTL-4, GTL-3 and GTL-2 relays non-operated, to the "LK-2" lead with the RK-3 relay operated, to the "LK-3" lead with the FMK and FML relays operated, to the "LK2" with the MT-14 relay non-operated, to the "LK-2" lead with the ITR-2 relay non-operated, to the "LK-1" lead with the LHT relay non-operated and to operating ground potential with the LK-1 relay operated. The DIS-1 and DIS-2 relays will lock operated with the TRLA relay non-operated and the line link marker connector MA relay operated. The DIS-2 relay in operating will operate the DISA relay.

7.613 Release of the TLC-1, TLC-2, TLC-3, CKG-2, CKG-3, CKG-4, CKG-5, CKG-6, CKG-7, OC-1 or OC-2, R-, GLH, and GLH1 Relays

The operation of the DIS-1 and DIS-2 relays will release the TLC-1/3 CKG-2/3, CKG-6/7, OC-1 or OC-2 and R- Relays. The release of the CKG-3 relay will release the CKG-4/5 relays. The release of the CKG2 relay will release the GLH relay which will release the GLH1 relay.

7.614 Release of the Line Link Marker Connector MS and MA Relays

The operation of the DIS-1 relay will release the line link marker connector MS relay which in turn will release the line link marker connector MA relay associated with the releasing marker circuit.

7.615 Release of the DIS-1 and DIS-2 Relays

The release of the line link marker connector MA relay will release the DIS-1 and DIS-2 relays.

7.616 Release of the MCB-1/6 Relays and Line Link Marker Connector CB Relays

The release of the DIS-2 relay will release the MCB-1/6 relays which in turn will release the CB relays associated with this marker circuit in all marker connector circuits. The release of the CB relays associated with this marker circuit in all marker connectors will indicate to all marker connectors that this marker has been released and is now idle and available and that any marker connector circuit may select and seize this marker for service.

7.617 Release of the DISA Relay

The release of the MCB-1 relay will release the DISA relay.

7.62 Release of the Identifications of the Connection Functions

7.621 Release of the D, MF or MLF Relay

The release of the line link marker connector MS relay will release the D, MF or MLF relay.

7.622 Release of the DT-1, DT-2, and DT-3 Relays

The release of the D, MF or MLF relay will release the DT-1, DT-2, and DT-3 relays.

7.623 Release of the Line Link Marker Connector MB Relay

The release of the line link marker connector MA relay will release the line link marker connector MB relay.

7.63 Release of the Identification of the Calling Line Functions

7.631 Release of the GTL-1, GTU, FT-0/3, FTB-0/3, FU-0/7 and FUT-0/9 Relays

The operation of the DCT-1 relay, as explained in paragraph 7.53 will release the GTL-1 relay which in turn will release the GTU relay. The release of the GTU relay will release the FT-0/3 relay which in turn will release the operated FTB-0/3 relay. The release of the GTU relay will also release the two operated FU-0/7 relays which in turn will release the operated FUT-0/9 relay.

7.632 Release of the GK, VGT-0/11, HGT-0/9, VFT-0/4, VTK, HTK, FTK, VTK-1, HTK-1 and FTK-1 Relays

The operation of the HMS-1 relay will release the GK relay. The release of the operated D, MF and MLF relay will release the operated VGT-0/11, HGT-0/9 and VFT-0/4 relays and the VTK, HTK and FTK relays. The release of the operated VGT-0/11, HGT-0/9 and VFT-0/4 relays will release the VTK-1, HTK-1 and FTK-1 relays.

7.633 Release of the Line Link and Connector MP, MCA, MCB VGA-0/11, VGB-0/11, HG-0/9 and LG-0/11 Relays

The release of the LLC-1 relay will release the line link and connector MP, MCA, MCB, HG-09 and LG-0/11 relays. The release of the line link and connector MCA relay will release the VGB-0/11 relay. The operation of the DIS-1 relay will release the line link and connector VGA-0/11 relay.

7.634 Release of CS-0/29 Relay

The release of the LLC-1 relay will release the operated CS-0/29 relay.

7.635 Release of the VG-0/10, HG-0/7, VF-0/4, CTO/2 and CU-0/7 Relays

The release of the F relay, as described in paragraph 7.54, in the selected originating register to which the marker is connected will release the F1 relay in the same originating register. The release of the originating register F1 relay will release the operated VG-0/10, HG-0/7, VF-0/4, CT-0/2 and CU-0/7 relays.

7.636 Release of the RK-1, RK-2 and RK-3 Relays

The release of any of the operated VG-0/10, HG-0/7, VF-0/4, CT-0/2 or CU-0/7 relays will release the RK-1 and RK-2 relays. The release of the CKG-2 relay will release the RYC relay which in turn will release the RK-3 relay.

7.64 Release of the Originating Register Selection Functions

7.641 Release of the FC-, FCA-, FCK, FCKA and FS- Relays

The release of the operated route R-relay will release the FC- and FCA- relays which in turn will release the FCK and FCKA relays. The release of the FCK and FCKA relays will release the operated FS- relay.

7.642 Release of the FTC- and FTCK Relays

All FTC- relays which are operated will be released when the FC- and FCA-relays are released. The release of the FTC- relays will release the FTCK relay.

7.643 Release of the Trunk Link and Connector MP, MC, MCA, MCB, MCC and MCD Relays

The release of the TLC-1 relay will release the trunk link and connector MP, MCA, MCB, MCC and MCD relays. The release of the trunk link and connector circuit MP relay will release the trunk link and connector circuit MC relay.

7.644 Release of the TFK-1, TFK-2, MAK-1 and MDK Relays

The release of the trunk link and connector circuit MP relay will release the TFK-1 and TFK-2 relays. The release of the trunk link and connector circuit MCA relay will release the MAK-1 relay and the release of the trunk link and connector circuit MCD relay will release the MDK relay.

7.645 Release of the TB-0/5, TG-0/9 and TS-0/19 Relays

The release of the operated route R- relay will release the operated TB-0/5 relay and the operated TG-0/19 relay. The release of the TLC-2 relay will release the operated TS-0/19 relay.

7.646 Release of the Trunk Link and Connector TB-0/5, LV-2/9 and LC-0/9 Relays

The release of the operated TB-0/5 relay in the marker circuit will release the associated TB-0/5 relay in the trunk link and connector circuit. The release of the trunk link and connector circuit FA relay as described in paragraph 7.54, will release the operated LV-2/9 and LC-0/9 relays.

7.647 Release of the TBK and LCK Relays

The release of the TB-0/5 relay in the trunk link and connector circuit will release the TBK relay and the release of the LC-0/9 relay in the trunk link and connector circuit will release the LCK relay.

7.648 Release of the FMK and FML Relays

The release of the D or MF relay will release the FMK relay. The release of the TFK-1 relay will release the FML relay.

7.65 Release of the Selection of the Connecting Path Functions

7.651 Release of the STF, PR 2TLF/10TLF, 20F, 40F, 7Q, P-0/9, 2G, 3G, PNR, PA, PB, PC, TCH-0/9, TCHK, JG-0/4, and JCK-0/1 Relays

The release of the trunk link and connector MCC relay, described in paragraph 7.643, will release the STF or PR relay and the operated 2TLF/10TLF relay. The release of the STF or PR relay will release the 20F relay and the release of the operated 2TLF/10TLF will release the 7Q or RQ relay, if operated.

The release of the FUT-0/3 relay; described in paragraph 7.631, will release the operated P-0/9 relay which will in turn release the 2G or 3G relay, if operated.

The release of the LLC-1 or ONW relay, described in paragraph 7.612 will release the STP-1 or STP-2 relay. The release of the operated STP-1 or STP-2 relay will release the PNR, PA, PB, PC and JG-0/4 relays. The release of the operated PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the trunk link and connector JC-0/9 relay will release the JCK-0/1 relays.

7.652 Release of the Trunk Link and Connector G-0/4, RF, EF, JC-0/19, L, EL, R and ER Relays

The release of the marker JG-0/4 relay will release the operated trunk link and connector JC-0/19, G-0/4, RF, EF, L, EL, R and ER relays.

7.653 Release of the TLL-0/9, TJ-0/9, TTL-0/9, TK, CHT, CHA and CH-0/9 Relays

The release of the line link frame HG-0/9 relay will release the TLL-0/9 relays. The release of the trunk link frame MCB relay will release the TJ-0/9 relay. The release of the trunk link frame LC-0/9 relay will release the TTL-0/9 relays. The release of the LLC-1 relay will release the CH-0/9 and CHA relays. The release of the LLC2 relay will release the HMS-1 relay which in turn will release the TK relay. The TK relay in releasing will release the CHT relay.

7.66 Release of the Setting Up of the Connecting Path Functions

7.661 Release of the Line Link and Trunk Link Frame Select Magnets

The operation of the DCT-1 relay will release the ONX relay which in turn will release the operated select magnets on the line link frame line and junctor switches and on the trunk link frame junctor and trunk switches.

7.662 Release of the HMS-1, and SL Relays

The release of the LLC2 relay will release the HMS-1 relay. The release of the trunk link and connector circuit FA or FB relay, described in paragraph 7.54, will release the SL relay.

7.663 Release of the CON-1, GT-1, GT-2 and DCT-1 Relays

The release of the LLC-1 relay will release the CON-1 relay which in turn will release the GT-1 and GT-2 relays. The release of the CKG-3 will release the CKG-4 which will release the DCT-1 relay.

8. INTRAOFFICE CALL, NON-REVERTING, NON-AMA

The marker circuit when assisting the completion of an intraoffice, non-reverting, non-AMA, call performs or assists in the performance of twelve major functions as follows:

a. Registration of information from the originating register which the marker requires in assisting an intraoffice call.

b. The identification of the call or connection which the marker will assist.

c. The selection of an available idle, intraoffice, non-reverting, trunk circuit.

d. The identification of the location of the called subscriber line.

e. The called subscriber line busy test.

f. The selection of an idle connecting path between the called subscriber line and the selected intraoffice trunk.

g. Connecting the called subscriber line to the selected intraoffice trunk through the selected connecting path.

h. Setting up the selected ringing code.

i. The release of the selection of the connecting path to the called line.

j. The selection of an idle connecting path between the calling subscriber line and the selected intraoffice trunk.

k. Connecting the calling subscriber line to the selected intraoffice trunk through the selected connecting path.

l. Release of the marker and associated circuits after the marker has completed the intraoffice, non-reverting, call functions.

8.01 Seizure of the Marker by the Originating Register

After the calling subscriber has dialed into the originating register the complete number of the called subscriber the originating register will seize the originating register marker connector with which it is associated if that originating register marker connector is idle. Since the originating register marker connector will not be provided on a one per originating register basis but instead will be provided on the basis of one originating register marker connector for a number of originating registers it is necessary for any originating register in attempting to seize its associated originating register marker connector to compete with the other originating registers associated with this originating register marker connector. If the originating register marker connector is busy the originating register must wait until it is idle before proceeding since no alternate originating register marker connector is available.

The originating register marker connector will have access to any marker and will test for and select an idle marker which will be seized and associated with the originating register marker connector and originating register.

8.011 Operation of Originating Register MST Relay and the Register Marker Connector RS, RA, RB, RC, RD, MS, MA, MB, MC and MD Relays

When the originating register desires to have access to a marker through its associated originating register marker connector the marker start MST relay in the originating register is operated. If the associated originating register marker connector is idle and available the operation of the MST relay in the originating register will seize the originating register marker connector and operate the register start RS relay in the originating register marker connector associated with this originating register. The operation of the RS relay associated with this originating register will lock-out all other originating registers associated with this originating register marker connector.

If the originating register marker connector associated with the originating register is not available, the originating register must wait until it becomes available.

The operation of the RS relay will operate the originating register marker connector RA and RC relays. The RA in turn will operate the RB and RD relays associated with this originating register. The operation of the RA, RB, RC and RD relays will extend a group of leads from the originating register to the associated originating register marker connector.

The operation of the originating register marker connector RD relay will extend a start lead through the non-operated CB relay in the originating register marker connector to operate a marker start MS relay associated with an idle and available marker. In each originating register marker connector there is one MS relay for each marker circuit to which the originating register marker connector may require access. By the operation of an MS relay associated with an idle and preferred marker the originating register marker connector will select the marker circuit from which assistance is desired for this connection. The arrangement of the CB and MS relays in the originating register marker connector is similar to the arrangement of these relays in the line link marker connector.

The operation of the MS relay will operate the originating register marker connector MA and MC relays which in turn will operate the MB and MD relays associated with the selected marker. The operation of the MA, MB, MC and MD relays extend a group of leads from the originating register marker connector to the selected marker and with the RA, RB, RC and RD relays operated will further extend a group of leads from the originating register to the selected marker.

8.012 Operation of the CKG-1, CKG-2, CKG-3, CKG-4, CKG-5, CKG-6, CKG-7, TLC-1, TLC-2, TLC-3, LLC-1, LLC-2, OR, GTL, GTL-2, GTL-3, GTL-4 ONW, and FSA Relays

To provide a large number of off-normal grounds and battery potentials to the marker circuit and to interconnect certain functional units in the process of assisting an intraoffice call, the CKG-1, CKG-2, CKG-3, CKG-4, CKG-5, CKG-6, CKG-7, TLC-1, TLC-2, TLC-3, ONW, LLC-1, LLC-2, OR GTL, GTL-2, GTL-3, and GTL-4 relays in the marker circuit will be operated.

The operation of the originating register marker connector MA relay will ground the "CKG" lead in the register marker connector. The "CKG" lead is extended to the marker circuit and with the TRLA, DIS-1 and DIS-2 relays non-operated the ground on the "CKG" lead will be extended to operate the CKG-1, CKG-2 and CKG-3 relays.

The operation of the CKG-3 relay will operate the CKG-4 relay, with the GP-2, RCY-1 and RAV-2 relays non-operated.

The operation of the CKG-3 relay will also operate the CKG-5 relay and the CKG-6 and CKG-7 relays.

The TLC-1, TLC-2 and TLC-3 relay windings in series are extended over the "TLC-1" lead thru the non-operated MRL-1 relay, over the "TLC-1" lead to the "TLC" lead. The operation of the CKG-3 relay with the DIS-1, TRLA RAV-1, and RCY relays non-operated will ground the "TLC" lead thereby operating the TLC-1, TLC-2 and TLC-3 relays.

The LLC-1, LLC-2 and ONW relay windings in series are extended over the "LLC-1" lead. The released condition of the MRL-1 relay will extend the "LLC-1" lead to the "LLC-A" lead and the DIS-1 and TRLA relays released will extend the "LLC-A" lead to the "LLC" lead. The release condition of the BY and OV relays will extend the "LLC" lead and the operation of the CKG-4 and CKG-5 relays with the LK-1 and RCY-2 relays released will ground the "LLC" lead thereby operating the LLC-1, LLC-2 and ONW relays.

The operation of the CKG-1 relay with all the FS- relays non-operate will operate the FSA relay. After operating, the FSA relay will lock operated through its own make contact, through the NGK-1 relay non-operated, through the CKG-1 relay operated to ground.

The operation of the originating register marker connector MA and RA relays will operate the SCK and PK relays in the marker.

The operation of the originating register marker connector MA relay will ground the "OR" lead to the marker. If the tandem screening feature is not equipped, the grounded "OR" lead will operate the originating register call, OR relay in the marker. If the tandem screening feature is equipped, the grounded "OR" lead will operate the originating class, OROA relay, in the marker which in turn will operate the OR relay to identify the call is an originating register call.

The operation of the OR relay with the CKG-6 relay operated will operate the GTL relay which in turn will operate the GTL-2, GTL-3 and GTL-4 relays when the DIS-2 relay is non-operated.

8.013 Operation of the MCB-1/6 Relays and the Operation of the CB Relays in the Marker Connectors

The MCB-1/6 relays in the marker and the CB relays in the marker connectors are operated as described for the dial tone connection in paragraphs 7.16 and 7.17.

8.02 Registration of Information From the Originating Register

After the seizure of the marker the class of service identification of the calling line, the called line office code and the numericals and the calling line identification will be transmitted from the originating register to the marker circuit.

8.021 Class of Service Identification

The class of service identification is needed by the marker not only to properly charge the calling subscriber for the call but is also needed to correctly route the call. For example, if certain intraoffice trunks are of the non-coin variety and others are of the coin type it will be necessary for the marker to know when the call is originated from a coin line subscriber so that the call may be correctly routed thru the intraoffice coin trunk. Also certain subscribers with extended area dialing privileges may directly dial certain areas whereas other subscribers without the extended area dialing privileges must be denied direct dial services to certain areas and should get access to the denied areas only thru an operator so as to be correctly charged for the call. Therefore, before the marker can correctly route a call the marker must be informed of the class of service of the calling line.

8.0211 Operation of CTA-0/2 and CU-0/7 Relays

The operation of the originating register marker connector MA and MC relays have extended a group of three class tens "CTA-0/2" leads and a group of five class units "CU-0/7" leads from the marker to the originating register marker connector and the operation of the originating register marker connector RA and RC relays have further extended these "CTA-0/2" and "CU-0/7" leads to the originating register circuit. The originating register circuit has placed ground on one of the "CTA-0/2" leads thereby operating one CTA-0/2 relay in the marker to indicate the tens digit of the class of service of the calling line and has also placed ground on two of the "CU-0/7" leads thereby operating two CU-0/7 relays in the marker to indicate the units digit of the class of service. The two CU-0/7 relays will be operated according to the "two-out-of-five" code as described in paragraph 7.2731.

8.0212 Operation of the S-, PSA, PSB, PSA-0/1, and PSB-0/1 Relays

The operation of one CTA-0/2 relay and two CU-0/7 relays with the CKG-1 relay operated will ground the one associated cross-connection terminal "SWC-0/29". Each "SWC-0/29" cross-connection terminal associated with a class of service from which a class of service indication is required for this office will be cross-connected to one or more "SW-00/44", "SW-100-144" cross-connection terminal or terminals. Therefore the one or more S-relay associated with the class of service of the calling subscriber will be operated.

In certain offices there may be two-party lines having parties that require different class of service treatment. Since both parties on a two-party line will give the same class of service information from the line link frame and since the same class of service CTA-0/2 and CU-0/7 relays will be operated in the marker, special marker cross-connections must be made to obtain different class of service treatment and to operate different S- relays for each party. To obtain this different class of service treatment for two-party lines the following cross-connections are made. The class of service which is associated with a two-party line which requires different service treatment is associated with a "SWC-0/29" cross-connection terminal which should be connected to the "SWP", "SWP1", "SWP2" or "SWP3" cross-connection terminal. With the tip party TP relay operated the "SWP", "SWP1", "SWP2" and "SWP3" cross-connection terminals will be connected to the "SWT", "SWT1", "SWT2" and "SWT3" cross-connection terminals respectively. With the ring party RP relay operated the "SWP", "SWP1", "SWP2" and"SWP3" cross-connection terminals will be connected to the "SWR", "SWR1", "SWR2" and "SWR3" cross-connection terminals respectively. Each "SWT", "SWT1", "SWT2", "SWT3", "SWR", "SWR1", "SWR2" and "SWR3" cross-connection terminal will be cross-connected to a "SWC-0/29" cross-connection terminal which is associated with the desired class of service treatment and which is cross-connected to the proper class of service treatment S- relay. The tip party TP relay or ring party RP relay will be operated from information received from the originating register which has made tests to determine which party on the subscriber line requires service.

In certain offices, where two class groups, such as coin and non-coin require separate trunk groups to the same termination a presort feature is employed to reduce the number of cross-connections to contacts of the S- relays. When this feature is equipped, a PSA or PSB relay is operated in series with the S- relays for each class group. The operated PSA or PSB will in turn operate relays PSAO-1 and PSBO-1 respectively. Cross-connections to contacts on PSAO-1 and PSBO-1 will indicate the proper routing for each of the two classes.

8.022 Office Code and Number of Called Line

The office code of the called line will be transmitted from the originating register to the marker where a group of register relays will be operated to indicate the office code. The particular number register relays in the marker which will be required to associate the called number relay with the proper digits incoming from the register will be determined by the area numbering plan.

8.0221 Operation of ACO/7, BCO/7, and CCO/7 relays.

A group of register relays ACO/7, BCO/7, CCO/7 will record the first three digits of the called subscriber number.

The operation of the originating register marker connector MA and RA relays will extend a group of leads designated "AO/7," "BO/7", and "CO/7" from the originating register to the marker. The originating register will place ground on two of the "AO/7" leads to identify the first digit, on two of the "BO/7" leads to identify the second digit and on two of the "CO/7" leads to identify the third digit. Therefore two ACO/7 relays two BCO/7 relays, and two CCO/7 relays will be operated. These relays change the two out of five input from the register to a one-out-of ten output for use in the marker translator.

8.0222 Identification of the Numericals of the Called Line

The operation of the originating register marker connector MA, MB, RA and RB relays will extend a number of groups of leads designated "BO/7", "CO/7", "DO/7" and where required "EO/7", "FO/7", "GO/7" from the originating register to the marker. The originating register will place ground on two leads of each group of leads to identify the digits. These grounded leads will later be used to operate the TH-O/7, HN-O/7, T-O/7 and U-O/7 relays, as described in paragraph 8.0412, to identify the numerical digits of the called line.

8.023 Calling Line Identification

The calling line identification will be transmitted from the originating register to the marker. The calling line identification will be determined by the line link frames tens, the line link frame units, the vertical group, the horizontal group and the vertical file identification.

8.0231 Operation of FTO/3, FUO/7 Relays

The originating register will transmit the line link frame identification of the calling line by placing ground on one of the frame tens, "FT-O/3" leads and by placing ground on two of the "FU-O/7" leads which are extended from the originating register to the marker. With the GTL-2 relay in the marker operated and the MC, MD, RC, and RD relays in the originating register marker connector operated, the "FT-O/3" and "FU-O/7" leads will be extended to operate one FT-O/3 relay and two FUO/7 relays to identify the line link frame of the calling subscriber's line according to the code as described in paragraphs 7.211 and 7.212.

8.0232 Operation of BG-O/10, HGO/7 and VFO/4 Relays

The originating register will transmit the equipment location of the calling subscriber's line on the line link frame by placing ground on two of the vertical group "VGO/10" leads, on two of the horizontal group "HGO/7" leads and on one of the vertical file "VFO-4" leads which are extended from the originating register to the marker. With the GTL-3 and GTL-4 relays in the marker operated and the MC, MD, RC and RD relays of the originating register marker connector operated, the "VGO/10" "HGO/7" and "VFO/4" leads will be extended to operate two VGO/10 relays, two HGO/7 relays and one VFO/4 relay to identify the equipment location according to the code as described in paragraph 7.2721.

8.03 Identification of the Basic Call or Connection

To determine the routing the call is to take (whether intra-office or outgoing), the marker must examine the office code portion of the dialed number. This identification is called "translation" and in effect filters an input of one, two, or three digits through relays in such a manner as to ground one code point in a set of approximately one thousand to indicate the office destination represented by the dialed office code.

For the purpose of indicating to the marker the number of digits to be translated, a set of three translator control relays TC5, 6, 7 are equipped in the marker and operated from the originating register when the register calls for local translation by grounding the "LT" terminal of Figure 38 thru the originating register marker connector MA and RA relays.

8.031 Operation of the TC5, 6, 7 relays

To indicate to the marker which of the dialed digits represent the office code one of the translator control TC5, 6, 7 relays will be operated as follows:

1. Where no local office code digit is employed.

For a called subscriber number consisting of four numericals only, the "LT" terminal of Fig. 38 will be cross-connected to terminal "TC5" of the same figure, thereby operating the TC5 relay when the originating register calls for local translation.

2. Where single digit local office codes are employed.

For a called subscriber number consisting of a single office code digit and four numericals, the "LT" terminal of Fig. 38 will be cross-connected to terminal "TC5" of the same figure thereby operating the TC5 relay when the originating register calls for local translation.

3. Where two digit local office codes are employed.

a. If the local office code consists of two digits, the "LT" terminal of Fig. 38 will be cross-connected to the "TC6" terminal of the same figure, thereby operating the TC6 relay when the originating register calls for local translation.

4. Where three digit local office codes are employed.

If the local office code consists of three digits, the "LT" terminal of Fig. 38 will be cross-connected to the "TC7" terminal of the same figure, thereby operating the TC7 relay when the originating register calls for local translation.

8.032 Translation of the office code digits

Translation is accomplished by using the one-out-of-ten output of the ACO/7, BCO/7, and CCO/7 relays. This decimal output is steered by the translator control relays to operate the proper translator relays AT2/9 and BT22/99 as necessary. The outputs of the translator circuits are the code points previously mentioned. The result of the translation - a single grounded code point - will indicate the office destination of the dialed office code. In this call, the grounded code point will correspond to one of the local office codes and therefore the call will be determined to be an intra-office call.

1. Where no local office code digit is employed.

(TC5 relay operated as described in paragraph 8.031-1)

a. If the local area codes consist of a single digit, no further translation is necessary, and terminals "C2-9" associated with the local area codes will be connected as code points. Terminals "C2-9" corresponding to the used thousands digits of the local office will be strapped and connected as a single code point.

b. If the local area codes consist of one or two digits and some of the single digit codes conflict with the initial digit of the two-digit codes, terminals "AT2/9" associated with the conflicting digits will be connected to correspondingly numbered terminals "C2-9" to operate the associated AT2/9 relay when that "A" digit lead is grounded. The grounded "B" digit lead will then be extended through the operated AT2/9 relay to ground a single code point of the "C22-99" group. In this case, all code points bearing the numerals of the two-digit codes shall be connected as code points. All terminals bearing similar "A" digits, not representing two-digit codes shall be strapped and connected as single code points.

2. Where single digit local office codes are employed.

(TC5 relay operated as described in paragraph 8.031-2)

a. If the local area codes consist of single digit codes only, no further translation is required and terminals "C2-9" at the TC5 relay will be connected as code points.

b. If the local area codes consist of one or two digits and some of the single digit codes conflict with the two-digit codes, terminals "AT2/9" associated with the conflicting digits will be connected to correspondingly numbered "C2-9" terminals, to operate the associated AT2/9 relay when the "A" digit lead is grounded. The grounded "B" digit lead will then be extended through the operated AT2/9 relay to ground a single code point of the "C22-99" group. In this case, all code points bearing the numerals of the two-digit codes shall be connected as code points. All terminals bearing similar "A" digits, not representing two-digit codes shall be strapped and connected as single code points.

3. Where two-digit local office codes are employed.

(TC6 relay operated as described in paragraph 8.031-3)

a. If the local area codes consist of two digits, the "AT2/9" terminals will be connected to terminals "6A2/9" to operate the AT2/9 relays when the correspondingly numbered "A" digit lead is grounded. The grounded "B" digit lead will be extended through the operated AT2/9 relay to ground a single two-digit code point in the C22-99 group.

b. If the local area codes consist of two and three-digit codes and no two and three-digit codes conflict, the "AT2/9" terminals will be connected to terminals "6A2-9" to operate an AT2/9 relay when an "A" digit lead is grounded. The "C22-99" terminals associated with the two-digit codes shall be connected as code points. The terminals in this group bearing the AB digits of the three-digit codes employed shall be connected to correspondingly numbered terminals "BT22/99" to operate the associated "BT22/99" relay. The grounded "C" digit lead will then be extended through the operated BT22/99 relays to ground a single code point of the "C220-999" group.

c. If the local area codes consist of two and three-digit codes and some of the two-digit codes conflict with three-digit codes, the "AT2/9" terminals will be connected to terminals "6A2/9" to operate an AT2/9 relay when an "A" digit lead is ground. The C22/99" terminal associated with non-conflicting two-digit codes shall be connected as code points. The "C22-99" punchings associated with three digit codes and conflicting two and three-digit codes shall be connected to correspondingly numbered "BT22/99" terminals to operate the associated BT22/99 relays. The grounded "C" lead will then be extended through the operated BT22/99 relay to ground a single code point of the "C220-999" group. All terminals bearing similar "AB" digits, not representing three-digit codes shall be strapped and connected as single code points for two-digit codes.

4. Where three-digit local office codes are employed.

(TC7 relay operated as described in paragraph 8.031-4)

a. If the local area codes consist of three digits, terminals "7A2/9" will be connected to terminals "AT2/9" to operate an AT2/9 relay when an "A" digit lead is grounded. Terminals "C22-99" will be connected to terminals "BT22/99" to operate a BT22/99 relay from the grounded "B" digit lead. The grounded "C" digit lead will be extended through the operated BT22/99 relay to ground one of the "C220-999" terminals which will be connected as code points.

b. If the local area codes consist of two and three-digit codes and none of the codes conflict, the "AT2/9" terminals will be connected to the "7A2/9" terminals to operate an AT2/9 relay. The "C22-99" terminals associated with the two-digits codes will be connected as code points. The terminals in this group bearing the AB digits of the three-digit codes will be connected to terminals "BT22/99 to operate a BT22/99. The grounded "C" digit lead will be extended through the operated BT22/99 relay to ground one of the "C220-999" terminals which will be connected as code points.

c. If the local area codes consist of two and three-digit codes and some of the codes conflict, the "7A2/9" terminals will be connected to terminals "AT2/9" to operate the AT2/9 relays. The "C22-99" terminals associated with non-conflicting two-digit codes will be connected as code points. The "C22-99" terminals associated with three-digit codes and conflicting two-digit codes will be connected to the corresponding "BT22/99" terminals to operate the BT22/99 relays. The grounded "C" digit lead will then ground one of "C220-999" terminals. All terminals in this group associated with three-digit codes shall be connected as code points. All terminals bearing similar AB digits not representing three-digit codes shall be strapped and connected as single code points for two-digit codes.

8.033 Operation of the LPA, LPB, LTA or LTB Relay

The code point or code points associated with the local office code or codes will be cross-connected so as to operate one of the LPA, LPB, LTA or LTB relays when the code point is grounded by the translator on an intraoffice call. Since it may be desirable to provide four local office codes because of charging area plan or numbering plan limitations the LPA, LPB, LTA or LTB relays are provided. For each of the local office codes one of the LPA, LPB, LTA or LTB relays will be provided. Normally, with only one local office code associated with an office, only the local physical office "A" LPA relay is provided. Where required the local physical office "B" LPB relay, the local theoretical office "A" LTA relay, and the local theoretical office "B" LTB relay will be provided.

The "AP" cross-connection terminal of Figure 44 associated with the LPA relay should be cross-connected to the code point associated with this local office code. Also, if required, the "BP" cross-connection terminal associated with the LPB relay, the "AT" cross-connection terminal associated with the LTB relay should be cross-connected to the associated local office code points.

The operation of the CKG-1 relay and the AC-0/7 and where required the BC-0/7, the CC-0/7, the AT-2/9 and the BT-20/99 relay will place ground on the code point thereby operating one of the LPA, LPB, LTA or LTB relays. The operated LPA, LPB, LTA or LTB relay identifies the call as an intraoffice call and informs the marker to perform the functions necessary for assisting an intraoffice call.

8.034 Operation of the Route R- Relay

The operation of the LPA, LPB, LTA or LTB relay has identified the call as an intraoffice call. However, before the marker can proceed to select an intraoffice trunk and a connecting channel between the called subscriber and calling subscriber the marker must determine the route and type of equipment which can provide the proper service for this call. For example, a calling subscriber with a coin class of service must be routed through an intraoffice trunk which is equipped to provide coin service and supervision. Usually therefore, there will be provided more than one route R- relay associated with intraoffice calls, the number depending upon the number of intraoffice routes required within the office. The operation of the class of service S-00/44, S-100/144 relay or relays associated with the class of service of the calling subscriber will select the particular intraoffice route which is required for this call and which will result in the operation of the associated route R- relay.

For a typical office the cross-connections for operating the route R- relay are as follows.

The operation of the CKG-1 relay with the DIS-2 relay non-operated will extend ground over the "CGD" lead and the operation of the OR relay will further extend the ground to the "RG" lead. The operation of one of the LPA, LPB, LTA or LTB relays will extend the ground on the "RG" lead to the associated "APR" or if provided the "BPR", "ATR" or "BTR" cross-connecting terminal. The "APR" and if provided the "BPR", "ATR" and "BTR" cross-connection terminals of Figure 44 will be cross-connected to associated "SC-" cross-connection terminals of Figure 61 or "PSC-" cross-connection terminals of Figure 135. The operation of a particular S00-44, S100-44, PSAO-1 or PSBO-1 relay associated with the class of service of the calling subscriber will extend the ground on the "APR", "BPR", "ATR" or "BTR" cross-connection terminal to the one particular "S-", "PSA-" or "PSB-" cross-connection terminal associated with the intraoffice call and with the class of service of the calling subscriber. The "S-", "PSA-" or "PSB-" cross-connection terminals will be cross-connected to the associated "RC" cross-connection terminals of Figure 51, thereby extending the ground from the "S-", "PSA-" or "PSB-" terminal to operate the route, R-, relay associated with an intraoffice call and with the class of service of the calling subscriber.

If the class of service distinction is not necessary when selecting the particular intraoffice R- relay which should be operated, the "APR", "BPR", "ATR" or "BTR" cross-connection terminal would be cross-connected to the associated "RC" cross-connection terminal and the "SC-", "S-", "PSC-", "PSA-", "PSB-" cross-connection terminals would not be required for operating the intraoffice, R-, relay.

The "R-" cross-connection terminal associated with the winding of the intraoffice route R- relay may be cross-connected to the "RB" cross-connection terminal of Figure 53, to the "NN", "NC", "TC" or "TN" cross-connection terminal of Figure 53 as described in Paragraph 26, or to the "MBS-0/9" cross-connection terminal of Figure 56. If the "R-" cross-connection terminal is connected to the "NN", "NC", "TC", "TN" or "MBS-0/9" cross-connection terminal the intraoffice route R- relay operating path will be through the winding of one of the route series NCNC, NCCN, TCNC, TCCN or MBS-0/9 relays which will also operate with the R- relay to provide information to the marker.

8.035 Operation of the NSI and ITR-1/3 Relays

The operation of the route relay on an intraoffice call, which does not require AMA, results in the operation of the no sender intraoffice NSI relay indicating to the marker than an outgoing sender is not required on this type of call. The non-operated RTST, LR and RCY relays have extended ground over the "OS" lead, thru the non-operated GS-1/5 relay associated with the intraoffice route relay, thru the operated intraoffice route R- to the associated "OS" cross-connection terminal.

When the two-step allotter is required for the selection of an intraoffice trunk the "OS" cross-connection terminal of Figure 64 where the operation of the GPA or GPB relay, as described in Paragraph 8.0513, will extend ground on the "OS" cross-connection terminal to the associated "OSA-0/3" or "OSB-0/3" cross-connection terminal. The "OSA-0/3" or "OSB-0/3" cross-connection terminals associated with the intraoffice call will be cross-connected to the "NSI" cross-connection terminal of Figure 33 thereby operating the NSI relay when the GPA or GPB relay operates.

When the two-step allotter is not required for the selection of an intraoffice trunk, the "OS" cross-connection terminal is connected to the "NSI" cross-connection terminal of Figure 33 thereby operating the NSI relay when the R- relay operates.

The operation of the NSI relay will operate the ITR-1/3 relays to direct the marker to perform functions required in assisting an intraoffice call. The windings of the ITR-3 relay, the ITR-2 relay and the ITR-1 relay are in series with each other and the operating path will be extended over the "ITR-1" lead, thru the operated OR relay, thru the operated NSI relay, with the RTST and LR relays non-operated thru the non-operated TR2E relay and over the "TRK" lead to the originating register marker connector circuit where the "TRK" lead is grounded when the originating register marker connector MC relay is operated and the TR-1 relay non-operated.

8.04 Identification of the Location of the Called Line

The marker will select and seize a number group circuit and transmit the called directory number to the number group. The number group circuit will translate the called directory numerical digits into called line location in terms of the line link frame number, vertical group, horizontal group and vertical file with which the called line is associated on the line link frame. The number group will transmit this line location information to the marker. The number group will also transmit to the marker the identification of the proper ringing code for the called subscriber.

8.041 Selection and connection to the number group

In general, before seizure of the number group is attempted, the marker must seize a trunk link frame. However, in the case of an intraoffice call, marker holding time may be reduced by allowing the marker to attempt a number group seizure while attempting a trunk link frame seizure if the marker fails to obtain a trunk link frame before completing its number group seizure, it will release the number group for use by other markers and await a trunk link frame seizure before attempting another number group seizure.

Each number group is equipped to assist in the translation of 1000 directory numbers. Therefore, there will be one number group assigned to each series of 1000 directory numbers. The marker by examining the thousands digit of the called directory number will determine the particular number group circuit which is required.

8.0411 Operation of the FLG, FLG-1, NGC, SNG-1/2, LLI, VGL-1/2 HGL-1, VFL-1, UC and CBF Relays

To initiate the identification of the location of the called line the first linkage FLG and FLG-1 relays the seize number group SNG-1/2 relays and the NGC relay will be operated. The operation of the ITR-2 relay with the CKG-3 relay operated and the LK-1 relay non-operated will operate the FLG relay. With the RCY-3 non-operated the operating ground of the FLG relay will be extended to operate the FLG-1 relay. The operation of the FLG-1 relay with the RNG relay non-operated will operate the number group control NGC relay.

The operation of the FLG relay will operate the SNG-1 and SNG-2 relays when the TNR, RNG, PUL, RCY-2, CKO and MRL-1 relays are non-operated.

The operation of the FLG-1 relay with the PUL and CKO relays non-operated will operate the lock line identification LLI relay.

The operation of the FLG relay will operate the VGL-1/2 HGL-1, VFL-1 and CBF relays.

The operation of the SNG-1 relay with the CKO relay non-operated will operate the UC relay.

8.0412 Operation of the N-1/4 N-1A/4A, TH-0/7, HN-0/7, TN-0/7, U-0/7, and NE Relays

The numericals of the called directory number will be identified in the marker by the operation of two of the thousands digit TH-0/7 relays by the operation of two of the hundreds digit HN-0/7 relays, by the operation of two of the tens digit TN-0/7 relays and by the operation of two of the units digit U-0/7 relays.

The office code and numericals of the called line were received from the originating register circuit and recorded in the marker as described in paragraph 8.022. However the marker must be able to determine which of the digits of the called directory number are in the office code digits and which are the numerical digits in order to operate the correct TH-0/7, HN-0/7, TN-0/7, and U-0/7 relays. To indicate to the marker which of the digits are the office code digits and which are the numerical digits one of the number translator N-1/4 and N1A/4A relays will be operated.

The operation of the LPA, LTA, LPB or LTB relay with one of the TC-5/7 relays operated and with the NR relay non-operated and the CKG-1 relay operated will place ground on one of the "NS-5/7" cross-connection terminals. The "NS-5/7" cross-connection terminal will be cross-connected to a "N-1/4" cross-connection terminal to operate one N-1/4 relay and one N1A/4A relay according to the following code.

Type of Local Office Code	Number Translator Relays Operated	"N-1/4" and "NS-5/7" Cross-Connections
Four Numericals Only	N1, N1A	"NS-5" to "N-1"
One Digit Office Code and Four Numericals	N2, N2A	"NS-5" to "N-2"
Two Digit Office Code with Two Digit Office Codes for Local Area Codes	N3, N3A	"NS-6" to "N-3"
Two Digit Office Code with Two and Three Digit Office Codes for Local Area Codes	N3, N3A	"NS-7" to "N-3"
Three Digit Office Code	N4, N4A	"NS-7" to "N-4"

The operation of one N-1/4 and one N-1A/4A relay will extend the operating path of the TH-0/7, HN-0/7, TN-0/7 and U-0/7 relays to ground potential thru the operated AC-0/7, BC-0/7 and CC-0/7 relays, if provided, and/or to the "A-0/7", "B-0/7", "C-0/7" "D-0/7", "E-0/7", "F-0/7" and "G-0/7", leads which are extended from the originating register marker connector circuit thereby operating the two TH-0/7 relays associated with the thousands digit, the two HN-0/7 relays associated with the hundreds digit, the two T-0/7 relays associated with the tens digit and the two U-0/7 relays associated with the units digit of the numericals of the called subscriber directory number.

The operation of one N1A/4A relay will operate the NE relay in the marker.

8.0413 Operation of the OAN and OBN relays

Where two series of 10,000 directory numbers are associated with one office, the office "A" OAN relay and the office "B" OBN relay will identify the 10,000 number series associated with the called number.

In offices not equipped with the PBX allotter circuit, the operation of the LPA or LTA two THO/7 two HNO/7 two TO/7 two UO/7 relays with the NR relay non-operated and the CKG1 relay operated will operate the OAN relay. The operation of the LPB or LTB, two THO/7, two HNO/7, two TO/7, and two UO/7 relays with the NR relay non-operated and the CKG1 relay operated will operate the OBN relay when provided.

In offices equipped with the PBX allotter circuit, the operation of the LPA or LTA, two THO/7, two HNO/7, two TO/7, and two UO/7 relays with the NR relay non-operated and the CKG1 relay operated will ground the OAN1 lead to the PBX allotter circuit to operate the OAN1 and OAN2 relays in that circuit. The operation of the LPB or LTB, two THO/7, two HNO/7, two TO/7, and two UO/7 relays with the NR relay non-operated and the CKG1 relay operated will ground the OBN1 lead to the PBX allotter circuit to operate the OBN1 and OBN2 relays in that circuit.

The operation of the OAN1 and OAN2 relays in the PBX allotter circuit will ground the OAN lead to the marker, operating the OAN relay.

The operation of the OBN1 and OBN2 relays in the PBX allotter circuit will ground the OBN lead to the marker operating the OBN relay.

8.0414 Operation of the MP relay in the number group

In the case of intraoffice calls, marker holding time may be reduced by allowing the marker to attempt to a number group seizure while attempting a trunk link frame seizure.

In offices where no PBX allotter is provided to seize the number group required for this intraoffice call, the marker will operate in the selected number group, the MP relay associated with this marker by placing battery potential on the "ST-" lead associated with the selected number group. Since each number group is associated with 1000 consecutive directory numbers with the same thousands digit the desired number group will be selected by examining the thousands digit of the called directory number. Battery potential is extended through the NGS lamp and the non-operated SP relay contacts over the "NGS" lead and through the operated TL C-1 relay, FS- relay, FSA relay, ITR3 relay, THO/7 relays and OAN or OBN relay to the "ST-" lead which is extended to the selected number group circuit. In the number group circuit, the battery potential on the "ST-" lead will be extended with the MBO/1 and TRO/3 relays non-operated to the winding of the MP relay thereby operating the MP relay associated with this marker in the selected number group.

In offices where the PBX allotter circuit is equipped, the marker will seize the number group required for this intra-office call through the PBX allotter circuit. The thousands, hundreds and tens digits of the called number will be transmitted to the Allotter by extending battery potential, received over the "THA', "HBA", and "TBA" leads from the allotter, through contacts of the operated THO/7, HNO/7, and TO/7 relays in the marker, back to the allotter over the "THAO-9", "HBAO-9", and "TBAO-9" leads. From these digits, the allotter will determine if the call is a non-allotted number (individual line or non-allotted PBX) or an allotted number (PBX with lines in more than one number group). The thousands, hundreds, and tens digits of the called number are sufficient information since it is a requirement that within a number group tens block lines of only of one allotted PBX may appear.

In addition to the called directory number information, the marker extends battery over the "NGB" lead to the allotter circuit through the NGS lamp, through the non-operated contacts of the SP relay and through the operated contacts of the TLC1, FS-, FSA, and ITR3 relays. If the allotter determines the number to be a non-allotted number, it will return this same battery potential to the marker over the "NGS" lead. This battery potential will be extended through the two operated THO/7 relays and the operated OAN or OBN relay over the "ST-" lead to the number group. In the number group, battery potential on the "ST-" lead will operate the MP- relay associated with this marker.

If the allotter circuit determines the called number to be an allotted number, it will test to determine in which number groups idle lines of the PBX exist. The allotter will then select one of these number groups for service and transmit to the marker the thousands digit associated with that number group. To accomplish this, after the allotter has determined the called number to be an allotted number it will ground the "NAR" lead to the marker operating the NAR1-3 relays in that circuit. The NAR3 relay in operating will extend ground through contacts of the operated NGC relay to the winding of the CKO relay, operating that relay. Relay CKO in operating will extend ground through the non-operated RCT10, RGTO, RGT1, FTL, FUL, VGL, HGL, VFL, RCL, PN, TN, and PTN relays to the winding of the CKR relay, operating that relay. The CKR relay in operating will operate relays PBX1 and PBX2 in the marker through contacts of the non-operated RNG and ANR1 relays and the operated FLG1 and NAR1-3 relays.

Relay PBX1 in operating will extend over the "NGB1" lead to the PBX allotter circuit, battery potential through the non-operated SP relay and the operated TLC1, FS-, FSA, and ITR3 relays. The allotter circuit will return this battery to the marker over the "THO-9" lead associated with the number group selected. Battery on a "THO-9" lead will be extended through an operated OAN or OBN relay over the "ST-" lead to the number group, operating the MP- relay in that circuit associated with this marker.

In some offices, where unused hundreds series of numbers exist in a number group, a second thousands series of numbers may be incorporated in the number group to employ the unused hundreds series of numbers. In such offices, if the added thousands series associated with office "A" numbers, its "ST-" punching will be connected to the "AS" punching of figure 125, to operate the AST relay. If the added thousands series is associated with office "B" numbers, its "ST-" punching will be connected to the "BS" punching of figure 125 to operate the BST relay. The "AST" or "BST" punchings of this figure (depending on whether the added series identifies office "A" or "B" numbers) will be connected to the "ST-" punching of the partially used number series.

When battery potential is extended to the added thousands series "ST-" punching the AST or BST relay will be operated, extending battery potential from the AST lamp to the AST or BST punching which is connected to the "ST-" punching of the partially used series. Battery potential at this point will operate the MP relay in the selected number group associated with this marker.

8.0415 Operation of the MCA, MCB, and MCC relays in the number group and operation of the NGK and NGK1 relays in the marker

The operation of the number group MP relay will result in the operation of the number group MCA, MCB and MCC relays which will connect a group of leads from the marker circuit to the number group. The operation of the number group MP relay with the TR-0/3 relay non-operated will operate the number group MCA (Bottom) relay.

The operation of the SNG-2 relay in the marker has extended battery potential over the "BS-1/4" leads to the number group circuit. The operation of the number group MCA (Bottom) relay will extend the battery potential on the "BS-1/4" leads to operate the number group MCA (Top) MCB and MCC relays.

To check in the marker the operation of the number group MCA (Bottom) relay the marker NKG relay will be operated. The operation of the number group MCA (Bottom) relay will place ground on the "NGK" lead which will be extended to the marker to operate the NGK relay.

To check in the marker the operation of the number group MCA (Top) and the MCB relays the marker NGK-1 relay will be operated. The operation of the number group MCA (Top) and the MCB relays will place ground on the "W" lead which will be extended to the marker to operate the NGK-1 relay when the marker BN, RI, TBI relays are non-operated and the marker SNG-2 relay is operated.

With the operation of the NGK1 relay, the circuit locking the FSA relay operated will be broken, causing the FSA relay to release. The release of the FSA relay will open the circuit over which the MP relay in the number group was operated unless the trunk frame check relay, TFK-1, has been operated, indicating trunk frame seizure. If the TFK1 relay has been operated, prior to the release of the FSA relay, the number group MP relay will be held operated. If, however, the marker has been delayed in its trunk link frame seizure and the TFK1 relay has not operated prior to the release of the FSA relay, the number group MP relay will release, releasing the number group. Reseizure of the number group on this call will then await the operation of the TFK1 relay indicating trunk frame seizure.

8.042 Number Group Translation and Marker Identification of Location of the Called Line and Ringing Code for a Non-terminal Hunting Line

A number group is equipped for the translation of 1000 directory numbers. Within the number group each directory number has three cross-connection terminals, the "L", "G" and "F" cross-connection terminals. The "L", "G" and "F" cross-connection terminals associated with each directory number are cross-connected to the "LL", "VHG" and "RF" cross-connection terminals in accordance with the location of the called subscriber line termination on the line link frame and with the ringing code required for the called subscriber. When the marker transmits the hundreds digit, the tens digit and the units digit numerical information of the called directory number to the number group battery potential is applied to the "L", "G" and "F" cross-connection associated with the called directory number. The cross-connections in the number group of these "L", "G" and "F" cross-connection terminals to the proper "LL", "VHG" and "RF" cross-connection terminals will extend this battery potential to the marker to operate a group of relays which will identify the line link frame location which is associated with the called directory number in terms of the associated line link frame tens digit the line link frame units digit, the vertical group, the horizontal group and vertical file. A relay will also be operated in the marker to identify the ringing code for the called subscriber.

8.0421 Operation of the HBO/9 relay in the Number Group

In offices where the PBX allotter circuit is not equipped, the hundreds block HBO/9 relay in the number group associated with the hundreds digit of the called directory number will be operated. The operation of the marker SNG2 relay extends battery potential from the HBS resistance lamp, through the non-operated SLCK1 relay contacts to the "HBS" lead. When the TFK1 relay is operated, the "HBS" lead is extended to the number group over the one "HBO/9" lead which is associated with the two operated HNO/7 relays. The "HBO/9" leads are extended through the operated MCA (bottom) relay contacts in the number group to the HBO/9 relays, thereby operating in the number group the one HBO/9 relay associated with the hundreds digit of the called directory number.

In offices equipped with the PBX allotter circuit, for non-allotted numbers, the operation of the marker SNG2 relay extends battery potential from the HBS resistance lamp, through the non operated SLCK1 relay contacts, to the "HBS" lead. When the TFK1 relay operates, the "HBS" lead is extended to the PBX allotter circuit over the "HBB" lead. When the allotter determines the number to be a non-allotted number, it will return this battery potential to the marker over the "HBS" lead. The "HBS" lead is extended to the number group over the one "HBO/9" lead which is associated with the two operated HNO/7 relays. The "HBO/9" leads are extended through the operated MCA (bottom) relay contacts in the number group to the HBO/9 relays, operating in the number group the one HBO/9 relay associated with the hundreds digit of the called directory number.

In offices equipped with the PBX allotter circuit, for allotted numbers, the PBX allotter must inform the marker as to the hundreds block in the selected number group in which lines of the allotted PBX appear. The operation of the marker

SNG2 relay extends battery potential from the HBS resistance lamp, through the non-operated SLCK1 relay contacts and through the operated TFK1 relay contacts to the PBX allotter circuit over the "HBB" lead. The allotter will return this battery potential to the marker over the "HBO/9" lead associated with the hundreds block in the selected number group in which lines of the allotted PBX appear. The marker will extend this battery potential over the "HBO/9" leads to the number group. The "HBO/9" leads are extended through the operated MCA (battery) relay contacts to operate the one HBO/9 relay associated with the hundreds block selected by the allotter.

The operation of the PN, TN, or PTN relay in the marker will block the operation of the HBO/9 relay in the number group.

8.0422 Operation of the PN, TH or PTN Relays and the PTK Relay

In some offices, the directory numbers are divided into groups so that discrimination as to service or message charging may be made in accordance with the origin of the call. In these offices the directory numbers are divided into two groups of directory numbers for zoning or other reasons. One group of directory numbers is assumed to consist of physical numbers and the other group is assumed to consist of theoretical numbers. Usually, in these cases, one office code is associated with the physical numbers and another office code is associated with the theoretical numbers. Offices having both physical and theoretical numbers may have some directory numbers which are not restricted as to service to subscriber numbers in either the physical or theoretical numbers. These numbers are called non-discriminating numbers. When the numbers in an office are not divided into groups all numbers are assumed to be physical numbers.

In order to complete a call, the marker must be able to make a comparison between the physical or theoretical number indication received from the office code dialed and the physical or theoretical number indication received from the number group. If the indications are identical the call is completed. If they are not identical, the call is routed to a no-such-number tone trunk or to an operator.

In the assignment of directory numbers as physical numbers, theoretical numbers of non-discriminating numbers there is one limitation which is necessary. This limitation is that all directory numbers within the same hundreds block of numbers can be assigned only one clasification such as a physical number, as a theoretical number or as a non-discriminating number.

The operation of the number group HBO/9 relay will place ground potential on the "PT" cross-connection terminal associated with that HBO/9 relay. The cross-connections for the "PT" terminals will be made as follows:

a. Where a number group serves a single thousands series of numbers the "PT" terminal will be cross-connected to the "PN" terminal if the directory numbers associated with the HBO/9 relay are physical numbers. For theoretical numbers, the "PT" terminal will be cross-connected to the "TN" terminal and for non-discriminating numbers the "PT" terminal will be cross-connected to the "PTN" terminal.

b. Where a number group serves two thousands series of numbers as described in paragraph 8.0413, those physical, theoretical, or non-discriminating numbers associated with the original, partially used thousands series will be cross-connected as in (a) above. In the added thousands series of numbers, for physical numbers, the "PT" terminal will be cross-connected to the "PN1" terminal. For theoretical numbers, the "PT" terminal will be cross-connected to the "TN1" terminal and for non-discriminating numbers, the "PT" terminal will be cross-connected to the "PTN" terminal.

Grounding the "PN", "TN", "PTN", "PN1", "TN1", or "PTN1" terminals in the number group will ground similarly designated leads to the marker.

In the marker, the physical-theoretical indication incoming from the number group must match the office code indication to permit the call to be completed. If the indication is a grounded "PN1", "TN1", or "PTN1" lead from the number group indicating that the number is part of an added thousands series, a further check will be made to insure that either the AST or BST relay is operated.

As an example, if the office code dialed is a local physical number in office A numbers, the LPA relay will be operated in the marker. (paragraph 8.033) if the numericals dialed represent a physical number in a number group serving a single thousands series the "PV" lead to the marker will be grounded. With the AST and BST relays non-operated, the "PN" lead will operate the physical number PN relay. The office code indication and the number group indication being identical will operate the physical-theoretical check, PTK, relay permitting the call to be completed.

In the above example, if the numericals dialed represented a physical number that was part of an added thousands series in a number group, the PTK relay would be operated only if the AST or BST relay was operated.

If through an error, or in order to avoid paying an extra charge, the office code dialed is a physical number in the office "A" numbers but the numericals dialed represent a theoretical number in the office "A" numbers a blank number is indicated. In this case, the office code dialed caused the operation of the LPA relay and since the numericals dialed represented a number assigned to theoretical numbers the number group will ground the "TN" lead to the marker which operates the theoretical number, TN, relay. The operation of the LPA and TN relays operate the blank number BN relay. The call is then completed to a "no such number" tone trunk or to an operator.

The same operation described also applies to the LPB relay which requires a physical number check from the number group or the LTA or LTB relays which require a theoretical number check to operate the PTK relay.

If the called subscriber is connected as a non-discriminating number in the number group, the call will be completed regardless of whether a physical or theoretical office code is dialed. In this case, the number group will ground the "PTN" or "PTN1" leads to the marker which operate the physical-theoretical, PTN relay which operates directly the PTK relay without checking.

In offices where two thousands series of numbers are combined in a single number group, a grounded "PN" "TN", or "PTN" lead with either the AST or BST relay operated will indicate a blank number. A grounded "PN1", "TN1", or "PTN1" lead with neither the AST or BST relay operated will also indicate a blank number and the call will be completed to a "no such number" tone trunk or to an operator.

8.0423 Operation of the TB00/99 Relay in the Number Group and the TBW relay in the Marker

In offices where the PBX allotter circuit is not equipped the tens block TB00/99 relay in the number group associated with the tens digit and with the hundreds digit of the called directory number will be operated to indicate within which group of ten directory numbers the called directory number is located. The operation of the marker SNG-2 relay extends battery potential through the TBS resistance lamp, through the operated SNG-2 relay contacts, through the non-operated RNG and BNTH relay contacts, through the winding of the TBW relay, through the non-operated SLCK-1 relay contacts to the "TBS" lead. The "TBS" lead is extended when one of the PTN, TN or PN relays are operated and further extended to the number group circuit over the one "TB-0/9" lead which is associated with the two operated tens digit T0/7 relays. The "TB-0/9" leads are extended in the number group through the operated MCA (bottom) relay contacts, through the operated HB-0/9 relay contacts to the tens block TB-00/99 relays thereby operating in the number group the one TB-00/99 relay associated with the tens digit and hundreds digit of the called directory number. The marker TBW relay will also be operated since its operating path is in series with the operating path of the number group TB-00/99 relay. The operation of the TBW relay in the marker will check in the marker that the operating path for the number group TB-00/99 relay has been completed.

In offices equipped with the PBX allotter circuit, for non-allotted numbers, the operation of the SNG2 relay extends battery from the TBS resistance lamp, through the operated SNG2 relay contacts, through the non-operated RNG and BNTH relay contacts, through the winding of the TBW relay, through the non-operated SLCK1 relay contacts to the "TBS" lead. The "TBS" lead is extended when one of the PN, TN, or PTN relays are operated to the PBX allotter circuit over the "TBB" lead. When the allotter determines the number to be a non-allotted number, it will return this battery over the "TBS" lead to the marker. The "TBS" lead is extended to the number group circuit over the "TB0/9" lead which is associated with the two operated tens digit T0/7 relays. The "TB0/9" leads are extended in the number group through the operated MCA (bottom) relay contacts, through the operated HB0/9 relay contacts to the tens block TB00/99 relays, thereby operating in the number group the one TB00/99 relay associated with the tens digit and hundreds digit of the non-allotted called directory number. The marker TBW relay will also be operated since its operating path is in series with the operating path of the number group TB00/99 relay. The operation of the TBW relay will check in the marker that the operating path for the number group TB00/99 relay has been completed.

In offices equipped with the PBX allotter circuit, for allotted numbers, the

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PBX allotter circuit must inform the marker as to the tens block in the selected number group in which lines of the allotted PBX appear. The operation of the SNG2 relay extends battery potential from the TBS resistance lamp, through the operated SNG2 relay contacts, through the non-operated RNG and BNTH relay contacts, through the winding of the TBW relay, through the non-operated SLCK1 relay contacts to the "TBS" lead. The "TBS" lead is extended when one of the PN, TN, or PTN relays are operated to the PBX allotter circuit over the "TBB" lead. The allotter circuit will return this battery potential over a "TBO/9" lead to the marker. The marker will extend this battery potential over the "TBO/9" leads to the number group, through the operated MCA (bottom) relay contacts, through the operated HBO/9 relay contacts to the tens block TB00/99 relays, thereby operating in the number group the one TB00/99 relay associated with the tens block and hundreds block in this number group in which lines of the allotted PBX appear.

8.0424 Operation of the UO/9 Relay in the Number group and the UK and HTUK Relays in the Marker

In offices where the PBX allotter circuit is not equipped, the units UO/9 relay in the number group associated with the units digit of the called directory number will be operated. Battery potential is extended through the UBS resistance lamp, through the non-operated UT relay contacts to the "UBS" lead. The "UBS" lead is extended through the two operated U-0/7 relays to the one "U-0/9" lead associated with the two operated units digit U-0/9 relays in the marker. With the UC relay operated battery potential is further extended over the one "U-0/9" lead to the number group circuit. The operation of the number group MCA (top) will extend the "U-0/9" leads to the number group units digit U-0/9 relays thereby operating in the number group the one units digit U-0/9 relay associated with the units digit of the called directory number.

In offices equipped with the PBX allotter circuit, for non-allotted numbers, the battery potential from the UBS resistance lamp will be extended through the non-operated UT relay contacts to the PBX allotter circuit over the "UBB" lead. When the allotter determines the number to be a non-allotted number, it will return this battery potential to the marker over the "UBS" lead. The "UBS" lead will be extended through the two operated UO/7 relays to the one "UO/9" lead associated with the two operated units digit UO/9 relays in the marker. With the UC relay operated, battery potential will be further extended over the one "UO0/9" lead to the number group circuit. The operation of the number group MCA (top) relay will extend the "UO/9" leads to the number group units digit UO/9 relays thereby operating in the number group the one units digit UO/9 relay associated with the units digit of the non-allotted called directory number.

In offices equipped with the PBX allotter circuit, for allotted numbers, the battery potential from the UBS resistance lamp will be extended through the non-operated UT relay contacts to the PBX allotter circuit over the "UBB" lead. When the allotter determines the number to be an allotted number, it will return this battery potential to the marker over the "UO" lead. With the UC relay operated, battery potential on the "UO" lead will be extended over the "UO" lead to the number group circuit. The operation of the number group MCA (top) relay will extend the "UO" lead to the number group UO relay, thereby operating that relay in the number group.

The operation of the number group U-0/9 relay with the number group MCB relay operated will place ground potential on the "UK" lead in the number group which will be extended over the "UK" lead to the marker circuit thereby operating the units check UK relay in the marker circuit as a means of checking that the number group U-0/9 relay has operated.

In offices not equipped with the PBX allotter circuit and in offices equipped with the circuit for non-allotted number operation, the operation of the UK relay with the TRST, PBX2, and TYM relays non-operated and the NGK1, TBW, and NGC relays operated will operate the hundreds, tens, units check, HTUK, relay.

In offices equipped with the PBX allotter circuit, for allotted number operation the operation of the PBX2 relay will prevent the operation of the HTUK relay.

8.0425 Operation of the FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4 and RCN-1/15 Relays

The operation in the marker of one frame units number FUN-0/9 relay will identify the units digit and the operation of one frame tens number FTN-0/3 relay will identify the tens digit of the line link frame associated with the called director number. The operation of one vertical group number VGN-0/11 relay will identify the vertical group, the operation of one horizontal group number HGN-0/9 relay will identify the horizontal group and the operation of one vertical file number VFN-0/4 relay will identify vertical file. The operation of one ringing combination number RCN-1/15 relay will identify the ringing combination or code to be applied to the called subscriber line.

The operation of the SNG-2 relay and the NGK-1 relay in the marker will extend one battery potential through the WL lamp and over the "WL" lead to the number group, will extend a second battery potential through the WG lamp and over the "WG" lead to the number group and will extend a third battery potential through the WF lamp and over the

"WF" lead to the number group circuit. The operation of the MCB relay, the one U-0/9 relay and the one TB-00/99 relay in the number group will extend the "WF" lead to one of a group of one thousand "F-000/999" cross-connection terminals in the number group, will extend the "WG" lead to one of a group of one thousand "G-000/999" cross-connection terminals and will extend the "WL" lead to one of a group of one thousand "L-000/999" cross-connection terminals. In the number group circuit there is one "F-000/999" cross-connection terminal, one "G-000/999" cross-connection terminal and one "L-000/999" cross-connection terminal for each of the one thousand directory numbers associated with this number group. The "L-000/999" cross-connection terminal associated with a directory number will be cross-connected to the one "LL-00/39" cross-connection terminal which is associated with the line link frame number with which the directory number is associated. The "G-000/999" cross-connection terminal associated with a directory number will be cross-connected to the one "VHG-000/119" cross-connection terminal which is associated with the vertical group and with the horizontal group with which the directory number is associated. The "F-000/999" cross-connection terminal associated with a directory number will be cross-connected to the one "RF-" cross-connection terminal which is associated with the ringing combination with which the directory number is associated. Therefore, the battery potential on the "LL-00/39" cross-connection terminal is extended with the number group MCA relay operated, over one "FT-0/3" lead and one "FU-0/9" lead to the marker circuit thereby operating in the marker the one frame tens number, FTN-0/3 relay and the one frame units number FUN-0/9 relay associated with the line link frame number associated with the called line. Also, the battery potential on the "VHG-000/119" cross-connection terminal is extended, with the number group MCB relay operated, over one "VG-0/11" lead and one "HG-0/9" lead to the marker circuit thereby operating in the marker the one vertical group number VGN-0/11 relay and the one horizontal group number HGN-0/9 relay associated with the called line. The battery potential on the "RF-" cross-connection terminal is extended, with the number group MCB relay operated, over one "VF-0/4" lead and one "RC-1/15" lead to the marker circuit thereby operating in the marker the one vertical file number VFN-0/4 relay and the one ringing combination number RCN-1/15 relay associated with the called line.

8.0426 Operation of the FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, RCT-1/15, FTL, FUL, VGL, HGL, VFL and RCLA Relays

The operation of the FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4 and RCN-1/15 relays will operate the associated identification test FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4 and RCT-1/15 relays which in turn will operate the FTL, FUL, VGL, HGL, VFL, RCL and RCLA relays.

8.043 Number Group Translation and Marker Identification of the Location of the Called Line and Ringing Code With a Terminal Hunting Line in Offices not Equipped with the PBX Allotter Circuit

Terminal hunting is the function performed by the number group and the marker in searching for an idle line or trunk in a PBX or a terminal hunting group. In order to direct terminal hunting, ringing combination number ten is assigned to the directory numbers within a terminal hunting group.

Terminal hunting is used on certain types of calls to subscribers because the called directory number is:

a) A PBX subscribers line number;
b) An intercepted number, either regular or trouble intercept;
c) A blank number; or
d) A number of a line or trunk requiring exchange of busy with No. 5 equipment (emergency lines, etc.)

Terminal hunting is required in selecting PBX lines because more than one line is used for terminating calls but only one directory number is assigned. Terminal hunting may be required for selection of the trunks and lines because more than one line or trunk is used for terminating the calls but only one line or trunk cross-connection per group is made.

For terminal hunting on PBX lines the marker and number group will proceed to translate the called directory number into the equipment location and ringing combination number in the same manner as for a non-terminal hunting line. However, after the equipment location and ringing combination number of the called line has been transmitted from the number group to the marker circuit the marker will recognize that a terminal hunting line is involved since the number group will indicate to the marker that the ringing combination is number ten. On PBX lines, ringing combination number ten is used to indicate that the subscriber's line is within a terminal hunting group.

After the number group has received the digits of the called line the number group has proceeded to translate the called line number into line location identity and transmitted the called line location to the marker. However, the called number may be busy and one of the other called numbers, within the same group of PBX numbers, may be selected. Therefore, it is necessary to release the called line location identification after which the marker and number group will proceed with the selection of an idle PBX line. In order that the marker and number group can hunt over a group of subscriber lines within the terminal hunting group for an idle line, the sleeve conductors of the subscribers' lines that are in the terminal hunting group and within the selected tens block will be extended to the marker. The marker will test the sleeve conductors for an idle condition, which is the absence of ground on the sleeve conductor, and will select an idle PBX line for completing this call. The directory number information for the selected line will be transmitted to the number group which will then proceed to translate this directory number into the associated line location information which will be transmitted to the marker.

Terminal hunting groups require different features and treatment in the number group and marker than non-terminal hunting lines as follows:

a) If the office has physical and theoretical numbers the tens blocks associated with the terminal hunting group must all be associated with the hundreds blocks which are associated with the same class of line numbers.

b) A terminal hunting group may be distributed over several tens and hundreds blocks, but must remain within one number group.

c) The cross-connection of the "G", "L" and "F" cross-connection terminals in the number group are the same for both terminal hunting and non-hunting lines, however, for terminal hunting lines, the "F" terminal is cross-connected to an "RF" terminal that is associated with ringing combination number ten. This indicates to the marker that it is a terminal hunting line.

8.0431 Terminal Hunting on PBX Lines Where The Hunting Group is Within a Single Tens Block

Assume that ten directory numbers within the same tens block have been assigned to a group of ten PBX lines, but only lowest directory number is listed and, therefore, is the only number dialed. All directory numbers within the same tens block are identical except for the different units digit numbers.

8.04311 Operations of Number Group and Marker Relays to Identify a Terminal Hunting Group

The circuit operation for an intraoffice call associated with a PBX line is the same as that for a non-terminal hunting line up to indication of the ringing combination. On PBX lines, ringing combination number ten is used to indicate to the marker that these lines require terminal hunting.

The number group HB-0/9 relay is operated as described in paragraph 8.0421 and the marker PN, TN, or PTN and PTK relays are operated as described in paragraph 8.0422. The number group TB-00/99 relay and the marker TBW relay are operated as described in paragraph 8.0423. The number group U-0/9 relay and the marker UK and HTUK relays are operated as described in paragraph 8.0424. The marker FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4 and RCN-1/15 relays are operated as described in paragraph 8.0425 and the marker FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4 and RCT-1/15 relays are operated as described in paragraph 8.0426.

8.04312 Operation of the PBX-1/2 Relays

As an indicator that the called line is a PBX line, the "F" and the "RF" cross-connection terminals in the number group associated with ringing combination ten are cross-connected thereby operating the RCN-10 and RCT-10 relays in the marker. The operation of the RCT-10 relay with the CKR, TNK, SPL-1, SPH and RNG relays non-operated and the NE and FLG-1 relays operated will operate the PBX-1 and PBX-2 relays to indicate to the marker that the subscriber's directory number is associated with a PBX and a terminal hunting group. The operated PBX-1 and PBX-2 relays will be held operated with the FLG-1 relay operated and the RNG relay non-operated.

8.04313 Operation of the SLCK, SLCK-1 and CKO Relays and Release of the SNG-1/2 and UC Relays

The operation of the PBX-1 and PBX-2 relays will extend the winding of the SLCK relay over the "SCK" lead to battery potential in the number group thereby operating the SLCK relay in the marker. The other side of the SLCK relay winding is at ground potential with the NGC relay operated and the GB relay non-operated. Since at this time the number group MCC relay and the number group SC relay are operated battery potential has been placed on the "SCK" lead in the number group. The operation of the number group SC relay is described in paragraph 8.04316. After operating the SLCK relay will be held operated with the PBX-2 relay operated.

The operation of the SLCK relay will operate the SLCK-1 relay, which will be held operated with the FLG-1 relay operated.

The operation of the SLCK relay with the NGC, PBX-1, VFL, HGL, VGL, FUL and FTL relays operated will operate the CKO relay. The CKO relay will be held operated with the NGC relay operated.

The operation of the CKO relay will release the operated SNG-1, SNG-2 and UC relays.

8.04314 Release of the Number Group U-0/9, MCA (Top) and MCB Relays and the Marker UK, HTUK and NGK1 Relays

The release of the marker UC relay will in turn release the operated U-0/9 relay in the number group which in turn will release the marker UK relay. The operation of the PBX2 and PBX1 relay will release the HTUK relay.

The release of the marker SNG-2 relay will release number group MCA (top) and MCB relays and the marker NGK-1 relay.

8.04315 Release of the FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4, RCN-10, FFT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, RCT-10, FTL, FUL, VGL, HGL, VFL and RCL Relays and the Operation of the CKR and TR1A Relays

The release of the SNG-2 relay will release the operated FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4 and RCN-10 relays which in turn will release the operated FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4 and RCT-10 relays which in turn will release the FTL, FUL, VGL, HGL, VFL and RCL relays.

After the release of the called line identification relays, the check release CKR relay operates to prepare for the new identification of the new called line identification. The release of the FTL, FUL, VGL, HGL, VFL and RCL relays with the RCT-10, RGT-0, RGT-1, PN, TN and PTN relays released and the CKO relay operated will operate the CKR relay.

The operation of the CKR relay with the NGC relay operated and the RCY-3, SPH and TR2 relays non-operated will operate the TR1A relay.

8.04316 Operation of the SC- relay in the Number Group and the Operation of the Marker SLC, SL-0/9, SA-0/9, SAE, and SPT relays

In order to extend the sleeve conductors of the lines in the terminal hunting group to the marker for terminal hunting, an SC- relay will be equipped in the number group for each terminal hunting group in each tens block. A TBA relay will also be provided for each tens block in which lines of more than one PBX appear.

Selection of a tens block containing more than one PBX will cause the number group TBA relay associated with the tens block to operate. Operation of the number group TBA relay will operate relay SPT in the marker to indicate that the tens block is associated with more than one PBX.

In tens blocks where lines of a single PBX appear, the SC relay associated with the PBX lines will be operated in multiple with the number group TB-00/99 relay.

In tens blocks where lines of several PBX's appear, selection of the proper SC relay is determined by the TBA and U-0/9 relays operated.

The release of the UC relay with the PBX-1 relay operated and the SAE, and GB relays non-operated will operate the sleeve cut-in SLC relay which extends the sleeves of the PBX lines to the sleeve test SL-0/9 relays.

One side of the SL-0/9 relay windings are connected to ground potential thru the SL-0/9 resistances when the MT-10 relay is non-operated. The other side of the SL-0/9 relay windings are extended to the number group over the "S-0/9" leads when the SLC relay is operated. With the number group MCC and SC- relays operated the "S-0/9" leads are extended to the "S-0/9" cross-connection terminals in the number group circuit. Each "S-0/9" cross-connection terminal in the number group is cross-connected to the sleeve conductor of the subscriber's line with which it is associated if the subscriber's line is associated with a terminal hunting group. If the associated subscriber's line is busy a ground potential will be applied to the sleeve conductor or if the subscriber's line is idle a battery potential, thru the line link frame hold magnet winding, will be applied to the sleeve conductor. Therefore each idle subscriber's line within the PBX terminal hunting group and within the selected tens block and associated with the operated number group SC- relay will extend battery potential to the marker to operate the associated SL-0/9 relay.

The operation of the SL-0/9 relays with the MT-10 relay non-operated will operate the associated SA-0/9 relays to record those PBX terminal hunting lines which are idle and available for completing this call. The operated SA-0/9 relays will be held operated with the NGC relay operated and the GB relay non-operated.

The operation of any SA-0/9 relay will operate the SAE relay which in turn will release the SLC relay which in releasing will release the operated SL-0/9 relays and will remove the operating path for the other non-operated SL-0/9 relays. By removing the operating path for the SL-0/9 relays the marker may proceed in the selection of an idle PBX terminal hunting line without interference from other PBX lines becoming idle.

8.04317 Reoperation of the Number Group MCA (Top) MCB, U-0/9 Relays and the Marker SNG-1/2, UK and NGK-1 Relays

The operation of the SAE relay will reoperate the SNG-1 and SNG-2 relays when the RNG, TNR and MRL-1 relays are non-operated and the FLG, CKR and CKO relays are operated.

The reoperation of the SNG-2 relay will reoperate the number group MCA (top) and MCB relays in the same manner as they were first operated as described in paragraph 8.0415. The operation of the number group MCA (top) and MCB relays will operate the marker NGK-1 relay as a check of their operation.

If any of the PBX lines within the terminal hunting group are idle the associated SA-0/9 relays have been operated. The marker will select the preferred idle PBX line for this connection to the called subscriber by selecting the idle PBX line associated with the lowest numbered operated SA-0/9 relay. Since the operated units U-0/9 relay in the number group has been released and since no new number has been dialed, it is necessary to operate the U-0/9 relay in the number group associated with the selected PBX line to identify the new called line before the number group translation can be made. Battery potential is extended through the UBS resistance lamp through the non-operated UT relay contacts to the "UBS" lead. The "UBS" lead is extended through the two operated U-0/7 relays to the one "U-0/9" lead associated with the two operated units digit U-0/9 relays in the marker. With one of the SA-0/9 relays operated and the TR1A relay operated battery is extended over the "U-0/9" lead to the number group circuit over the "U-0/9" lead associated with the lowest numbered operated SA-0/9 relay. The operation of the number group MCA (top) will extend the "U-0/9" leads to the number group units digit U-0/9 relays thereby operating in the number group the one units digit U-0/9 relay associated with the units digits of the selected PBX line associated with the called directory number.

It should be noted, that if the directory number dialed is not the directory number associated with the lowest numbered directory number within the group of PBX numbers, the marker and number group will not select any of the PBX directory numbers for service which are lower numbered than the dialed directory number. The marker and number group will select for service only those PBX directory numbers which are associated with the dialed directory number or directory numbers which are higher numbered than the dialed directory number.

The operation of the number group U-0/9 relay will operate the marker UK relay as a check of the operation of the number group U-0/9 relay in the same manner as described in paragraph 8.0424.

8.04318 Operation of the FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4, RCN-1/15, FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, RCT-1/15, FTL, FUL, VGL, HGL, VFL, and RCL Relays

This group of relays will be reoperated in the same manner as for their first operation as described in paragraphs 8.0425 and 8.0426.

8.0432 Terminal Hunting on PBX Lines where the Hunting group is Distributed Over More Than One Tens Block

Where lines of a terminal hunting group are distributed over more than one tens block, the marker and number group will test for an idle PBX line within the first tens block and if none is idle, the marker and number group will advance to another tens block associated with this terminal hunting group. In this manner the marker and number group will test all of the terminal hunting lines within all of the tens blocks associated with this terminal hunting group until an idle line is found.

Advancing from one tens block to another can be accomplished by the "block hunt" or "block select" method, depending upon which feature is equipped in the number group.

In the "block hunt" method, after the marker has determined that no idle lines of the terminal hunting group exist in the tens block being tested, it will advance to another tens block in which lines of the terminal hunting group appear. The order of advance is predetermined by cross connections in the number group.

In the "block select" method, after the marker has determined that no idle lines of the terminal hunting group exist in the tens block being tested, it will advance to another tens block in which idle lines of the terminal hunting group appear. The order of advance is not predetermined and depends solely upon the appearance of idle lines in a tens block.

8.04321 Operations of Number Group and Marker Relays For Terminal Hunting Within the First Tens Block

The circuit operations for terminal hunting within the first tens block where the hunting group is distributed over more than one tens block is similar to the operations for terminal hunting where the hunting group is confined to a single tens block as described in paragraph 8.0431.

If an idle PBX line is found within the first tens block the terminal hunting operations will be similar to terminal hunting within a single tens block and no further number group and marker relay operations are necessary to advance the terminal hunting to the second tens block. However, if all of the PBX lines in the first tens block are busy the marker and number group must advance to terminal hunt in the second tens block which requires the relay operations which follow in paragraphs 8.04322, 8.04323, 8.04324, 8.04325, 8.04326 and 8.04327. If all of the PBX lines in the first tens block are busy the marker SL-0/9, SA-0/9 and SAE relays will not be operated.

8.04322 Operation of the Number Group A Relay and the Marker A, AK, TYM and GB Relays

The operation of the SLC relay, as described in paragraph 8.04316, with the AK and TYM relays non-operated and the SLCK, PBX-2 and NGC relays operated will operate the marker advance A relay. After operating the marker A relay will be held operated with the NGC relay operated and the SCR relay non-operated.

The operation of the marker A relay will extend battery potential through the NGB lamp to the "OA" lead to the number group circuit where the operation of the MCC and SC- relays will extend the battery potential to the "A" cross-connection terminal. The "A" cross-connection terminal associated with each number group SC- relay will be connected to an "AD" terminal associated with a number group A relay to operate that A relay when the number group is arranged for block hunt. When the number group is arranged for block select, the "A" cross-connection terminal associated with each number group SC- relay will be connected to an "AS" terminal to operate an SA relay in the number group associated with a tens block containing idle lines of the terminal hunting group.

The operation of the number group A or SA relay with the number group MCC relay operated will extend ground over the "AK" lead to the marker, thereby operating the marker AK relay as a check that a number group A or SA relay has operated.

The number group A or SA relay has been operated so that if there are no idle PBX lines within the first tens block of the terminal hunting group the marker will be able to select a second tens block associated with this terminal hunting group. However, until the marker has determined that all PBX lines within the first tens block are busy, the operation of the number group A or SA relay and the marker AK relay will perform no function other than to inform the marker that a terminal hunting group is involved in which the marker should proceed to the next associated tens block if all lines of the terminal hunting group are found busy within the tens block.

In order to determine if there are any PBX lines idle within the first tens block the operation of the marker AK relay will start the TYM timing circuit. If at the end of the TYM timing circuit timing limit all SA-0/9 relays are non-operated the group busy GB relay will be operated to indicate that all PBX lines within the first tens block are busy.

The operation of the AK relay removes ground potential from the secondary winding of the TYM relay and the short circuit from the TYM condenser. This permits the TYM condenser to charge through the 2600 ohm winding of the TYM relay and the TYM-0 resistance. After a short interval of time the condenser is fully charged, the current flow through the 2600 ohm relay winding will cease and the TYM relay will operate on its 200 ohm winding in series with the 350 ohm TYM-2 resistance.

Since all of the PBX lines in the first tens block are busy and therefore none of the SA-0/9 relays are operated, the operation of the TYM relay will operate the group busy GB relay as an indication to the marker to advance to the second tens block for testing for an idle PBX line. The operation of the TYM relay will operate the GB relay by connecting ground to one side of the winding of the GB relay when the A, AK, PBX-2 and NGC relays are operated. The other side of the GB relay will be extended through the contacts of all of the SA-0/9 relays non-operated, of the operated U-0/7 relays, of the UT relay non-operated and through the UBS resistance lamp to battery potential.

8.04323 Release of the Number Group HB-0/9, TB-00/99 and SC Relays and the Marker SLC and SLCK Relays

The operation of the GB relay will release the SLC and SLCK relays. The operation of the GB relay will remove the battery potential on the "LHB" lead which has been extended to the number group circuit to hold operated the HB-0/9 relay in the number group. The release of the SLCK relay will remove the battery potential on the "SCK" lead which has been extended to the number group circuit to hold operated the SC- and TB-00/99 relays in the number group.

8.04324 Operation of the UT, SCR, and SLC Relays and Release of the A and GB Relays

The operation of the GB relay with the NGC relay operated and the EG relay non-operated will operate the units transfer, UT, relay. The UT relay will be held operated with the NGC relay operated.

As explained in paragraph 8.04317, a subscriber will gain access to a terminal hunting group if the directory number or a higher number of a line associated with the terminal hunting group is dialed. However, when the marker advances to test the lines associated with the terminal hunting group in the second tens block, the marker must test and select any one of the desired terminal hunting lines without regard to the number dialed. Therefore, the function of the UT relay is to provide that terminal hunting will include all lines within the second tens block associated with the desired terminal hunting group. This is done by transferring the operating path of the number group U-0/9 relay from the control of the marker U-0/7 relays to the UT relay when the marker is terminal hunting within the second tens block.

The release of the number group SC-relay will remove the battery potential which is extended to the winding of the number group A relay and further extended to the "LA" lead to the marker which shunts the operating path for the marker SCR relay. The release of the number group SC-relay will result in the operation of the marker SCR relay in series with the winding of the number group A relay which has been operated previously.

The operation of the SCR relay will release the marker A relay which in turn will release the GB relay. The release of the GB relay with the SAE and UC relays released and the PBX-1 relay operated will operate the SLC relay.

8.04325 Operation of the Number Group TB-00/99, TBA, and SC Relays

The release of the marker A relay will operate, in the number group, the TB relay of the second tens block to be tested. In addition, the SC relay associated with this terminal hunting group in the second tens block will be operated. If the second tens block is associated with lines of more than one terminal hunting group, a TBA relay of the selected tens block will also be operated. The release of the marker A relay will extend battery potential through the NGB lamp, through the operated UT and SCR relay contacts to the "OTB" lead which is extended to the number group. If the number group is arranged for block hunt operation, battery on the "OTB" lead will be extended through the operated A relay in the number group to operate a predetermined TB-00/99 relay associated with the second tens block in which lines of this terminal hunting group appear. The SC relay in the number group associated with the chosen tens block and with lines of this terminal hunting group will also be operated by the battery potential on the "OTB" lead. If the chosen tens block contains lines of more than one terminal hunting group, the TBA relay associated with the tens block will be operated.

If the number group is arranged for block select operation, battery on the "OTB" lead from the marker will be extended through the operated number group A relay to operate a TB-00/99, an SC, and if necessary a TBA relay in the number group associated with a tens block in which idle lines of this terminal hunting group appear.

8.04326 Operation of the Marker SL-0/9, SA-0/9, SAE, SNG-1/2, UK, and NGK-1 Relays and the Number Group MCA, MCB, and U-0/9 Relays

After the operation of the number group TB-00/99, SC, and if necessary, TBA relays associated with the second tens block, the marker SL-0/9, SA-0/9, SAE, SNG-1/2, UK and NGK-1 relays and the number group MCA, MCB and U-0/9 relays will be operated as described in paragraphs 8.04316 and 8.04317. It should be noted however that the operating path of the number group U-0/9 relay has been transferred from the operated marker U-0/7 relay contacts to the operated UT relay contacts.

8.04327 Operation of FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4, RCN-1/15, FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, RCT-1/15, FTL, FUL, VGL, HGL, VFL, and RCL Relays

This group of relays will be reoperated in the same manner as for their first operation as described in paragraph 8.0425 and 8.0426.

8.04328 Operations of Number Group and Marker Relays When All Lines of a Terminal Hunting Group are Found Busy in the Second Tens Block

Whether the number group is arranged for block hunt or block select operation, it is possible that all lines of the terminal hunting group in the second tens block will be found busy when tested. In block hunt operation, since selection of a second tens block is predetermined by cross connections, it is possible for all lines of the terminal hunting group to be busy in the second tens block prior to its selection. In block select operation, where a second tens block is chosen on the basis that idle lines of the desired terminal hunting group appear therein, it is still possible that when the marker hunts for an idle line in the group, all lines will be busy. This condition might occur if another marker makes connection to the last idle line of the terminal hunting group in the second tens block during the interval between selection of the second tens block and the start of terminal hunting in the second tens block by this marker.

If the number group is arranged for block hunt operation, and all lines of the terminal hunting group in the second tens block are found busy, the marker and number group must advance to terminal hunt in the third tens block if a third tens block is associated with the terminal hunting group. Within the third tens block, terminal hunting is similar to the operations for terminal hunting within the second tens block as described in paragraphs 8.04322, 8.04323, 8.04324, 8.04325, 8.04326, and 8.04327. If all of the lines of the terminal hunting group in the third tens block are found busy, the marker and number group will advance to terminal hunt in the fourth tens block if available. In this manner, the marker and number group will advance from tens block to tens block, until an idle line of the terminal hunting group is found.

With the number group arranged for block hunt operation, if all of the lines of the terminal hunting group are found busy, the number group and marker will advance from tens block to tens block until informed by the operation of the marker end of group EG relay that the last tens block of the terminal hunting group has been reached. In the number group circuit the "A" cross-connection terminal associated with the SC relay associated with the last tens block of the terminal hunting group is not connected to operate a number group A relay busy instead is cross-connected to the "EG" cross-connection terminal. The operation of the marker A relay will extend battery potential through the NGB lamp to the "OA" lead to the number group circuit where the operation of the MCC relay and the SC relay associated with the last tens block will extend the battery potential to the "A" cross-connection terminal and the "EG" cross-connection terminal. The battery potential on the "EG" cross-connection terminal will be extended over the "EG" lead to the marker thereby operating the end of group EG relay in the marker. If the number group is arranged for block select operation, and all lines of the terminal hunting group in the second tens block are found busy, the EG relay in the marker will be operated immediately, and no further hunting will be attempted. In this case the marker EG relay will be operated through contacts on the operated A relay in the marker, the operated SC, TBT, and MCC relays in the number group, and the non-operated SA relays in the number group.

8.044 Number Group Translation and Marker Identifieation of the Location of the Called Line and Ringing Code With a Terminal Hunting Line in Offices Equipped with the PBX Alotter Circuit

In offices equipped with the PBX allotter circuit, for terminal hunting groups whose lines appear in a single number group (non-allotted numbers), terminal hunting will be accomplished as described in paragraphs 8.043 to 8.04328.

In offices equipped with the PBX allotter circuit, for terminal hunting groups whose lines are distributed among several number groups (allotted numbers), terminal hunting will proceed in much the same manner as for hunting in offices not equipped with the PBX allotter.

When the alotter circuit determines the called number to be an allotted number, it will operate the NAR-1/3 relays which in turn will operate the CKO relay. Relay CKO in operating will operate the CKR relay which will operate relays PBX-1 and PBX-2 in the marker. The operation of relays PBX-1 and PBX-2 will extend battery potential over a "THO-9" lead to seize the number group in which the allotter has recognized idle lines of the desired terminal hunting group. The detailed description of this number group seizure is covered in paragraph 8.0414.

The allotter will also inform the marker as to the hundreds block and tens block in which to begin terminal hunting (paragraphs 8.0421 and 8.0423).

As explained in paragraph 8.0424, the allotter will transmit battery potential over the "UO" lead to the marker which will extend this same battery potential over the "UO" lead to the number group. Since it is a requirement that lines of no other terminal hunting group may appear in a tens block containing lines of an allotted terminal hunting group, battery potential on the "UO" lead to the number group is sufficient information to cause all lines of the allotted terminal hunting group in the tens block to be tested.

After the number group has been selected and the proper TB-00/99 relay operated, terminal hunting will proceed as explained in paragraphs 8.043 to 8.04328.

8.045 Comparison of the Called Line and the Calling Line

The marker will examine the calling line location information and the called line location information to determine if the called line and the calling line are the same subscriber line. If the called line and calling line are the same subscriber line the call is an intra-office reverting call. The marker must perform the necessary functions differently for an intra-office reverting call as compared with an intra-office non-reverting call.

8.0451 Non-operation of the RV-1 and RV-2 Relays

For an intra-office reverting call the reverting RV-1 and RV-2 relays operate indicating an intra-office reverting call. However, the call being described is an intra-office non-reverting call therefore the RV-1 and RV-2 relays do not operate. The non-operated condition of the RV-1 and RV-2 relays indicate to the marker to proceed with the functions of an intra-office non-reverting call.

8.046 Release of the Number Group

After the called line location has been recorded in the marker, the number group will be released.

8.0461 Operation of the RNG, NR Relays and Release of the SNG-1/2, NGC and TBW Relays in the Marker and the TB-00/99 Relay in the Number Group

The operation of the FTL, FUL, VGL, HGL, VFL, and RCL relays with the LLI relay operated will extend ground through the non-operated OFK relay, to operate the release number group RNG relay which in turn will operate the number release NR relay. The operation of the RNG relay will also release the SNG-1/2, NGC, and TBW relays in the marker and the TB-00/99 relay in the number group.

8.0462 Release of the N-1/4, N1A/4A, THO/7, HNO/7, TO/7, UO/7, NE, and the OAN or OBN Relays

The operation of the NR relay will release the operated N-1/4, N1A/N4A, and the OAN or OBN relays. The release of the N-1/4 relay will release the THO/7 and HNO/7 relays and the release of the N1A/N4A relay will release the NE, TO/7, and UO/7 relays.

8.0463 Release of the MP, MCA, MCB, and MCC Relays in the Number Group and the Release of the NGK and NCK1 Relays in the Marker

The release of the SNG2 relay will release the number group MP, MCB, and MCC relays. The release of the number group MP relay will release the number group MCA relay which in turn will release the NGK relay in the marker. The release of the number group MCB relay will release the NGK1 relay in the marker.

8.0464 Release of the HB-0/9, SC and U-0/9 Relays in the Number Group and Release of the UK Relay in the Marker

The release of the SNG2 relay will release the operated HG-0/9, SC, and U-0/9 relays in the number group. The release of the number group U-0/9 relay will release the UK relay in the marker.

8.0465 Release of the FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4 RCN-1/15 and if Operated the AST or BST Relays

The SNG2 relay in releasing will release this group of relays.

8.0466 Release of the PBX-1/2 Relays

The operation of the RNG relay will release the PBX-1/2 relays if operated.

8.05 Intra-Office, Non-Reverting, Trunk Selection

The intra-office, non-reverting, trunk selection will be initiated when the marker has identified the call or connection as an intra-office call. The marker will initiate the intra-office trunk selection when the marker route relay associated with an intra-office call is operated as described in paragraph 8.03. The intra-office, non-reverting, trunk selection will be proceeding at the same time as the marker and number group are identifying the location of the called line.

The method of selecting an idle intra-office trunk circuit for completion of the call is, in general, similar to the method of selecting an idle originating register circuit for completion of a dial tone connection, as described in paragraph 7.3.

8.051 Test and Selection of an Idle Trunk Link Frame With an Idle Intra-Office Trunk

The test and selection of an idle trunk line frame with an idle intra-office trunk is similar to the test and selection of an idle trunk link frame with an idle originating register for a dial tone connection as described in paragraph 7.32. In addition to the operations described for a dial tone connection it may be necessary on an intra-office call to provide a two-step allotter circuit.

The marker circuit is equipped to test a maximum of twenty intra-office trunk circuits on any one trunk link frame. However, in some offices two subgroups of twenty intra-office trunks may be associated with one trunk link frame. Therefore the two-step allotter circuit is provided so that the marker may select one of the two subgroups of intra-office trunk circuits for testing.

8.0511 Operation of the BC and BCA Relays

The operation of the TLC-2 relay with the FML relay non-operated will operate the busy connector BC and BCA relays.

The BC and BCA relays in operating will extend from the marker circuit a trunk link frame busy test lead designated either "FBE" or "FBO" to each trunk link frame. Test leads designated "FBE" will connect to even numbered markers while test leads designated "FBO" will connect to odd numbered markers.

If the number of trunk link frames is ten or less the BCA relay is not required to be equipped and therefore will not enter into the circuit operation.

8.0512 Operation of the FB- Relays

The operation of the FB- relays for an intra-office call is similar to the operation of the FB- relays for a dial tone connection as described in paragraph 7.322.

8.0513 Operation of the AL-0/3, GPA or GPB, FC-, FCA-, FCK and FCKA Relays

When the two-step allotter is required for the selection of an intra-office trunk, the operation of the route R- relay operates one of the allotter AL-0/3 relays which will operate one of the subgroup "A" or "B" GPA or GPB relays to select the subgroup of intra-office trunk circuits to be tested. The operation of the GPA or GPB relay will in turn operate the frame cut-in FC- and FCA- relays associated with the selected intra-office trunk circuits. If the two-step allotter is not required for the selection of an intra-office trunk the operation of the route R- relay will operate the FC- and FCA- relays.

The operation of the route R- relay with the GS-1/5, RCY and DISA relays non-operated will extend ground to the associated "FCR" cross-connection terminal of figure 51. When the two-step allotter is required for the selection of an intra-office trunk the "FCR" cross-connection terminal is connected to the associated "FCG-0/3" cross-connection terminal of figure 64 thereby operating the AL-0/3 relay associated with the required intra-office trunk circuits. The operation of the AL-0/3 relay with the MT-1, GP-2 and GZ relays non-operated will operate the subgroup "A" GPA relay which will select the intra-office trunk circuits associated with subgroup "A" for this call. If the GZ relay is operated the operation of the AL-0/3 relay with the MT-1 and GP-2 relays non-operated will operate the subgroup "B" GPB relay which will select the intra-office trunk circuits associated with subgroup "B" for this call. The GZ relay is operated on every other seizure of the marker, excluding the marker seizure for the dial tone connection, so as to equally distribute the traffic to the intra-office trunk circuits. The operation of the GPA or GPB relay with the AL0/3 relay operated will place ground on the associated "FCA-0/3" or "FCB-0/3" cross-connection terminal of figure 64. The "FCA-0/3" or "FCB-0/3" cross-connection terminal is connected to the associated "FC" cross-connection terminal of figure 19 thereby operating the associated FC- and FCA- relays. Thus with the two-step allotter circuit one of the two subgroups of FC- and FCA- relays which are associated with this intra-office call are operated to select the particular subgroup of intra-office trunk circuits which are to be tested.

The operation of the route R- relay with the GS-1/5, RCY and DISA relays non-operated will extend ground to the associated "FCR" cross-connection terminal of figure 51. When the two-step allotter is not required for the selection of an intra-office trunk the "FCR" cross-connection terminal is connected to the associated "FC" cross-connection terminal of figure 19 thereby operating the associated FC- and FCA- relays.

The FC- and FCA- relays in operating will extend from the marker circuit one trunk link frame test lead designated "FTC-" to each trunk link and connector circuit for the purpose of testing for the required intra-office trunk circuits associated with the trunk link frame.

To check that the FC- relay has operated the frame cut-in check FCK relay will be operated when the FC- relay has operated and to check that the FCA- relay has operated the frame cut-in check FCKA relay will be operated when the FCA- relay has operated.

If the number of trunk link frames is ten or less the FCA- relays are not required to be equipped and therefore will not enter into the circuit operation. Whenever the FCA- relays are not provided the FCKA relay is not equipped.

8.0514 Operation of the FTC-, FTCK and FTCK-1 Relays

The operation of the FTC-, FTCK and FTCK-1 relays for an intra-office call is similar to the operation of the FTC-, FTCK and FTCK-1 relays for a dial tone connection as described in paragraph 7.325. However, the operating path for the FTC- relays will be extended to a group of trunk link frame test leads designated "FTC-" associated with the required intra-office trunk circuits instead of being associated with the originating registers.

Also these "FTC-" leads will be extended to the required intra-office trunk circuits each of which will place ground on its associated "FT" test lead when that intra-office trunk circuit is idle and available for service.

8.0515 Operation of the FS- Relay

The operation of the FS- relay to select an idle trunk link frame associated with an idle intra-office trunk circuit for an intra-office call is similar to the operation of the FS- relay for a dial tone connection as described in paragraph 7.326.

8.052 Connection to Selected Trunk Link Frame

The connection to the selected trunk link frame in the intra-office call is similar to the connection to the selected trunk link frame in a dial tone connection as described in paragraph 7.33.

8.053 Test and Selection of an Idle Intra-Office Trunk

The test and selection of an idle intra-office trunk is similar to the test and selection of an originating register in a dial tone connection, as described in paragraph 7.34 with the exception that the proper TB-0/5 and TG-0/19 relays are operated so that the marker will test for an intra-office trunk circuit instead of an originating register. Also, to provide for selecting the correct trunk block group when the two-step alloter, as described in paragraph 8.0513, is required the TB-0/5 relays in the marker are operated by cross-connecting the "TBC-0/5" cross-connection terminal of figure 81 to the "TBA-0/3" or "TBB-0/3" cross-connection terminal of figure 64 and by cross-connecting the "TB" cross-connection terminal of figure 51 to the "TBG-0/3" cross-connection terminal of figure 64.

8.054 Connection to the Selected Intra-Office Trunk

After the marker has selected the intra-office trunk circuit by operating the test selection TS-0/19 relay associated with the selected intra-office trunk circuit and has checked the operation of the TS-0/19 relay by the release of the TSE-1, TSE-2 and TSE-3 relays the marker will then operate the F relay in the selected intra-office trunk circuit to secure access to the selected intra-office trunk circuit.

8.0541 Operation of the F Relay in the Intra-Office Trunk Circuit

The operation of the F relay in the intra-office trunk circuit for an intra-office call is similar to the operation of the F relay in the originating register for a dial tone connection as described in paragraph 7.351.

8.0542 Operation of the FA-, FB-, LV-2/9 and LC-0/9 Relays in the Trunk Link and Connector Circuit

In each trunk link and connector circuit there is one FA- relay and one FB- relay associated with each intra-office trunk circuit which is associated with the trunk link frame. Each intra-office trunk circuit has two trunk appearances on the trunk link frame. One trunk appearance is an "A" trunk appearance and is associated with the connection of the intra-office trunk to the calling subscriber line. The other trunk appearance is a "B" trunk appearance and is associated with the connection of the intra-office trunk to the called subscriber line. One FA- relay in the trunk link frame will be associated with the "A" trunk appearance and one FB- relay will be associated with the "B" trunk appearance. The operation of the F relay in the selected intra-office trunk will place ground on the "FA" lead associated with the selected intra-office trunk. The ground on the "FA" lead will be extended to the trunk link and connector circuit associated with the selected intra-office trunk to operate the FA- and FB- relays associated with the selected intra-office trunk.

In each trunk link and connector circuit there are eight LV-2/9 relays. Each LV-2/9 relay is associated with one of the ten horizontal levels, except horizontal switches of the trunk link frame. The operation of the FA- or FB- relay will operate the LV-2/9 relay associated with the horizontal level of the trunk switch which is associated with the selected intra-office trunk.

Associated with each trunk switch on the trunk link frame is one LC-0/9 relay. The released condition of the LK-1 and TX relays in the marker circuit will place battery potential on the "BLC" lead which will be extended to the trunk link and connector circuit with the trunk link and connector MCB relay operated. The operation of the LV-2/9 relay with the associated FB- relay operated will extend the battery potential on the "BLC" lead to operate an LC-0/9 relay.

8.0543 Operation of the FBK and LCK Relays

The operation of an LV-2/9 relay, an associated FB- relay and the MCB relay in the trunk link and connector circuit will place ground on the "FBK" lead which is extended to the marker circuit. The released condition of the LK-1 relay will further extend the "FBK" lead to operate the FBK relay.

The operation of an LC-0/9 relay with the MCB relay in the trunk link and connector circuit operated will place ground on the "LCK" lead which will be extended to the marker circuit to operate the marker LCK relay.

8.0544 Operation of the S1 Relay in the Intra-Office Trunk

The S1 relay in the selected intra-office trunk will be operated when the trunk link and connector LV-2/9 relay is operated, when the trunk link and connector MCB relay is operated and when ground potential is placed on the "S1" lead by the non-operated condition of the marker TOG-2 relay.

8.055 Transmitting Class Information to Trunk

For an intra-office call the marker will transmit class information to the selected trunk over the "TC" and "TP" leads if class information is required by the trunk circuit. If class information is required by the trunk circuit the class check CLK relay will be operated after the class information has been transmitted to the trunk or if class information is not required by the trunk circuit to no class NOC relay will be operated when the NSI relay operates. Also to check the "TC" lead class signal the marker talking charge TC relay will be operated. To check the "TP" lead class signal the marker tip party check TPK relay will be operated.

For various types of treatment the class information which is transmitted to the trunk and the trunk and marker relays which are operated are as follows:

Type of Trunk	Type of Service or Treatment	Marker to Trunk Leads Grounded	Trunk Relays Operated	Marker Relays Operated
Intra-office	Flat Rate Call	None	None	NOC
	Ring Party Call (Message Register Charge)	"TC"	TCM or None	TC, CLK
Intra-office	Tip Party call (Message Register Charge)	"TC", "TP"	TCM & TP or TP Alone	TC, TPK, CLK
Intra-office	Coin Call	"TC"	TC or None	TC, CLK
Intra-office	Coin Call to Free Number	None	None	CLK
Outgoing	Flat Rate Call	None	None	NOC
	Ring Party Call (Message Register Charge)	"TC"	TCM	TC, CLK
	Tip Party Call (Message Register Charge)	"TC", "TP"	TCM, TP	TC, TPK, CLK
	Coin Call	"CN" or None	CN or None	CNC, CLK

Type of Trunk	Type of Service or Treatment	Marker to Trunk Leads Grounded	Trunk Relays Operated	Marker Relays Operated
Special Service	Class of Service Tone	"TC"	TC	TC, CLK
Intermarker Group (Calling Mkr. Group)	Flat Rate Call	None	None	None
	Ring Party Call (Message Register Charge)	"TC"	TCM	TC, CLK
	Tip Party Call (Message Register Charge)	"TC", "TP"	TCM, TP	TC, TPK, CLK
Tone Trunk - Coin and Non-Coin	Paths Busy Tone	None	None	None
	Vacant Code or Partial Dial Tone	"TP"	VP	TPK, CLK
	Line Busy Tone	"TC"	LB	TC, CLK
Common Overflow	Paths Busy Tone (Overflow from Line Busy, Paths Busy, Partial Dial or Vacant Code)	None	None	None
	Permanent Signal Tone (Overflow from Permanent Signal Holding)	"TC"	PS	TC, CLK

8.0551 No Class Information to be Transmitted to Trunk Circuit

When the service treatment required is for a flat rate call and therefore class information is not to be transmitted to the trunk circuit the no charge - non coin NCNC route series relay will be operated in series with the route R- relay. The operation of the NCNC relay will operate the no class NOC relay, thru the following contacts; from the winding of the NOC relay, thru the CLT1 and CLG relays non-operated, thru the NSI relay operated, thru the non-operated SON relay, thru one of the RP or TP relays operated, thru the TC and CNC relays non-operated, thru the operated NCNC relay, and thru the OPR, BL, VP and CAA relays non-operated to ground potential. The operation of the NOC relay will indicate to the marker that class information is not to be sent to the trunk and therefore the marker should not check that this class information has been received by the trunk circuit.

8.0552 Class Information to be Transmitted to Trunk Circuit

When the selected ringing code has been set up and the RCK3 relay has operated, as described in paragraph 8.093, the class ground CLG relay will be operated. The operation of the CLG relay will extend ground to the "TC" lead and will operate the marker TC relay and the trunk TC or TCM relay if provided and if a "TC" signal to the trunk circuit is required. Also the operation of the CLG relay will extend ground to the "TP" lead and will operate the marker TPK relay and the trunk TP relay if a "TP" signal to the trunk circuit is required.

After class information has been transmitted to the trunk circuit the marker will start timing to insure that the trunk TC or TCM and TP relays will have adequate time in which to operate. About .053 seconds after the CLG relay has operated the class timing CLT relay will operate which in turn will operate the CLT-1 relay. The operation of the

CLT-1 relay will release the CLG relay which will remove the ground which the marker has previously placed on the "TC" and "TP" leads, if required. However, if the TC or TCM relay in the trunk circuit has operated, the trunk TC or TCM relay will place ground on the "TC" lead in the trunk circuit which will be extended to the marker to hold operated the marker TC relay as a check of the operation of the TC or TCM trunk relay. Also if the TP relay in the trunk circuit has operated, the trunk TP relay will place ground on the "TP" lead in the trunk circuit which will be extended to the marker to hold operated the marker TPK relay as a check of the operation of the trunk TP relay.

After the CLG relay has released the marker will start timing to insure that the trunk TC or TCM and TP relay will have adequate time in which to release if a trouble condition exists which prevents these relays from being held operated. About .023 seconds after the CLG relay has released the class timing CLT relay will be released which in turn will operate the CLT2 relay. The operation of the CLT2 relay will operate the class check CLK relay if the TPK and TC relays in the marker have not released to indicate a trouble condition which has prevented the trunk circuit from recording the class information.

8.056 Trunk Link Frame Selection Preference

The trunk link frame selection preference for an intra-office call is similar to the trunk link frame selection preference for a dial tone connection as described in paragraph 7.36.

8.057 Trunk Selection Preference

The trunk selection preference for an intra-office call is similar to the originating register selection preference for a dial tone connection as described in paragraph 7.37.

8.06 Called Line Busy Test

After the location of the called line is identified the marker will test the called line for a busy condition before establishing a connecting path from the selected intra-office non-reverting trunk to the called subscriber line. If the called line is idle the marker will assist in the connection of the calling line to the called line. However, if the called line is busy the marker will assist in the connection of the calling line to a busy tone trunk so that a busy tone may be transmitted to the calling subscriber.

8.061 Seizure of the Line Link Frame

To test the called line for a busy condition the marker must connect to the line link frame and to the sleeve conductor associated with the called line. The information of the location of the called line as received from the number group circuit and described in paragraph 8.04 will be used to direct the marker to seize the particular line link frame associated with the called line.

8.0611 Operation of the MP, MCA and MCB Relays of the Line Link Frame

The marker by operating the MP relay in the line link frame associated with the called line will seize this line link frame. Also by operating the MCA and MCB connector relays in the line link frame there will be extended from the line link frame to the marker a group of leads required for completing the intra-office call functions associated with the called line.

Battery potential will be extended through the LFS lamp, through the contacts of the non-operated SP relay, through the contacts of the operated LLC-1 TFK-2, and PTK relays, through the contacts of the operated RCLA relay, through the contacts of the non-operated SCB-1 relay, and through the one operated FUT-0/9 relay and the one operated FTT-0/3 to place battery potential on the one "ST-00/39" lead associated with the line link frame which is associated with the called line. Battery potential on the "ST-00/39" lead is extended from the marker to the line link frame to operate the associated MP relay in the line link and connector circuit. The operation of the FTT-0/3 and FUT-0/9 relays as described in paragraph 8.042 or 8.043 will identify the line link frame associated with the called line.

The operation of the MP relay with the TR-0/3 relay non-operated will operate the line link and connector MCA (bottom) relay. The operation of the MCA (bottom) relay with the marker LLC-1 relay operated will operate the MCA (top) and the MCB relay in the line link and connector circuit.

8.062 Called Line Busy Test

The marker will gain access, on the line link frame, to the sleeve conductor associated with the called line by operating the horizontal group and the line group connector relays in the line link frame.

8.0621 Operation of the VGB-0/11, HG-0/9 and LG-0/11 Relays on the Line Link Frame and the HGK Marker Relay

The number group has identified the location of the called line and has transmitted to the marker the location of the called line by operating the vertical group identification VGT-0/11 relay, the horizontal group identification HGT-0/9 relay and the vertical file identification VFT-0/4 relay associated with the location of called line.

In the line link and connector circuit will be one VGB-0/11 relay associated with each vertical group. After the vertical group associated with the called line has been identified the associated VGB-0/11 relay in the line link and connector circuit will be operated. The operation of the marker circuit VTK-1 relay and the VGT-0/11 relay associated with the vertical group of the called line will place battery potential on the associated "VGB-0/11" lead in the marker. The "VGB-0/11" leads will be extended from the marker to the line link and connector circuit when the line link and connector MCA relay is operated thereby operating the VGB-0/11 relay in the line link and connector circuit associated with the vertical group of the called line.

The operation of the HTK-1 relay and the HGT-0/9 relay associated with the horizontal group of the called line and with the LCC-1 relay operated will place battery potential on the associated "HG-0/9" lead. With the line link and connector circuit MCA relay operated the group of "HG-0/9" leads will be extended from the marker circuit to the line link and connector circuit where the associated HG-0/9 relay will be operated.

As a check that an HG-0/9 relay in the line link and connector circuit has operated the HGK relay in the marker will operate. The operation of any HG-0/9 relay in the line link and connector circuit will place ground on the "HGK" lead in the line link and connector circuit. With the line link and connector MCA relay operated the "HGK" lead is extended from the line link and connector circuit to the marker thereby operating the HGK relay in the marker circuit.

The operation of one VGB-0/11 relay and one HG-0/9 relay in the line link and connector circuit will identify the line group of the called line and operate the associated line group LG-0/11 relay in the line link and connector circuit. The operating path for the LG-0/11 relay will be extended through the contacts of the one operated HG-0/9 relay and the one operated VGB-0/11 relay in the line link and connector circuit, through the contacts of the operated MCA relay and over the "BS" lead to the marker circuit. In the marker circuit the operation of the HGK relay with the LLC-1 relay operated will place battery potential on the "BS" lead thereby operating the LG-0/11 relay in the line link and connector circuit.

8.0622 Operation of the LBT Relay

The operation of the LG-0/11 relay will extend to the marker a group of five busy test leads from the sleeve conductors associated with the five subscriber lines within the associated subscriber line group. The operation of the one vertical file identification VFT-0/4 relay will extend the winding of the line busy test LBT relay to the one busy test lead associated with the called line. If the called line is busy the busy test lead associated with this subscriber line will be grounded thereby operating the LBT relay to indicate a busy line.

The winding of the LBT relay is extended through the contacts of the operated FLG and ITR-3 relays, through the contacts of the operated HMT-1 relay, through the contacts of the NTT relay non-operated, through the contacts of the FTK-1 relay operated, the MT-11 relay non-operated and the one VTF-0/4 relay operated to the one "LH-0/4" lead. The "LH-0/4" lead is extended from the marker to the line link and connector circuit and with the MCB relay and the one LG-0/11 relay operated the "LH-0/4" lead is further extended to the sleeve conductor of the called line. If the called line is busy the sleeve conductor will be grounded thereby operating the LBT relay in the marker. If the called line is idle the sleeve conductor will not be grounded and therefore the LBT relay will not operate.

8.07 Selection of the Connecting Path to the Called Line

Before the marker may proceed with the selection of the connecting path to the called line the marker must seize the trunk link frame associated with the selected intra-office trunk as described in paragraph 8.052, the marker must seize the line link frame associated with the called line as described in paragraph 8.061, and the marker must select and be connected to the intra-office trunk as described in paragraph 8.054.

The marker operations required for the selection of the connecting path between the called line and the intra-office trunk circuit is similar to the selection of the connecting path between the calling line and the originating register circuit for a dial tone connection as described in paragraphs 7.41, 7.42, 7.43, 7.44 and 7.45. However, the originating register is associated with the "A" appearance on the trunk link frame whereas the intra-office trunk appearance associated with the called line is the "B" appearance. Therefore the selected connecting path must connect to the "B" appearance of the intra-office trunk circuit.

8.08 Setting Up the Selected Connecting Path to the called Line

After the marker has determined the connecting paths which are idle and has selected one preferred connecting path or channel, by the operation of the preferred channel selection relay, the marker will initiate the operations necessary for connecting the called subscriber line to the selected intra-office trunk circuit thru the selected connecting path. The marker circuit will set up that part of the connecting path from the called subscriber line, thru the line link frame line and junctor switches and thru the trunk link frame junctor and trunk switches by operating the select magnets and hold magnets associated with the selected connecting path. The marker circuit will further extend the selected connecting path from the trunk link frame trunk switch to the selected intra-office trunk circuit by releasing the associated trunk link frame FB- relay after the marker has selected and set up the connecting path to the calling line as described in paragraphs 8.11 and 8.12.

8.081 Select Magnet Operation

The operation of the select magnets for setting up the connecting path to the called line from the intra-office trunk is similar to the operation of the select magnets for setting up the connecting path to the originating register from the calling line for a dial tone connection, as described in paragraph 7.51. However, instead of operating the trunk link frame trunk switch select magnet A, the trunk link frame trunk switch select magnet B will be operated thru the contacts of the operated marker FBK relay since the connection of an intra-office trunk circuit to the called line is associated with the "B" trunk appearance on the trunk link frame.

8.082 Hold Magnet Operation

The operation of the hold magnets is similar to the operation of the hold magnets for a dial tone connection, as described in paragraph 7.52.

8.083 False Cross and Ground, Continuity, Double Connection and Ground, Loop or Receiver-Off-Hook Tests

To determine if the connecting path is in a proper condition for service a false cross and ground test, a continuity test, and a double connection test will be made on the selected connecting path. Also a ground, loop or receiver-off-hook test will be made on the selected connecting path. The false cross and ground test, the continuity test and the double connection test are similar to the tests which are made while setting up the connecting path to the calling line for a dial tone connection, as described in paragraph 7.53. Ground, loop or receiver-off-hook test was not performed for a dial tone connection.

8.0831 False Cross and Ground Test

The false cross and ground test on the connecting path to the called subscriber line for an intra-office call is similar to the false cross and ground test for a dial tone connection as described in paragraph 7.531.

8.0832 Continuity Test

The continuity test on the connecting path to the called subscriber line for an intra-office call is similar to the continuity test for a dial tone connection, as described in paragraph 7.532. However, if the subscriber is a tip party subscriber the RCTB relay will be operated before continuity test is made. The operation of the RCT-7, RCT-9 or RCT-11/15 relay will operate the RCTB relay which will release the RCTA relay which in turn will release the RCT relay. The release of the RCT relay, as described in paragraph 7.5322, will change the continuity test from the ring to the tip side of the line for such a condition.

8.0833 Ground, Loop or Receiver-Off-Hook Test

"Ground test" is made by the marker on any called subscriber line which is not a PBX line and is not a "ground start" coin line. "Loop test" is made by the marker of any called subscriber line which is a PBX line. "Receiver-off-hook test" is made by the marker of any called line which is a coin line arranged for "ground start".

For an intra-office non-reverting call these tests are made only while setting up the connecting path to the called line. These tests are made to prevent charging the calling subscriber falsely for a call which cannot be completed.

The "ground test" is made on the ring and tip conductors, of a non-PBX and non-ground start coin line, from the trunk link frame trunk switch to the line link frame line switch and to the subscriber set to detect a false conductor.

The "loop test" is made on the ring and tip conductors from the trunk link frame trunk switch to the subscriber's PBX switchboard to detect a false cross between the tip and ring conductors, or a plug in the jack at the PBX switchboard. "Loop test" does not test for a plugged up line.

The "receiver-off-hook test" is made on the ring and tip conductors from the trunk link frame trunk switch to the coin station of a "ground start" coin line to detect a false ground on the tip conductor or a false cross between the tip and ring conductors. "Receiver-off-hook test" provides for testing for a plugged up line.

8.08331 Operation of the GT-1, GT-2, LGT, PBXA, GT-4, CS-0/29, and CN Relays and the Non-operation of the CCT Relay

The operation of the CON-1 relay with the SP, LXP and LXP-1 relays non-operated and the SL and LLC-1 relays operated will operate the ground test GT-1 and GT-2 relays which are in series.

The non-operation of the cancel ground test CGT relay at this time will indicate to the marker that "ground", "loop" or "receiver-off-hook" test should be made.

To indicate that the called line is a PBX line and therefore a "loop test" instead of a "ground test" should be made, the LGT, PBXA and GT4 relays will be operated. When the CKR relay is operated the LGT and PBXA relays will be operated. The CKR relay will be operated, as described in paragraph 8.04315, only when the called line is a PBX line.

To indicate that the called line is a "ground start" coin line and therefore a "receiver-off-hook test" instead of a "ground test" should be made, the LGT relay will be operated. When the line link frame associated with the called line has been seized and the VGB-0/11 relay on the line link frame operated the marker will determine the class of service of the called line by operating one class of service CS-0/29 relay. The CS-0/29 relay associated with the class of service of the called line will be operated in a similar manner as the CS-0/29 relay associated with the class of service of the calling line was operated, as described in paragraph 7.26.

However, the CS-0/29 relay will be operated, and the following marker actions will proceed, only if the FLG2 relay is provided and is operated. In offices with "non-ground start" coin lines the FLG2 relay will not be equipped therefore the CS-0/29 and the LGT relays will not be operated and the marker will not initiate the "receiver-off-hook test".

If the CS-0/29 relay operates and if the called line is a coin line the coin class CN relay will be operated in a manner similar to that described in paragraph 7.262. The operation of the CLH relay with the CN, LLC-1 and FLG-2 relays operated and the 2P, MAN and AO relays non-operated, will operate the LGT relay.

The operation of the LGT relay with the GT relay operated and the PU relay non-operated will operate the GT-4 relay.

8.08332 Operation and Release of the GT Relay

The GT relay is provided to indicate the success or failure of "ground test", "loop test" or "receiver-off-hook test". The subscriber line will be tested on the basis of holding operated the GT relay if the line test is not satisfactory. If the line test is satisfactory the GT relay will be released permitting the marker to proceed and to operate the DCT-1 relay if the double connection test is satisfactory.

The secondary winding of the ground test GT relay is energized by the operation of the TLC-1 and CKG-4 relays which operates the GT relay to the non-operated position. The operation of the GLH relay, as described in paragraph 8.082, with the GT-2 relay non-operated will extend ground to the primary winding of the GT relay thereby operating the GT relay to the operate position.

When "ground test" is being made the primary winding of the GT relay is extended to the tip and to the ring conductors over the "BRT" and "BTT" leads which are extended to the trunk link frame and then to the tip and ring conductors of the selected connecting path. The primary winding of the GT relay is extended to the "BTT" lead with the CGT and LGT relays non-operated and the CON-1, GLH-1 and FBK relays operated. The primary winding of the GT relay is also extended through the winding of the PU relay to the "BRT" lead with the CGT and LGT relays non-operated and the CON-1, GLH-1, GLH and FBK relays operated. The operation of the GT-2 relay will remove the local circuit operating ground from the primary winding of the GT relay. Therefore the primary winding of the GT relay is connected only to the tip and ring conductors of the called line. The GT relay will hold operated if there is a false ground on the tip or ring conductors of the subscriber line. A successful ground test is indicated by the release of the GT relay.

When "loop test" is being made the primary winding of the GT relay is extended to the tip conductor over the "BTT" lead which is extended to the trunk link frame and then to the tip conductor of the selected connecting path. Ground potential is extended over the "BRT" lead to the ring conductor during "loop test". The primary winding of the GT relay is extended to the "BTT" lead with the CGT relay non-operated and the GT-4, LGT, CON-1, GLH-1 and FBK relays operated. Ground potential is extended over the "BRT" lead to the ring conductor with the FBK, GLH, GLH-1, CON-1, LGT, PBXA and GT-4 relays operated. The operation of the GT-2 relay will remove the operating round from the primary winding of the GT relay. Therefore, the primary winding of the GT relay is connected only to the tip conductor of the called line. The GT relay will hold operated if there is a false ground on the tip conductor, if there is a false cross between the tip conductor and the ring conductor or if there is a plug in the jack at the PBX switchboard.

When "receiver-off-hook test" is being made the primary winding of the GT relay is extended to the tip conductor over the "BTT" lead which is extended to the trunk link frame and then to the tip conductor of the selected connecting path. Ground potential, in series with the PU relay, is extended over the "BRT" lead to the ring conductor during "receiver-off-hook test". The primary winding of the GT relay is extended to the "BTT" lead with the CGT relay non-operated and the GT-4, LGT, CON-1, GLG-1 and FBK relays operated. Ground potential is extended thru the winding of the PU relay and over the "BRT" lead to the ring conductor with FBK, GLH, GLH-1, CON-1, GT-4 relays operated and the PBXA relay non-operated. The operation of the GT-2 relay will remove the operating ground from the primary winding of the GT relay. Therefore, the primary winding of the GT relay is connected only to the tip conductor of the called line. The GT relay will hold operated if there is a false ground on the tip conductor or if there is a false cross between the tip conductor and the ring conductor.

8.0834 Double Connection Test

The sleeve conductor double connection test is made after the hold magnets have been operated. The circuit operation is similar to the sleeve double connection test for a dial tone connection, as described in paragraph 7.53. The operation of the DCT-1 relay at this time, however, does not release the F relay in the intra-office trunk as the F relay in the originating register was released in the dial tone connection.

The operation of the DCT-1 relay with the HMC and ITR-2 relays operated will place ground on the "BST" lead to the trunk link frame for holding operated the hold magnets associated with the connecting path to the called line.

8.09 Setting Up the Selected Ringing Code

The called subscriber ringing must be transmitted to the selected intra-office trunk circuit which will extend the ringing to the subscriber set at the proper time. There is provided a maximum of fifteen different ringing combinations. For example, the ringing voltage may be applied to either the ring conductor or to the tip conductor and the ringing voltage may consist of various codes. The ringing voltage which is an alternating voltage may be superimposed on a DC voltage of either polarity.

A ringing selection switch consisting of a crossbar switch is provided to connect the proper ringing code to the selected intra-office trunk circuit. One of two ringing selection switch select magnets will be operated to select either the ring or the tip conductor to which ringing should be applied. One of the other eight ringing selection switch select magnets will be operated to select the proper ringing supply code. By operating the ringing selection switch hold magnet associated with the selected intra-office trunk the proper ringing supply code will be connected by the crossbar crosspoints to either the ring or the tip conductor in the selected intra-office trunk circuit.

The number group has identified the ringing combination for the called line and has transmitted the ringing combination to the marker, as described in paragraph 8.042 and 8.043. The marker will establish the ringing condition on the ringing selection switch and will then transfer the control of the ringing to the selected intra-office trunk.

8.091 Operation of the Marker RS-0/9 and RSK Relays and the Ringing Selection Switch Select Magnets -0/9

The RCT-1/15 relay is operated, as described in paragraphs 8.042 and 8.043, to identify the ringing combination. The operation of the one RCT-1/5 relay will operate two of the associated ringing selection RS-0/9 relays in the marker. Either the RS-0 or RS-1 relay is operated to determine if the ringing is to be on the tip or on the ring conductor. One of the RS-2/9 relays are operated to determine the ringing code. Each of the operated RS-0/9 relays will operate the associated ringing selection switch select magnet-0/9 by extending battery potential over the associated "RS-0/9" lead.

As a check of the operation of the ringing selection switch select magnets, the "RSK" lead will be grounded by the off-normal contacts on the ringing selection switch select magnets, thereby operating the RSK relay in the marker.

The windings of the RS-2/9 relays will be extended through the contacts of the operated RCT-1/15 relays and the non-operated FNA, FNB, BNB, RIB, TBIB, BY, and OV relays to ground.

The operation of one of the RS-2/9 relays with the FLG and ONX relays operated will extend battery potential over the associated "RSO/9" leads to the trunk link frame where the operated MCA and LV-relays will extend the "RS-0/9" leads to the ringing selection switch thereby operating the associated RS-2/9 select magnet.

The operation of one of the ringing selection switch select magnets will place ground on the "RSK" lead to the marker to operate the RSK relay in the marker.

The RSK relay in operating will extend ground through the non-operated OV, BY, TBIB, RIB, BNB, and FNB relay contacts and through the operated RCT-1/15 relay contacts to operate either of the RS-0/1 relays.

The operation of one of the RS-0/1 relays with the FLG and ONX relays operated will extend battery potential over the associated "RS-0/1" leads to the trunk link frame where the operated MCA and LV relays will extend the "RS-0/1" leads to the ringing selection switch thereby operating the associated RS-0/1 select magnet.

8.092 Operation of the Marker SRK and LI Relays and the Inta-Office Trunk RC Relay

The operation of the RSK relay will operate the start ringing check SRK relay. The operation of the HMS-1 relay, as described in paragraph 8.082, with the SRK relay operated and the OV and TRIB relays non-operated will operate the line idle LI relay.

The operation of the marker LI relay will extend resistance ground potential to the "RC" lead which will be extended through the trunk link frame with the MCB and LV- relays operated to the selected intra-office trunk circuit to operate the ringing control RC relay in the intra-office trunk circuit. Resistance ground potential is placed on the "RC" lead in the marker by extending the "RC" lead from the trunk link frame through the contacts of the non-operated OC, TOG-3, RV-3 and SOG-3 relays to the primary winding of the RCK-1 relay, through the primary winding of the RCK-1 relay, through the contacts of the operated CKG-6 and LI relays, through the RCK-1 resistance, through the contacts of the operated FLG-1 relay and through the contacts of the non-operated MXT, XRS-1 and XRS-2 relays to ground potential.

8.093 Operation of the Ringing Selection Switch Hold Magnet and the Marker RCK-1, RCK-2 and RCK-3 Relays

The operation of the RC relay in the selected intra-office trunk circuit will extend ground over the "H" lead to operate the associated ringing selection switch hold magnet.

The RCK-1 relay in the marker will be operated to check that the ringing selection switch crosspoints have been operated. With the operation of the CKG-6 relay battery potential through the RCK-2 resistance has been extended to one side of the primary winding of the RCK-1 relay. The other side of the primary winding of the RCK-1 relay is extended to the "RC" lead and to the winding of the RC relay in the intra-office trunk circuit. The other side of the winding of the RC relay in the intra-office trunk is connected to battery potential, therefore the primary winding of the RCK-1 relay is not energized in the operate polarity. It is to be noted that the ground potential which was extended through the primary winding of the RCK-1 relay energizes the primary winding in the non-operate polarity. When the ringing selection switch crosspoints are operated a holding ground is supplied to the RC relay in the intra-office trunk. This hoding ground on the winding of the RC relay is extended over the "RC" lead to the marker and to the primary winding of the RCK-1 relay and energizes the primary winding in the operate polarity. Therefore the RCK-1 relay operates as a check that the ringing selection switch crosspoints have operated.

The operation of the RCK-1 relay will operate the RCK-2 relay which in turn will operate the RCK-3 relay.

8.10 Releasing the Called Line Connecting Path Functions and Initiating the Calling Line Connecting Path Functions

After the sleeve double connection test has been satisfactorily completed indicating the successful completion of connecting the called line to the selected intra-office trunk the marker relays associated with the called line connecting path functions will be released or recycled. After the called line connecting path functions have been released the marker will initiate the calling line connecting path functions.

8.101 Releasing the Called Line Connecting Path Functions

Releasing the called line connecting path functions consists of releasing the identification of the called line location, releasing the selection of the connecting path to the called line functions, releasing the setting up of the connecting path to the called line functions, and releasing the line link frame.

Since the operating path for holding operated the various marker relays may be opened at several different points almost simulteneously, this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

8.1011 Recycle of the Marker Called Line Connecting Path Control

8.10111 Release of the DCT Relay and the Operation of the LK-1/2 Relays

The primary winding of the DCT relay will be extended through the operated HMS-1 relay contacts, through the operated GT-1 relay contacts, through the non-operated HMT-1 relay contacts, through the non-operated NTT relay contacts, through the operated FTK-1 relay contacts and the non-operated MT-11 relay contacts, through the operated VFT-0/4 relay contacts to place ground potential, in series with the primary winding of the DCT relay, on the one "LH-0/4" lead. This ground potential in series with the primary winding of the DCT relay, will be extended to the sleeve conductor of the selected connecting path and will hold operated the line link frame and trunk link frame hold magnets associated with the selected connecting path. The hold magnet holding current will also operate the DCT relay.

The operation of the DCT-1 relay with the ITR-2 relay and the HMC relay operated has extended ground potential over the "BST" lead from the marker to the trunk link frame. With the trunk link frame MCB, LV- and FB- relays operated this ground potential on the "BST" lead has been extended to the sleeve conductor of the selected connecting path. This ground potential on the sleeve conductor will hold operated the hold magnets associated with the selected connecting path until the marker has completed the operations of connecting the calling line to the selected intra-office trunk and until the hold magnet holding ground is transferred to the selected intra-office trunk circuit.

When the operation of DCT-1 relay has extended ground potential to the sleeve conductor of the selected connecting path the DCT relay will be released as a Check that the ground potential has been extended to the sleeve conductor by the operation of the DCT-1 relay. The DCT relay has been operating in series with the hold magnets therefore the holding ground on the sleeve conductor will release the DCT relay by shunting its operating path.

The linkage check LK-1 and LK-2 relays will be operated in series when the DCT relay is released with the ITR-2, DCT-1, CKG-4 and GT-2 relays operated and the CB-7, TOG-2, DCT-2, GT-5, CT and PU relays non-operated. The LK-1 and LK-2 relays will lock operated with the CKG-4 and ITR-2 relays operated and the CB-7 relay non-operated.

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8.10112 Release of the LLC-1/2, FBK, ONW, FLG, and FLG-1 Relays in the Marker and Release of the LC-0/9 Relay in the Trunk Link and Connector Circuit

The operation of the LK-1 relay will release the LLC-1, LLC-2, FBK, ONW, FLG and FLG-1 relays in the marker and the LC-0/9 relay in the trunk link and connector circuit.

8.10113 Release of the LCK and SL Relays in the Marker

The release of the trunk link and connector LC-0/9 relay will release the LCK relay in the marker.

The release of the FBK relay in the marker will release the SL relay.

8.1012 Release of the Identification of the Location of the Called Line

8.10121 Release of the FTL, FUL, VGL-1/2, HGL-1, VFL-1, RCL, RCLA, FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, RCT-1/15, VTK-1, HTK-1, and FTK-1 Relays

The release of the FLG-1 relay will release the LLI relay which in turn will release the FTL, FUL, RCL, and RCLA relays. The release of the FLG relay will release the VGL-1/2, HGL-1, and VFL-1 relays. The release of the FTL, FUL, RCL, VGL-1/2, HGL-1, and VFL-1 relays will release the operated FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, and RCT-1/15 relays which in turn will release the VTK-1, HTK-1, and FTK-1 relays.

8.10122 Release of the PN, TN, or PTN Relays

The release of the LLI relay will release the operated PN, TN, or PTN relay.

8.1013 Release of the Line Link Frame Associated with the Called Line

8.10131 Release of the Line Link and Connector MP, MCA and MCB Relays and the Marker LFK Relay

The release of the LLC-1 relay will release the line link and connector MP, MCA and MCB relays. The release of the MCA relay will release the LFK relay in the marker.

8.10132 Release of Line Link and Connector VGB-0/11, HG-0/9 and LG-0/11 Relays

The release of the line link and connector MCA relay will release the line link frame VGB-0/11 relay. The release of the LLC-1 relay will release the operated HG-0/9 and LG-0/11 relays in the line link frame.

8.1014 Release of the Selection of the Connecting Path to the Called Line Functions

8.10141 Release of the PA, PB, PC, PNR, TCH-0/9, TCHK, P-0/9, 2G and 3G Relays

The operation of the LK-2 relay will release the operated PA, PB, PC or PNR relay and the operated P-0/9 relay. The release of the operated PA, PB, PC or PNR relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay. The release of the operated P-0/9 relay will release the 2G or 3G relay, if operated.

8.10142 Release of the Trunk Link and Connector JC-0/19, L, R, EL, ER, EF, RF, and G-0/4 Relays and the Marker JCK-0/1, LK, RK, and JG-0/4 Relays

The operation of the LK2 relay will release the trunk link frame L, R, EL, ER, RF, EF, G-0/4, and JC-0/19 relays. The JC-0/19 relays in releasing will release the JCK-0/1 relays and the L or R relay in releasing will release the operated LK or RK relay. The release of the LLC-2 relay will release the marker JG-0/4 relay.

8.10143 Release of the TLL-0/9, LB-0/9, TJ-0/9, TTL-0/9, CH-0/9 and CHA Relays

The release of the line link frame HG-0/9 relay will release the TLL-0/9 and LB-0/9 relays. The release of the trunk link frame JC-0/19 relay will release the TJ-0/9 and TTL-0/9 relays. The release of the LLC-1 relay will release the CH-0/9 and CHA relays.

8.1015 Release of the Setting Up the Connecting Path to the Called Line Functions

8.10151 Release of the Line Link and Trunk Link Frame Select Magnets

The operation of the DCT-1 relay will release the ONX relay which in turn will release the operated select magnets on the line link frame and on the trunk link frame.

8.10152 Release of the HMS-1, GLH, FCGA, LTR, GC, GLH-1, CON-1, GT-1, GT-2, SRK, RCK-2, STP-1, PEG, TK, and CHT Relays

The release of the LLC-2 relay will release the HMS-1, FCGA, LTR, and GC relays. The release of the LLC-1 relay will release the CON-1, STP-1 and PEG relays. The operation of the LK-2 relay will release the GLH relay which in turn will release the GLH-1 relay. The release of the CON-1 relay will release the GT-1 and GT-2 relays. The HMS-1 relay in releasing will release the TK and LI relays. The TK relay will in turn release the CHT relay. The LI relay in releasing will release the SRK and RCK-2 relays.

8.102 Initiating the Calling Line Connecting Path Functions

After the called line connecting path functions have been released the start call back SCB, SCB-1 and SCB-2 relays in the marker are operated to initiate the calling line connecting path functions.

8.1021 Operation of the SCB, SCB-1 and SCB-2 Relays

When the relays associated with the functions of connecting the intra-office trunk to the called line have been released the SCB, SCB-1 and SCB-2 relays will be operated. The SCB, SCB-1, and SCB-2 relays are operated in parallel and will be operated when the ITR-2 and LK-1 relays are operated and when the TK, RK, LK, TCHK, HGK, LCK, JCK-1 and JCK-0 relays have been released. After operating the SCB, SCB-1 and SCB-2 relays are held operated with the SCB and CKG-4 relays operated.

8.1022 Operation of the LLC-1, LLC-2, ONW, CB, CB-1/5, CB-7, CBF, CBD and CBD-1 Relays

The LLC-1, LLC-2 and ONW relay windings in series are extended thru the released DIS-1, MRL-1 and TRLA relay contacts, the operated SCB-1, CKG-4 and CKG-5 relay contacts and the non-operated RCY-2 relay contacts to ground.

The call back CB relay will be operated when the SCB-2 and SCB relays operate. The operating path of the CB relay is through the contacts of the DIS-2 relay non-operated, the SCB-2 relay operated, the PUL, RCY-3, CON-1, GT-2, GLH-1 and SL relays non-operated, the HMT-1 and SCB relays operated, the CKO, PTN, TN, PN, RCL, VFL, HGL, VGL, FUL, FTL, RGT-0/1 and RCT-10 relays non-operated. After operating the CB relay will be held operated with the DIS-2 relay non-operated and the SCB-1 and SCB-2 relays operated.

The operation of the CB relay will operate the CB-1, CB-2, CB-3, CB-4, CB-5, CB-7, CBD, CBD-1 and CBF relays,

8.11 Selection of the Connecting Path to the Calling Line

The selection of the connecting path to the calling line will be initiated as soon as the relays associated with functions of connecting the called line to the selected intra-office trunk have been released and the call back relays have been operated to indicate that the marker should set up a call back connection from the selected intra-office trunk to the calling line.

The marker operations required for the selection of the connecting path between the calling line and the selected intra-office trunk circuit is similar to the selection of the connecting path between the calling line and the originating register circuit for a dial tone connection as described in paragraphs 7.41, 7.42, 7.43, 7.44 and 7.45. However, in addition, the marker must first register the calling line information from the originating register and seize the line link frame associated with the calling line before proceeding.

8.111 Identification of the Calling Line and Seizure of the Line Link Frame

Before proceeding with the selection of the connecting path to the calling line the marker must operate the calling line identification relays. The originating register, as described in paragraph 8.023, has transmitted to the marker the line link frame tens digit, the line link frame units digit, the vertical group, the horizontal group and the vertical file identification. The marker must translate these calling line registrations which are registered on two-out of five relays operated and must operate the frame tens test relay, the frame units test relay, the vertical group test relay, the horizontal group test relay and the vertical file test relay associated with the calling line.

After identifying the line link frame associated with the calling line location the marker will seize this line link frame before proceeding with the selection of the connecting path between the calling line and the selected intra-office trunk.

8.1111 Identification of the Calling Line and the Operation of the FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4 VTK-1, HTK-1 and FTK-1 Relays

The calling line information was registered and stored in the marker, as described in paragraph 8.023, by the operation of the FT-0/3, FU-0/7, VG-0/10, HG-0/7 and VF-0/4 register relays.

The operation of the call back CB-7, CBF and CBD-1 relays will operate the FTT/-03 relay associated with the operated FT-0/3 register relay to identify the line link frame tens digit. The operation of the CB-7 and CBD relays will operate the FUT-0/9 relay associated with the two operated FU-0/7 register relays to identify the line link frame unit digit.

The operation of the CB-7, CB-1 and CB-2 relays will operate the VGT-0/11 relay associated with the two operated VG-0/10 register relays. The operation of the one VGT-0/11 relay will operate the VTK-1 relay.

The operation of the CB-7 and CB-3 relays will operate the HGT-0/9 relay associated with the two operated HG-0/7 register relays. The operation of the one HGT-0/9 relay will operate the HTK-1 relay.

The operation of the CB-7 and CB-4 relays will operate the VFT-0/4 relay associated with the one operated VF-0/4 register relay. The operation of the one VFT-0/4 relay will operate the FTK-1 relay.

8.1112 Seizure of the Line Link Frame and the Operation of the Line Link Frame MP, MCA, MCB, VGB-0/11, HG-0/9 and LG-0/11 Relays

The operation of the FTT-0/3 and FUT-0/9 relays will initiate the seizure of the line link frame. The marker by operating the MP relay in the line link frame associated with the called line will seize this line link frame. Also by operating the MCA and MCB connector relays in the line link frame there will be extended from the line link frame to the marker a group of leads required for completing the intra-office call functions associated with the calling line.

Battery potential will be extended through the LFS lamp, through the contacts of the non-operated SP relay, through the contacts of the operated LLC-1 relay, through the contacts of the operated TFK-2 relay, through the contacts of the operated SCB-1 relay, and through the one operated FUT-0/9 relay and the one operated FTT-0/3 to replace battery potential on the one "ST-00/39" lead associated with the line link frame which is associated with the calling line. Battery potential on the "ST-00/39" lead is extended from the marker to the line link frame to operate the associated MP relay in the line and connector circuit.

The operation of the MP relay with the TR-0/3 relay non-operated will operate the line link and connector MCA (bottom) relay. The operation of the MCA (bottom) relay with the marker LLC-1 relay operated will operate the MCA (top) and the MCB relay in the line link and connector circuit.

To gain access, on the line link frame, to the sleeve conductors associated with the line link group, the VGB-0/11, HG-0/9 and LG-0/11 relay on the line link frame will be operated.

In the line link and connector circuit will be one VGB-/11 relay associated with each vertical group. The operation of the marker circuit VTK-1 relay and the VGT-0/11 relay will place battery potential on the associated "VGB-0/11" lead in the marker. The "VGB-0/11" leads will be extended from the marker to the line link and connector circuit when the line link and connector MCA relay is operated thereby operating the VGB-0/11 relay in the line link and connector circuit.

The operation of the HTK-1 relay, the HGT-0/9 relay and the LLC-1 relay will place battery potential on the associated "HG-0/9" lead. The operation of the line link and connector circuit MCA relay will extend the "HG-0/9 leads, from the marker to the line link and connector circuit thereby operating the HG-0/9 relay in the line link and connector circuit.

The operation of one VGB-0/11 relay and one HG-0/9 relay in the line link and connector circuit will identify the line group of the calling line and operate the associated line group LG-0/11 relay in the line link and connector circuit. The operating path for the LG-0/11 relay will be extended through the contacts of the one operated HG-0/9 relay and the one operated VGB-0/11 relay, through the contacts of the operated MCA relay and over the "BS" lead to the marker circuit. In the marker circuit the operation of the HGK relay with the LLC-1 relay operated will place battery potential on the "BS" lead thereby operating the LG-0/11 relay in the line link and connector circuit.

8.112 Selection of the Line Link Group

The selection of the line link group is similar to the selection of the line link group for a dial tone connection, as described in paragraph 7.41.

8.113 Selection of the Junctor Subgroup

The selection of the junctor subgroup will be initiated when the calling line connecting path functions are initiated, as described in paragraph 8.10 and when the line link frame identification FTT-0/3 and FUT-0/9 relays are operated, as described in paragraph 8.111. The selection of the junctor subgroup is similar to the selection of the junctor subgroup for a dial tone connection, as described in paragraph 7.42.

8.114 Selection of the Trunk Link Group

At the same time as the SCB, SCB-1 and SCB-2 relays are operated the LC-0/9 relay on the trunk link frame associated with the "A" or calling line appearance of the selected intra-office trunk will be operated. The selection of the junctor subgroup and the operation of the trunk link frame LC-0/9 relay will select the trunk link group for testing in a manner similar to the selection of the trunk link group for a dial tone connection, as described in paragraph 7.43.

8.115 Test and Selection of an Idle Connecting Path

The test and selection of an idle connecting path is similar to the test and selection of an idle connecting path for a dial tone connection, as described in paragraph 7.44 and 7.45. However, the line link employed in the dial tone connection associated with this intra-office call is considered as an idle line link. The line link employed in the dial tone connection associated with this intra-office call can be considered as an idle line link since the dial tone connection will be released, thereby making the associated line link idle and available, before the marker will set up the connecting path between the calling line and the selected intra-office trunk.

The operation of the CB-5 relay will extend a group of leads from the originating register to the marker. The originating register will transmit over these leads to the marker the identification of the line link associated with the dial tone connection by operating in the marker two line link identification LL-0/7 relays associated with the two operated line link identification LL-0/7 relays in the originating register circuit. The line link identification LL-0/7 relays in the originating register circuit were operated during the dial tone connection, as described in paragraph 7.46.

The operation of the two LL-0/7 relays in the marker will open the operating path for the associated test line link TLL-0/9 relay. Since the test line link TLL-0/9 relay is operated to indicate a busy line link the operation of the two LL-0/7 relays will prevent the operation of the associated TLL-0/9 relay and therefore will prevent a busy indication of the line link associated with the connecting path between the originating register and the calling line. Therefore the marker may select this line link as a part of the connecting path from the intra-office trunk to the calling line.

8.116 Release of the Originating Register Connection

After completion of the selection of the connecting path to the calling line, the connecting path of the dial tone connection associated with this intra-office call will be released. The release of the dial tone connection connecting path is initiated at this time to make available the line link associated with the dial tone connection connecting path. The originating register, however, is not released at this time but will be released when the marker releases.

8.1161 Operation of the Originating Register RL Relay snd the Release of the Line Link Frame and Trunk Link Frame Hold Magnets Associated With the Dial Tone Connection

The release of the connecting path to the originating register is initiated when the CHE relay has released to indicate that the selection of the connecting path to the calling line has been completed. The release of the CHE relay with the TK, CB-5 and FAK relays operated and the TRL, RBT and RTST relays non-operated will place ground potential on the "RL" lead in the marker. The ground potential on the "RL" lead will be extended to the originating register marker connector circuit and to the originating register associated with this call, thereby operating the RL relay in the originating register circuit.

The operation of the RL relay removes the holding ground potential on the sleeve of the dial tone connection connecting path and thereby releases the hold magnets on the trunk link frame and the hold magnets on the line link frame associated with the dial tone connection connecting path. The originating register does not release at this time.

8.1162 Dial Tone Lockout and the Operation of the Marker LOT, LOT-1 and DTK Relays and the Line Link Frame DT and LO Relays

The release of the line link frame L hold magnet reoperates on the line link frame the line L-0/4 relay associated with the calling line. If there were no subscribers on this line link frame waiting for a dial tone connection, the reoperation of the line relay would start a false seizure of a marker. To prevent the false seizure of another marker the dial tone lockout feature is provided.

The operation of the CB relay, as described in paragraph 8.10, will operate the lockout test LOT relay. The operation of the TCHK relay with the ONX and LOT relays operated will extend ground over the "G" lead to the line link and connector circuit. If the dial tone DT relay in the line link frame is non-operated this ground will be extended over the "LO" lead to the marker circuit thereby operating the LOT-1 relay in the marker. The DT relay on the line link frame is operated by the line link frame VGS-0/11 relay if any subscribers associated with the line link frame are awaiting a dial tone connection. The operation of the LOT-1 relay in the marker will indicate to the marker that there are no subscribers on the associated line link frame waiting for a dial tone connection.

The operation of the LOT-1 relay in the marker with the LOT relay operated will extend battery potential thru the LOB lamp and over the "LOB" lead to the line link frame thereby operating the lockout LO relay in the line link frame. The operation of the line link frame LO relay will disconnect the battery potential from the start "STA" and "STB" leads in the line link frame. The battery potential being disconnected from the "STA" and "STB" leads, the reoperation

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of the line L-0/4 relay on the line link frame cannot cause the false seizure of another marker.

The operation of the LO relay on the line link frame will place ground on the "LOK" lead which will be extended to the marker to operate the DTK relay to check the operation of the line link frame LO relay.

If there were subscribers on the line link frame associated with the calling line waiting for a dial tone connection, the dial tone DT relay on the line link frame would be in the operated condition. The operated condition of the line link frame DT relay and the marker LOT relay and the operation of the TCHK relay would not operate the LOT-1 relay but would extend ground potential over the "DTK" lead from the line link frame to immediately operate the DTK relay in all markers connected to this line link frame.

The lockout LO relay on the line link frame would not be operated therefore another marker may be seized to initiate a dial tone connection. However, to prevent the other marker, which is establishing a dial tone connection, from proceeding with the calling line identification the operation of the DTK relay, in this other marker, will prevent the operation of the horizontal group gating HGG relay in that marker.

The non-operation of the HGG relay prevents the operation of the GK relay thereby preventing the other marker from identifying the calling line. If the other marker was permitted to proceed with the identification of the calling line the false operation of the line L-0/4 relay associated with the intra-office call could falsely identify the calling line associated with the intra-office call as a subscriber line awaiting dial tone service.

8.12 Setting Up the Selected Connecting Path to the Calling Line

After the connecting path to the calling line has been selected, the select and hold magnets on the line link frame and trunk link frame are operated, tests are made on the calling line and the connecting path supervision is transferred to the selected intra-office trunk.

8.121 Select Magnet Operation

The operation of the select magnets is similar to the select magnet operation for a dial tone connection, as described in paragraph 7.51.

8.122 Hold Magnet Operation

The operation of the hold magnet is similar to the hold magnet operation for a dial tone connection, as described in paragraph 7.52.

8.123 False Cross, Continuity and Double Connection Tests

To determine if the connecting path is in a proper condition for service a false cross and ground test, a continuity test, and a double connection test will be made on the selected connecting path.

8.1231 False Cross and Ground Test

The false cross and ground test on the connecting path to the calling subscriber for an intra-office call is similar to the false cross and ground test for a dial tone connection, as described in paragraph 7.531.

During the assistance of connecting the intra-office trunk to the calling subscriber the false cross and ground test will be cancelled if a "heavy traffic" condition exists or if the calling subscriber is associated with a PBX line that has dial selected trunks. To indicate that the false cross and ground test will be cancelled when the calling subscriber is associated with a PBX line that has dial selected trunks, the HTR relay will be operated. The "HTG" cross-connection terminal of Figure J will be cross-connected to the "SC-" cross-connection terminal of Figure 61 associated with the class of service of the PBX subscriber that has dial selected trunks. Also the "HTR" cross-connection terminal of Figure 30 will be cross-connected to the "S-" cross-connection terminal of Figure 61 associated with the class of service of the calling subscriber. For a PBX subscriber that has dial selected trunks, the operation of the TK and SCB relays will extend ground to the "HTG" and "SC-" cross-connection terminals and with the associated S relay operated ground will be extended to the "S-" and "HTR" cross-connection terminal thereby operating the HTR relay.

8.1232 Continuity Test

The continuity test on the connectint path to the calling subscriber line for an intra-office call is similar to the continuity test for a dial tone connection, as described in paragraph 7.532. However, if the calling subscriber is a tip party subscriber the RCTB relay, as described in paragraph 7.5322, will be operated before continuity test is made. The operation of the marker tip party TP relay will indicate that the calling subscriber is a tip party subscriber. The operation of the TP and SCB-1 relays will operate the RCTB relay which will release the RCTA relay which in turn will release the RCT relay. The release of the RCT relay, as described in paragraph 7.5322, will change the continuity test from the ring to the tip side of the subscriber line for such a condition.

8.1233 Double Connection Test

The double connection test on the connecting path to the calling subscriber for an intra-office call is similar to the double connection test for a dial tone connection, as described in paragraph 7.533. However, the DCT-1 relay will not be operated since it was previously operated on the double connection test on the connecting path to the called line, as described in paragraph 8.0834, and will be held operated until the marker is released. The DCT-1 relay is held operated to provide a holding ground on the sleeve conductor of the connecting path to the called line to hold operated the hold magnets associated with the connecting path to the called line. Therefore, to indicate the successful completion of a double connection test on the connecting path to the calling line on an intra-office the DCT-2 relay, instead of the DCT-1 relay will be operated.

The winding of the DCT-2 relay has been extended through the operated LK-1 relay contacts, through the operated SCB-1 relay contacts, through the non-operated OTT and TTK relay contacts, through the contacts of one of the CLK or NOC relays operated and the other CLK or NOC relay non-operated, through the operated NSI relay contacts, through the non-operated AVK-1 relay contacts, through the operated LK-1 relay contacts, through the non-operated DCT-3 relay contacts, through the operated RNG relay contacts, through the operated RCK-3 and ITR-3 relay contacts, through non-operated DT-2 and SP relay contacts and the DCT coil, through the non-operated MT-14 relay contacts, through the operated DCT and CKG-4 relay contacts, through the operated GT-2 relay contacts, through the non-operated GT-5, GT, and PU relay contacts to the ground potential which will operate the DCT-2 relay.

8.124 Transfer of the Connecting Path Supervision to the Intra-Office Trunk

The transfer of the connecting path supervision to the intra-office trunk for an intra-office call is similar to the transfer of the connecting path supervision to the originating register for a dial tone connection, as described in paragraph 7.54.

After the completion of the double connection test, the DCT-2 relay operates and releases the F relay in the selected intra-office trunk. The release of the F relay releases the FA- and FB- relays in the trunk link frame. The intra-office trunk connects ground potential through 10 ohms resistance and through the contacts of the released FA- and FB- relays to the sleeve conductor associated with the calling line and the called line connecting path for holding operated the associated hold magnets.

8.13 Release of the Marker and Associated Circuits

After the marker circuit has completely performed the intra-office call functions, the marker circuit will be released from this intra-office call and will be recycled to the idle condition so as to be available for assistance to other calls or connections.

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously, this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

8.131 Recycle of the Marker Release Control

8.1311 Release of the DCT Relay and the Operation of the DIS-1, DIS-2, and DISA Relays

The release of the FA- relay in the trunk link frame releases the DCT relay. The release of the DCT relay operates the disconnect DIS-1 and DIS-2 relays. The operating path for the DIS-1 and DIS-2 relays in series is extended from the winding of the DIS-1 relay over the "DIS" lead with the MT-1, MON-1, TR-1, TRR and TR-1 relays non-operated, to the "TG" lead with the TG relay non-operated, to the "DIS-1" lead if the HTR relay is either operated or non-operated, to the "DIS-1" lead with the RRK and RRC relays non-operated, to the "DIS-1" lead with the PSR relay non-operated, to the "LLK-2" lead with the TRS relay non-operated, to the "LLK1" lead with the ITR-3 relay operated, to the "LK2" lead with the RK-3 relay operated, to the "LK-3" lead with the FMK and FML relays operated, to the "LK-2" lead with the MT-14 relay non-operated, to the "M-0" lead with the ITR-2, DCT-2, and CKG-4 relays operated and the DCT relay non-operated, and to operating ground potential with the GT-2 relay operated and the GT-5, GT and PU relays non-operated. The DIS-1 and DIS-2 relays will lock operated with the TRLA relay non-operated and the originating register marker connector MA relay operated. The DIS-2 relay in operating will operate the DISA relay.

8.1312 Release of the TLC-1/3, LLC-1/2, ONW, CKG-1/7, and CB Relays

The operation of the DIS-1 and DIS-2 relays will release the TLC-1/3, LLC-1/2, ONW, CKG-1/3, CKG-6/7 and CB relays. The release of the CKG-3 relay will release the CKG-4/5.

8.1313 Operation of the Originating Register MRL Relay and the Release of the Register Marker Connector RS, RA, RB, RC, RD, MS, MA, MB, MC and MD Relays

The operation of the DIS-1 and DIS-2 relays with the marker MRL-1 relay non-operated will extend ground over the "MRL" lead to the originating register marker connector circuit and to the originating register circuit to operate the MRL relay in the originating register circuit. The operation of the MRL relay will release the originating register from this intra-office call and will also release the originating register marker connector circuit.

The operation of the MRL relay in the originating register circuit will release the RS and MS relays in the originating register marker connector. The release of the RS relay will release the RA, RB, RC and RD relays in the originating register marker connector. The release of the MS relay will release the MA and MC relays which in turn will release the MB and MD relay in the originating register marker connector.

8.1314 Release of the DIS-1 and DIS-2 Relays

The release of the originating register marker connector MA relay will release the DIS-1 and DIS-2 relays.

8.1315 Release of the MCB-1/6 Relays and the Marker Connector CB Relays

The release of the DIS-2 relay will release the MCB-1/6 relays which in turn will release the CB relays associated with this marker circuit in all marker connector circuits. The release of the CB relays associated with this marker circuit in all marker connectors will indicate to all marker connectors that this marker has been released and is now idle and available and that any marker connector circuit may select and seize this marker for service.

8.1316 Release of the DISA Relay the Release of the MCB-1/6 Relay will Release the DISA Relay

8.132 Release of the Registration of Information From Originating Register Functions

8.1321 Release of the CTA-0/2, CU-0/7, S-, FT-0/3, FU-0/7, VG-0/10, HG-0/7, VF-0/4, PSA, PSB, PSA-0/1, and PSB-0/1 Relays

The release of the originating register marker connector RA and RC relays will release the CTA-0/2 and the CU-0/7 relays. The operation of the DIS-2 relay will release the GTL-2/4 relays which in turn will release the FT-0/3, FU-0/7, VG-0/10, HG-0/7 and VF-0/4 relays. The release of the CKG-1 relay will release the S- relay and the operated PSA or PSB relay. The PSA and PSB relays in releasing will release the PSA-0/1 and PSB-0/1 relays.

8.1322 The release of the OROA, OROB, OROC, OROD, and OR Relays.

In offices where the tandem screening feature is provided the release of the originating register marker connector MA relay will release the marker OROA, OROB, OROC, and OROD relays. The OROA relay in releasing will release the OR relay.

In offices not equipped with the tandem screening feature, the OR relay will be released directly from the originating register marker connector MA relay.

8.1323 Release of the AC-0/7, BC-0/7 and CC-0/7 Relays

The release of the originating register marker connector RB relay will release the AC-0/7, BC-0/7 and CC-0/7 relays.

8.133 Release of the Identification of the Call Functions

8.1331 Release of the TC-5/7, AT-2/9, BT-20/99, LPA, LPB, LTA, LTB and R-Relays

The release of the originating register marker connector MA relay will release the operated TC-5/7 relay. The release of the CKG-1 relay will release the operated AT-2/9, BT-20/99, LPA, LPB, LTA, and LTB relays. The operation of the DIS-2 relay will release the R- relay.

8.1332 Release of the NSI and ITR-1/3 Relays

The release of the R- relay will release the NSI relay which in turn will release the ITR-1/3 relays.

8.134 Release of the Intra-Office, Non-Reverting, Trunk Selection Functions

8.1341 Release of the AL-0/3, FC-, FCA-, FCK, FCKA and FS- Relays

The operation of the DISA relay will release the operated AL-0/3 relay which will in turn release the FC- and FCA- relays if the AL-0/3 relays are provided. If the AL-0/3 relays are not provided, the operation of the DISA relay will release the FC- and FCA- relays. The release of the FC- and FCA- relays will release the FCK and FCKA relays which in turn will release the FS- relay.

8.1342 Release of the FCT-, FTCK and FTCK-1 Relays

All FTC- relays which are operated will be released when the FC- and FCA- relays are released. The release of the FTC- relays will release the FTCK and FTCK-1 relays.

8.1343 Release of the Trunk Link and Connector MP, MC, MCA, MCB, MCC and MCD Relays

The release of the TCL-1 relay will release the trunk link and connector MP, MCA, MCB, MCC and MCD relays. The release of the MP relay will release the trunk link frame MC relay.

8.1344 Release of the TFK-1, TFK-2, MAK-1 and MDK Relays

The release of the trunk link and connector MP relay will release the TFK-1 and TFK-2 relays. The release of the trunk link and connector MCA relay will release the MAK-1 relay and the release of the trunk link and connector MCD relay will release the MDK relay.

8.1345 Release of the TB-0/5, TG-0/19 and TS-0/19 Relays

The release of the operated route R- relay will release the operated TB-0/5 relay and the operated TG-0/19 relay. The release of the TLC-2 relay will release the operated TS-0/19 relay.

8.1346 Release of the Trunk Link and Connector TB-0/5, LV-2/9 and LC-0/9 Relays

The release of the operated TB-0/5 relay in the marker circuit will release the associated TB-0/5 relay in the trunk link and connector circuit. The release of the trunk link and connector circuit FA relay will release the operated LV-2/9 LC-0/9 relays.

8.1347 Release of the TBK and LCK Relays

The release of the TB-0/5 relay in the trunk link and connector circuit will release the TBK relay and the release of the LC-0/9 relay in the trunk link and connector circuit will release the LCK relay.

8.1348 Release of the FMK and FML Relays

The release of the TLC-2 relay will release the FMK relay. The release of the TFK-1 relay will release the FML relay.

8.135 Release of the Selection of the Connecting Path to the Calling Line Functions

8.1351 Release of the SCB, SCB-1, SCB-2, CB-1/5, CB-7, CBD, CBF, CBD-1, FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9 VFT-0/4, VTK-1, HTK-1 and FTK-1 Relays

The release of the CKG-4 relay will release the SCB, SCB-1 and SCB-2 relays. The release of the CB relay will release the CB-1/5, CB-7, CBF, CBD and CBD-1 relays which will release the FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, and VFT-0/4 relays which will in turn release the VTK-1, HTK-1 and FTK-1 relays.

8.1352 Release of the Line Link Frame MP, MCA, MCB, VGB-0/11, HG-0/9 and LG-0/11 Relays

The release of the LLC-1 relay will release the line link and connector MP, MCA, MCB, HG-0/9 and LG-0/11 relays. The release of the line link frame MCA relay will release the VGB-0/11 relay.

8.1353 Release of the STF, PR, 2TLF/10TLF, 20F, 40F, 7Q, RQ, PNR, PA, PB, PC P-0/9, 2G, 3G, TCH-0/9, TCHK, JG-0/4 and JCK-0/1 Relays

The release of the TLC-3 relay will release the STF or PR relay and the operated 2TLF/10TLF relay. The release of the STF or PR relay will release the 20F or 40F relay and the release of the operated 2TLF/10TLF relay will release the 7Q or RQ relay, if operated.

The release of the ONW and LLC-1 relays will release the STP-1 or STP-2 relay which will release the PNR, PA, PB or PC relay. The release of the operated

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PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the trunk link frame MCC relay will release the operated P-0/9 relay which will in turn release the 2G or 3G relay, if operated.

The release of the LLC-2 relay will release the JB-0/4 relay. The release of the trunk link frame MCB relay will release the JCK-0/1 relays.

8.1354 Release of the Trunk Link and Connector G-0/4, RF, EF, JC-0/19, L, R, EL, and ER Relays

The release of the marker JG-0/4 relay will release the G-0/4, RF, EF, JC-0/19, L, R, EL and ER Relays.

8.1355 Release of the TLL-0/9, TJ-0/9, TTL-0/9, TK CHT, CH-0/9 and CHA Relays

The release of the line link frame HG-0/9 relay will release the TLL-0/9 relays. The release of the trunk link frame MCB relay will release the TJ-0/9 relays. The release of the trunk link frame LC-0/9 relay will release the TTL-0/9 relays.

The release of the LLC-1 relay will release the CH-0/9 and CHA relays. The release of the LLC-2 relay will release the HMS-1 relay which in turn will release the TK relay which will release the CHT relay.

8.136 Release of the Setting Up the Selected Connecting Path to the Calling Line Functions

8.1361 Release of the Line Link and Trunk Link Frame Select Magnets

The operation of the GT-1 relay will release the ONX relay which in turn will release the operated select magnets on the line link frame line and junctor switches and on the trunk link frame junctor and trunk switches.

8.1362 Release of the HMS-1, SL SL-0/9, LTR, GLH and GLH-1 Relays

The release of the LLC-X2 relay will release the HMS-1 relay. The release of the trunk link frame FA- relay will release the SL relay which in turn will release the LTR relay. The release of the SL relay will also release the GLH relay which will release the GLH-1 relay. The release of the line link frame HG-0/9 relay will release the LB-0/9 relays.

8.1363 Release of the CON, CON-1, CON-3, GT-1, GT-2, DCT-1, DCT-2 and FAK Relays

The operation of the GT-2 relay will release the CON and CON-3 relays. The release of the LLC-1 relay will release the CON-1 relay which in turn will release the GT-1 and GT-2 relays. The release of the CKG-4 relay will release the DCT-1 and DCT-2 relays. The release of the trunk link frame FA- relay will release the FAK relay.

9. INTRA-OFFICE CALL, REVERTING, NON-AMA, FLAT RATE CLASS OF SERVICE WITH REVERTING TRUNKS

A call to a subscriber on the same subscriber line as the calling subscriber is a reverting call. The talking connection in the office consists of a connection path between the subscriber line and an intra-office reverting trunk if the class of service of the calling line is a flat rate class and if reverting trunks are provided in the office. This type of reverting call is described in paragraph 9. However, if reverting trunks are not provided or if the class of service of the calling line is a message rate class it is necessary to connect the calling subscriber to an operator and not to a reverting trunk. For a message rate class of service it is necessary to connect to an operator so that the proper message charging can be made since the reverting trunk cannot be equipped to provide message charging. This type of reverting call is described in paragraph 10.

The marker circuit when assisting the completion of an intra-office, reverting, non-AMA, flat rate class of service with reverting trunks, performs or assists in the performance of nine major functions as follows:

a. Registration of information from the originating register which the marker required in assisting an intra-office call.

b. The identification of the call or connection which the marker will assist.

c. Identification of the Location of the Called Line.

d. Identification of the intra-office call as a reverting type intra-office call.

e. The selection of an available idle intra-office, reverting, trunk circuit.

f. The selection of an idle connecting path between the called and calling subscriber line and the selected intra-office, reverting, trunk.

g. Connecting the called and calling subscriber line to the selected reverting intra-office trunks through the selected connecting path.

h. Setting up the selected ringing code.

i. Release of the marker and associated circuits after the marker has completed the reverting intra-office call functions.

A revertive intra-office call is identified by the marker comparing the identification of the location of the calling line, which is received from the originating register, and the identification of the location of the called line, which is received from the number group circuit. Before the marker receives the identification of the location of the called line from the number group circuit the marker will proceed to perform the functions necessary for a non-reverting intra-office call. If the marker waited until it received the location of the called line from the number group circuit and then determined that the intra-office call was a non-reverting call or a reverting call before proceeding, a much longer marker operating time would be required on non-reverting intra-office calls. Since the greater number of intra-office calls will be of the non-reverting type the marker will proceed to perform the non-reverting intra-office call functions whenever the marker is seized to assist an intra-office call. However, whenever the marker determines that a reverting intra-office call is involved, the marker must release the non-reverting intra-office call functions and initiate the reverting intra-office call functions.

9.01 Seizure of the Marker by the Originating Register

The seizure of the marker by the originating register for a reverting intra-office call is identical to the seizure of the marker by the originating register for a non-reverting intra-office call, as described in paragraph 8.01.

9.02 Registration of Information from the Originating Register

The registration of information from the originating register for a reverting intra-office call is identical to the registration of information from the originating register for a non-reverting intra-office call, as described in paragraph 8.02.

9.03 Identification of the Basic Call or Connection

The identification of the basic call or connection for a reverting intra-office call is identical to the identification of the basic call or connection for a non-reverting intra-office call, as described in paragraph 8.03.

9.04 Identification of the Location of the Called Line

The identification of the location of the called line for a reverting intra-office call is similar to the identification of the location of the called line for a non-reverting intra-office call. However, when the comparison of the called line and the calling line is made the marker will determine that both the calling subscriber and the called subscriber are associated with the same subscriber line. This will indicate to the marker to release the non-reverting intra-office call functions and to initiate the reverting intra-office call functions.

9.041 Selection and Connection to the Number Group

The selection and connection to the number group for a reverting intra-office call is similar to the selection and connection to the number group for a non-reverting intra-office call, as described in paragraph 8.041.

9.042 Number Group Translation and Marker Identification of the Location of the Called Line

The number group translation and marker identification of the location of the called line for a reverting intra-office call is similar to the number group translation and marker identification of the location of the called line for a non-reverting intra-office call, as described in paragraph 8.042.

9.043 Comparison of the Called Line and the Calling Line

The marker will examine the calling line location information and the called line location information to determine if the called line and the calling line are the same subscriber line. If the called line and calling line are the same subscriber line the call is a reverting intra-office call. The marker must perform the necessary functions differently for a reverting intra-office call as compared with a non-reverting intra-office call.

9.0431 Operation of the RV, RV-1, RV-2 and RV-3 Relays

For a reverting intra-office call the reverting RV, RV-1, RV-2 and RV-3 relays are operated to indicate a reverting intra-office call.

Ground potential will be extended through the contacts of the operated CKG-1 relay contact, through the winding of the RV-1 relay, through the non-operated CB-7 relay contacts, through the operated FT-0/3 relay contacts, through the operated FTT-0/3 relay contacts, through the non-operated CB-7 relay contacts, through the two operated, FU-0/7 relay contacts, through the operated FUT-0/9 relay contacts, through the non-operated CB-7 relay contacts, through the two operated VG-0/10 relay contacts, through the operated VGT-0/11 relay contacts, through the operated VTK-1 relay contacts, through the non-operated CB-7 relay contacts, through the two operated HG-0/7 relay contacts, through the operated HGT-0/9 and HTK-1 relay contacts, through the non-operated CB-7 relay contacts, through the operated VF-0/4 relay contacts, through the operated VFT-0/4 and FTK-1 relay contacts, through the non-operated SOG-2 and SCB-2 relay contacts, to the winding of the RV-2 relay, thereby operating both the RV-1 and RV-2 relays.

The operation of the RV-1 and RV-2 relays with the RGT-0/1 relays non-operated, will operate the RV relay. The RV relay will be held operated with the CKG-1 relay operated.

The RV-3 relay will be operated as described in paragraph 9.0623.

9.044 Release of the Number Group

The release of the number group circuit for a reverting intra-office call is similar to the release of the number group circuit for a non-reverting intra-office call, as described in paragraph 8.045.

9.05 Intra-Office, Non-Reverting, Trunk Selection

The intra-office non-reverting trunk selection will be initiated when the marker has identified the call or connection as an intra-office call and will not wait until the marker has determined if the call is a reverting or non-reverting intra-office call. Since practically all intra-office calls will be of the non-reverting type the marker will proceed as for a non-reverting intra-office call. The intra-office, non-reverting, trunk selection will proceed at the same time as the marker and number group are identifying the location of the called line and the non-reverting intra-office trunk selection will be completed before the marker determines that this call is a reverting intra-office call. Therefore, when the marker determines that the call is a reverting intra-office call the marker will release the non-reverting intra-office trunk selection, as described in paragraph 9.061. The marker must then initiate the reverting intra-office trunk selection, as described in paragraph 9.07.

The selection of the non-reverting trunk for a reverting intra-office call is similar to the selection of the non-reverting trunk for a non-reverting intra-office call, as described in paragraph 8.05.

9.06 Releasing the Non-Reverting Intra-Office Call Functions and Initiating the Reverting Intra-Office Call Functions

When the marker determines, by the operation of the RV, RV-1 and RV-2 relays, that the call is a reverting intra-office call, the marker must release those non-reverting intra-office call functions which are not required and must then initiate the reverting intra-office call functions which are required.

9.061 Release of the Non-Reverting Intra-Office Call Functions

The marker will first release those non-revertive intra-office call functions which are not required for a reverting intra-office call.

9.0611 Release of the Marker Non-Reverting Intra-Office Call Control Relays

9.06111 Operation of the RAV1/2, RA1/6, GS1/5, and ITA relays.

The operation of the RV relay will extend ground over the "BY" lead and with the ITR-1 relay operated will extend the ground to operate the route advance RAV-1/2 relays in series. The RAV-1/2 relays will be held operated with the RAV-1 and SNK relays operated.

The operation of the RAV1 relay with the ITR1 and CKG2 relays operated will operate the ITA relay.

The one route advance RA-1/6 relay associated with the ground supply associated with the non-reverting intra-office trunk route will be operated when the RAV1 relay is operated. The winding of this RA-1/6 relay will be extended through the non-operated GS-1/5 relay contacts, through the operated non-reverting intra-office route R- relay contacts, over the "RAL" lead and through the operated RAV1 relay contacts and over the "G4" lead and through the operated CKG2 relay contacts to ground, thereby operating the RA-1/6 relay. After operating, the KA-1/6 relay will be held operated with the RAV1 and CKG2 relays operated.

The operation of one RA-1/6 relay with the CKG3 or CKG7 relay operated will operate the associated ground supply group GS-1/5 relay. The operated GS-1/5 relay will be held operated with the CKG3 or CKG7 relay operated.

9.06112 Release of the TLC-1/3 LLC-1/2, ONW, and CKG-4 Relays

The operation of the RAV-1 relay will release the TLC-1/3 relays. The operation of the RAV-2 relay will release the CKG-4 relay which in turn will release the LLC-1/2 and ONW relays.

9.06113 Release of the NSI, ITR-1/3, FLG and FLG-1 Relays

The operation of the GS-1/5 relay will release the NSI relay which will release the ITR-1/3 relays which in turn will release the FLG and FLG-1 relays.

9.0612 Release of the Identification of the Location of the Called Line Functions

9.06121 Release of the FTL, FUL, VGL-1/2, HGL-1, VFL-1, FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, VTK-1, HTK-1, FTK-1 and RV-1/2 Relays

The release of the FLG-1 relay will release the LLI relay which in turn will release the FTL, and FUL relays. The release of the FLG relay will release the VGL-1/2, HGL-1, and VFL-1 relays. The release of the FTL, FUL, VGL-1/2, HGL-1 and VFL-1 relays will release the operated FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, and VFT-0/4 relays which in turn will release the VTK-1, HTK-1, FTK-1 and RV-1/2 relays.

9.06122 Release of the PN, TN or PTN Relays

The release of the LLI relay will release the operated PN, TN or PTN relay.

9.0613 Release of the Intra-Office Non-Reverting Trunk Selection Functions

9.06131 Release of the AL-0/3, FC-, FCA-, FCK, FCKA and FS- Relays

The operation of the GS-1/5 relay will release the operated AL-0/3 relay which will in turn release the FC- and FCA- relays if the AL-0/3 relays are provided. If the AL-0/3 relays are not provided the operation of the GS-1/5 relay will release the FC- and FCA- relays. The release of the FC- and FCA- relays will release the FCK and FCKA relays which in turn will release the FS- relay.

9.06132 Release of the FTC- FTCK, and FTCK1 Relays.

All FTC- relays which are operated will be released when the FC- and FCA- relays are released. The release of the FTC- relays will release the FTCK and FTCK1 relays.

9.06133 Release of the Trunk Link and Connector MP, MC, MCA, MCB, MCC and MCD Relays

The release of the TLC-1 relay will release the trunk link and connector MP, MCA, MCB, MCC and MCD relays. The release of the MP relay will release the trunk link frame MC relay.

9.06134 Release of the TFK-1, TFK-2, MAK-1 and MDK Relays

The release of the trunk link and connector MP relay will release the TFK-1 and TFK-2 relays. The release of the trunk link and connector MCA relay will release the MAK-1 relay and the release of the trunk link and connector MCD relay will release the MDK relay.

9.06135 Release of the TB-0/5, TG-0/19 and TS-0/19 Relays

The operation of the GS-1/5 relay will release the operated TB-0/5 relay and the operated TG-0/19 relay. The release of the TLC-2 relay will release the operated TS-0/19 relay.

9.06136 Release of the Trunk Circuit F Relay and the Trunk Link Frame FB-, TB-0/5, LV-2/9 and LC-0/9 Relays

The release of the trunk link frame MCA relay will release the trunk circuit F relay which in turn will release the trunk link frame FB- relay which in turn will release the LV-2/9 relay. The release of the trunk link and connector circuit MCB relay will release the operated LC-0/9 relay.

The release of the trunk link frame MCB relay will release the associated TB-0/5 relay in the trunk link and connector circuit.

9.06137 Release of the TBK and LCK Relays

The release of the trunk link frame MCB and MCD relays will release the TBK and LCK relays.

9.06138 Release of the FMK and FML Relays

The release of the TLC-2 relay will release the FMK relay. The release of TFK-1 relay will release the FML relay.

9.0614 Release of the Non-Reverting Intra-Office Selection of the Connecting Path Functions

Before the marker determines that the intra-office call is a reverting intra-office call certain preliminary functions to the selection of the connecting path have been completed. These non-reverting intra-office selection of the connecting path functions must be released.

9.06141 Release of the Line Link Frame MP, MCA, MCB, VGB-0/11, HG-0/9 and LG-0/11 Relays

The release of the LLC-1 relay will release the line link and connector MP, MCA, MCB, HG-0/9 and LG-0/11 relays. The release of the line link frame MCA relay will release the VGB-0/11 relay.

9.06142 Release of the STF, PR, 2TLF/10TLF, 20F, 40F, 7Q, RQ, PNR, PA, PB, PC, P-0/9, 2G, 3G, TCH-0/9, TCHK, JG-0/4 and JCK-0/1, Relays

The release of the TLC-3 relay will release the STF or PR relay and the operated 2TLF/10TLF relay. The release of the STF or PR relay will release the 20F or 40F relay and the release of the operated 2TLF/10TLF relay will release the 7Q or RQ relay, if operated.

The release of the ONW and LLC-1 relays will release the STP-1 or STP-2 relay which will release the PNR, PA, PB or PC relay. The release of the operated PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the trunk link frame MCC relay will release the operated P-0/9 relay which will in turn release the 2G or 3G relay, if operated.

The release of the LLC-2 relay will release the JG-0/4 relay. The release of the trunk link frame MCB relay will release the JCK-0/1 relays.

9.06143 Release of the Trunk Link and Connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER Relays

The release of the marker JG-0/4 relay will release the trunk link and connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER relays.

9.06144 Release of the TLL-0/9, TJ-0/9 and TTL-0/9 Relays

The release of the line link frame HG-0/9 relay will release the TLL-0/9 relays. The release of the trunk link frame MCB relay will release the TJ-0/9 relays. The release of the trunk link frame LC-0/9 relay will release the TTL-0/9 relays.

9.062 Initiating the Intra-Office, Reverting, Call Functions

After the marker has released the non-reverting intra-office call functions the marker will initiate the reverting intra-office call functions.

9.0621 Release of the SNK, RAV-1/2 and RA-1/5 Relays

The release of the TFK-1, FCK, FCKA, FTCK, FML and FMP relays will release the selections normal check SNK relay as a check of the release of these relays and as a check that the non-reverting intra-office call functions have been released.

The release of the SNK relay will release the RAV-1/2 relays which in turn will release the operated RA-1/6 relay.

9.0622 Operation of the Route R- Relay Associated With the Reverting Intra-Office Call

In order for the marker to proceed to select a reverting intra-office trunk and a connecting channel between the subscribers line and the reverting intra-office trunk the marker must determine the route and type of equipment which can provide the proper service for this reverting call. Therefore, there may be provided more than one route R- relay associated with reverting intra-office calls. The operation of the class of service S-00/44, S-100/144 relay or relays associated with the class of service of the calling subscriber will select the particular reverting intra-office route which is required for this call and which will result in the operation of the associated route R- relay.

For a typical office the cross-connections for operating the route R- relay are as follows: The operated CKG3 relay contacts will extend ground through the released RA-1/6 relays and the operated GS-1/5 relay, through the operated non-reverting intra-office route relay, to the route advance "RA" cross-connection terminal. The "RA" cross-connection terminal of figure 51 will be cross-connected to the "LR" cross-connection terminal of figure 53. Therefore ground is extended to the "LR" cross-connection terminal of figure 53 and further extended with the RV relay operated to place ground on the "RV" cross-connection terminal of figure 53. The "RV" cross-connection terminal of figure 53 will be cross-connected to associated "SC-" cross-connection terminals of figure 61.

The operation of a particular class of service S-00/44 or S-100/144 relay associated with the class of service of the calling subscriber will extend the ground on the "RV" cross-connection terminal to the one particular "S-" cross-connection terminal of figure 61 associated with the reverting intra-office call and with the class of service of the calling subscriber. The "S-" cross-connection terminals of figure 61 be cross-connected to the associated "RC" cross-connection terminal of figure 51 thereby extending the ground from the "S-" cross-connection terminal to operate the route R- relay associated with a reverting intra-office call and with the class of service of the calling subscriber.

The "R-" cross-connection terminal associated with the winding of the reverting intra-office route R- relay may be cross-connected to the "RB" cross-connection terminal of figure 53.

9.0623 Operation of the RV3, NSO, SOG-1/3, CB, CB-1/5, CB7, CBF, CBD, and CBD1 relays

The operation of the route relay on a reverting intra-office call will operate the RV3 relay. Ground is extended through the operated GS-1/5 relay and the operated reverting route R- relay to the "CL" terminal. The "CL" terminal is cross-connected to the "RV3" terminal at the winding of the RV3 relay. Ground potential at the "RV3" terminal will operate the RV3 relay.

The operation of the RV3 relay results in the operation of the no sender outgoing NSO relay indicating to the marker that an outgoing sender is not required on this type of call. The operation of the NSO relay also indicates to the marker that only the connecting path between the calling subscriber line and the reverting trunk circuit should be established. This is similar to an outgoing call in which the marker establishes the connecting path between the calling subscriber line and the outgoing trunk circuit.

The non-operated LR, RTST, RCY and GS-1/5 relays and the operation of the reverting intra-office route R- relay will extend the ground to the associated "OS" cross-connection terminal of figure 51 which will be cross-connected to the "NSOR" cross-connection terminal of figure 23. The operation of the "RV3" relay will extend ground from the "NSOR" cross-connection terminal to the winding of the NSO relay, operating that relay.

The operation of the NSO relay will operate the subscriber outgoing SOG-1/3 relays to direct the marker to perform functions required in assisting a reverting intra-office call. The marker functions required for a reverting intra-office call are somewhat similar to the functions required for a subscriber outgoing call.

The windings of the SOG-3 relay, the SOG-2 relay and the SOG-1 relay are in series with each other and the operating path will be extended through the operated OR relay contacts, through the operated NSO relay contacts, through the non-operated RTST and LR relay contacts, through the non-operated TR2E relay contacts over the "TRK" lead to the originating register marker connector circuit where the "TRK" lead will be grounded when the originating register marker connector MC relay is operated and the TR-1 relay is non-operated.

The operation of the SOG-2 relay with the RV-1/2 relays released, will operate the CB relay when the DIS-2 relay is non-operated. The operation of the CB relay will operate the CB-1/5, CB-7, CBD, CBD-1 and CBF relays.

9.0624 Operation of the TLC-1/3, LLC-1/2, ONW and CKG-4 Relays

The release of the RAV-1/2 relays will reoperate the TLC-1/3 and CKG-4 relays. The operation of the CKG-4 relay will reoperate the LLC-1/2 and ONW relays.

9.07 Intra-Office, Reverting Trunk Selection

The intra-office, reverting trunk selection will be initiated by the marker when the marker route relay associated with a reverting intra-office call is operated.

The method of selecting an idle reverting intra-office trunk circuit for completion of the call is similar to the method of selecting an idle originating register, as described in paragraphs 7.32, 7.33, 7.34, 7.35, 7.36 and 7.37. However, since the reverting intra-office trunk is associated with only a "B" appearance on the trunk link frame the FB- relay, but no FA- relay, will be operated in the trunk link and connector circuit.

9.08 Selection of the Connecting Path

The selection of the connecting path to the calling line will be initiated as soon as the relays associated with the non-reverting intra-office call functions have been released and the call back relays have been operated to indicate that the marker should set up a call back connection from the selected reverting intra-office trunk to the calling line.

The marker operations required for the selection of the connecting path between the calling line and the selected reverting intra-office trunk circuit is similar to the selection of the connecting path between the calling line and the selected non-reverting intra-office trunk circuit, as described in paragraph 8.11.

9.09 Setting Up the Selected Connecting Path

After the connecting path to the calling line has been selected, the select and hold magnets on the line link frame and trunk link frame are operated, tests are made on the calling line and the connecting path supervision is transferred to the selected reverting intra-office trunk.

9.091 Select Magnet Operation

The operation of the select magnets is similar to the select magnet operation for a dial tone connection, as described in paragraph 7.51.

9.092 Hold Magnet Operation

The operation of the hold magnet is similar to the hold magnet operation for a dial tone connection, as described in paragraph 7.52.

9.093 False Cross, Continuity and Double Connection Tests

To determine if the connecting path is in a proper condition for service a false cross and guard test, a continuity test, and a double connection test will be made on the selected connecting path.

9.0931 False Cross and Ground Test

The false cross and ground test on the connecting path to the calling subscriber for a reverting intra-office call is similar to the false cross and ground test for a dial tone connection, as described in paragraph 7.531.

9.0932 Continuity Test

The continuity test on the connecting path to the calling subscriber line for a reverting intra-office call is similar to the continuity test for a dial tone connection, as described in paragraph 7.532. However, if the calling subscriber is a tip party subscriber the RCTB relay, as described in paragraph 7.5322, will be operated before continuity test is made. The operation of the marker tip party TP relay will indicate that the calling subscriber is a tip party subscriber. The operation of the TP and SOG-3 relays will operate the RCTB relay which will release the RCTA relay which in turn will release the RCT relay. The release of the RCT relay, as described in paragraph 7.5322, will change the continuity test from the ring to the tip side of the subscriber line for such a condition.

9.0933 Double Connection Test

The double connection test on the connecting path to the calling subscriber for a reverting intra-office call is similar to the double connection test for a dial tone connection, as described in paragraph 7.533.

9.094 Transfer of the Connecting Path Supervision to the Reverting Intra-Office Trunk

The transfer of the connecting path supervision to the reverting intra-office trunk for a reverting intra-office call is similar to the transfer of the connecting path supervision to the originating register for a dial tone connection, as described in paragraph 7.54. However, since the reverting intra-office trunk is associated with a "B" trunk appearance on the trunk link frame the FB- relay on the trunk link frame will be released.

9.10 Setting Up the Selected Ringing Code

The setting up the selected ringing code for a reverting intra-office call is similar to the setting up the selected ringing code for a non-reverting intra-office call, as described in paragraph 8.09.

Before the marker determines that this call is an intra-office reverting call, the marker will operate two ringing switch select magnets associated with the non-reverting intra-office trunk in the same manner as described in paragraph 8.09. However, when the marker releases the trunk link frame associated with the intra-office non-reverting trunk, as described in paragraph 9.061, these ringing switch select magnets associated with this non-reverting intra-office trunk will be released. After the marker has selected a reverting intra-office trunk two ringing switch select magnets associated with this trunk and with the required ringing code will be operated in a similar manner as described in paragraph 8.09.

9.11 Release of the Marker and Associated Circuits

After the marker circuit has completely performed the reverting intra-office call functions, the marker circuit will be released from this reverting intra-office call and will be recycled to the idle condition so as to be available for assistance to other calls or connections.

Since the operating path for holding operated the various marker relay may be opened at several different points almost simultaneously this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

9.111 Recycle of the Marker Release Control

9.1111 Release of the DCT Relay and the Operation of the LK-1 Relay

The release of the FB- relay in the trunk link frame releases the DCT relay. The release of the DCT relay will operate the LK-1 relay with the DCT-1, the CKG-4, and the GT-2 relays operated and the DCT-2, TOG-2, ITR-2, GT-5, GT and PU relays released. The LK-1 relay will be locked operated with the CKG-4 relay operated.

9.1112 Release of the LLC-1/2, and ONW Relays and the Operation of the DIS-1/2 and DISA Relays.

The operation of the LK-1 relay will release the LLC-1/2 and ONW relays. The operation of the linkage check LK-1 relay will also operate the DIS-1/2 relays. The operating path for the DIS-1/2 relays in series is extended from the winding of the DIS-1 relay over the "DIS" lead to the "DIS-1" lead with the MT-1, MON-1, TRL-1, TRR and TR1 relays non-operated, to the "TG" lead with the TG relay non-operated, to the "DIS-1" lead if the HTR relay is either operated or non-operated, to the "DIS-1" lead with the RRK and RRC relays non-operated, to the "DIS-1" lead with the PSR relay non-operated, to the "LKK-2" lead with the TRS relay non-operated, to the "LKK-1" lead with the SOG-3 relay operated, to the "LK-2" lead with the RK-3 relay operated, to the "LK-3" lead with the FMK and FML relays operated, to the "LK-2" lead with the MT-14 relay non-operated, to the "LK-2" lead with the ITR-2 relay non-operated, to the "LK-1" lead with the LHT relay non-operated and to the operating ground potential with the LK-1 relay operated. The DIS-1/2 relays will lock operated with the TRLA relay non-operated and the originating register marker connector MA relay operated. The DIS2 relay in operating will operate the DISA relay.

9.1113 Release of TLC-1/3, CKG-1/7, CB and R- Relays

The operation of the DIS-1 and DIS-2 relays will release the TLC-1/3, CKG-1/3, CKG-6/7 and CB relays. The release of the CKG-3 relay will release the CKG-4/5 relays and the reverting intra-office route R- relay.

9.1114 Operation of the Originating Register MRL Relay and the Release of the Register Marker Connector RS, RA, RB, RC, RD, MS, MA, MB, MC and MD Relays

The operation of the DIS-1 and DIS-2 relays with the marker MRL-1 relay non-operated will extend ground over the "MRL" lead to the originating register marker connector circuit and to the originating register circuit to operate the MRL relay in the originating register circuit. The operation of the MRL relay will release the originating register from this reverting intra-office call and will also release the originating register marker connector circuit.

The operation of the MRL relay in the originating register circuit will release the RS and MS relays in the originating register marker connector. The release of the RS relay will release the RA, RB, RC and RD relays in the originating register marker connector. The release of the MS relay will release the MA and MC relays which in turn will release the MB and MD relays in the originating register marker connector.

9.1115 Release of the DIS-1/2 Relays

The release of the originating register marker connector MA relay will release the DIS-1/2 relays.

9.1116 Release of the MCB-1/6 Relays and the Marker Connector CB Relays

The release of the DIS-2 relay will release the MCB-1/6 relays which in turn will release the CB relays, associated with this marker circuit in all marker connector circuits. The release of the CB relays associated with this marker circuit in all marker connectors will indicate to all marker connectors that this marker has been released and is now idle and available and that any marker connector circuit may select and seize this marker for service.

9.1117 Release of the DISA Relay

The release of the MCB-1/6 relay will release the DISA relay.

9.112 Release of the Registration of Information from Originating Register Functions

9.1121 Release of the CTA-0/2, CU-0/7, S-, FT-0/3, FU-0/7, VG-0/10, HG-0/7 VF-0/4, PSA, PSB, PSA-0/1 and PSB-0/1 Relays

The release of the originating register marker connector RA and RC relays will release the CTA-0/2 and the CU-0/7 relays. The operation of the DIS-2 relay will release the GTL-2/4 relays which in turn will release the FT-0/3, FU-0/7, VG-0/10, HG-0/7 and VF-0/4 relays. The release of the CKG-1 relay will release the S- relay and the operated PSA or PSB relay. The PSA and PSB relays in releasing will release the PSA-0/1 and PSB-0/1 relays.

9.1122 The Release of the OROA, OROB, OROC, OROD, and OR Relays.

In offices where the tandem screening feature is provided, the release of the originating register marker connector MA relay will release the marker OROA, OROB, OROC, and OROD relays. The OROA relay in releasing will release the OR relay.

In offices not equipped with the tandem screening feature, the OR relay will be released directly from the originating register marker connector MA relay.

9.1123 Release of the AC-0/7, BC-0/7 and CO-0/7 Relays

The release of the originating register marker connector RA relay will release the AC-0/7, BC-0/7 and CC-0/7 relays.

9.113 Release of the Identification of the Call Functions

9.1131 Release of the TC-5/7 AT-2/9, BT-20/99, LPA, LPB, LTA, LTB and R- Relays

The release of the originating register marker connector MA relay will release the operated TC-5/7 relay. The release of the CKG-1 relay will release the operated AT-2/9, BT-20/99, LPA, LPB, LTA, and LTB relays. The operation of the DIS-2 relay will release the non-reverting intra-office route R- relay which in turn will release the reverting intra-office route R- relay.

9.1132 Release of the NSO and SOG-1/3 Relays

The release of the reverting intra-office route R- relay will release the NSO relay which in turn will release the SOG-1/3 relays.

9.114 Release of the Intra-Office, Reverting, Trunk Selection Functions

9.1141 Release of the FC-, FCA-, FCK, FCKA and FS- Relays

The release of the operated reverting route R- relay will release the FC- and FCA- relays. The release of the FC- and FCA- relays will release the FCK and FCKA relays which in turn will release the FS- relay.

9.1142 Release of the FTC-, FTCK, and FTCK1 Relays

All FTC- relays which are operated will be released when the FC- and FCA- relays are released. The release of the FTC- relays will release the FTCK relay.

9.1143 Release of the Trunk Link and Connector MP, MC, MCA, MCB, MCC and MCD Relays

The release of the TLC-1 relay will release the trunk link and connector MP, MCA, MCB, MCC and MCD relays. The release of the MP relay will release the trunk link frame MC relay.

9.1144 Release of the TFK-1/2, MAK-1 and MDK Relays

The release of the trunk link and connector MP relay will release the TFK-1/2 relays. The release of the trunk link and connector MCA relay will release the MAK-1 relay and the release of the trunk link and connector MCD relay will release the MDK relay.

9.1145 Release of the TB-0/5, TG-0/19, and TS-0/19 Relays

The release of the operated reverting route R- relay will release the operated TB-0/5 relay and the operated TG-0/19 relay. The release of the TLC-2 relay will release the operated TS-0/19 relay.

9.1146 Release of the Trunk Link and Connector TB-0/5, LV-2/9 and LC-0/9 Relays

The release of the operated TB-0/5 relay in the marker circuit will release the associated TB-0/5 relay in the trunk link and connector circuit. The release of the trunk link and connector circuit FB- relay will release the operated LV-2/9 and LC-0/9 relays.

9.1147 Release of the TBK and LCK Relays

The release of the TB-0/5 relay in the trunk link and connector circuit will release the TBK relay and the release of the LC-0/9 relay in the trunk link and connector circuit will release the LCK relay.

9.1148 Release of the FMK and FML Relays

The release of the TLC-2 relay will release the FMK relay. The release of the TFK-1 relay will release the FML relay.

9.115 Release of the Selection of the Connecting Path Functions

9.1151 Release of the CB-1/5, CB-7, CBD, CBF, CBD-1, FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, VTK-1, HTK-1 and FTK-1 Relays

The release of the CB relay will release the CB-1/5, CB-7, CBF, CBD and CBD-1 relays which will release the FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, and VFT-0/4 relays which in turn will release the VTK-1, HTK-1 and FTK-1 relays.

9.1152 Release of the Line Link Frame MP, MCA, MCB, VGB-0/11, HG-0/9, and LG-0/11 Relays

The release of the LLC-1 relay will release the line link and connector MP, MCA, MCB- HG-0/9 and LG-0/11 relays. The release of the line link frame MCA relay will release the VGB-0/11 relay.

9.1153 Release of the STF, PR, 2TLF/10TLF, 20F, 40F, 7Q, RQ, PNR, PA, PB, PC, PO/9, 2G, 3G, TCH-0/9, TCHK, JG-0/4 and JCK-0/1 Relays

The release of the TLC-3 relay will release the STF or PR relay and the operated 2TLF/10TLF relay. The release of the STF or PR relay will release the 20F or 40F relay and the release of the operated 2TLF/10TLF relay will release the 7Q or RQ relay, if operated.

The release of the ONW and LLC-1 relay will release the STP-1 or STP-2 relay which will release the PNR, PA, PB or PC relay. The release of the operated PNR, PA, PB or PC relay will release, the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the trunk link frame MCC relay will release the operated P-0/9 relay which will in turn release the 2G or 3G relay, if operated.

The release of the LLC-2 relay will release the JG-0/4 relay. The release of the trunk link frame MCB relay will release the JCK-0/1 relays.

9.1154 Release of the Trunk Link and Connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER Relays

The release of the marker JG-0/4 relay will release the G-0/4, RF, EF, JC-0/19, L, R, EL and ER relays.

9.1155 Release of the TLL-0/9, TJ-0/9, TTL-0/9, TK, CHT, CH-0/9 and CHA Relays

The release of the line link frame HG-0/9 relay will release the TLL-0/9 relays. The release of the trunk link frame MCB relay will release the TJ-0/9 relays. The release of the trunk link frame LC-0/9 relay will release the TLL-0/9 relays.

The release of the LLC-1 relay will release the CH-0/9 and CHA relays. The release of the LLC-1 relay will also release the HMS-1 relay which in turn will release the TK relay and the CHT relay.

9.116 Release of the Setting Up the Selected Connecting Path

9.1161 Release of the Line Link and Trunk Link Frame Select Magnets

The operation of the DCT-1 relay will release the ONX relay which in turn will release the operated select magnets on the line link frame line and junctor switches and on the trunk link frame junctor and trunk switches.

9.1162 Release of the HMS-1, SL, LB-0/9, LTR, GLH and GLH-1 Relays

The release of the LLC-1 relay will release the HMS-1 relay. The release of the trunk link frame FB- relay will release the SL- relay which in turn will release the LTR relay. The release of the SL relay will also release the GLH relay which will release the GLH-1 relay. The release of the line link frame HG-0/9 relay will release the LB-0/9 relays.

9.1163 Release of the CON, CON-1, CON-3, GT-1, GT-2, DCT-1, and FBK Relays

The operation of the GT-2, relay will release the CON and CON-3 relays. The release of the LLC-1 relay will release the CON-1 relay which in turn will release the GT-1 and GT-2 relays. The release of the CKG-4 relay will release the DCT-1 relay. The release of the trunk link frame FB- relay will release the FBK relay.

10. INTRA-OFFICE CALL, REVERTING, NON-AMA, MESSAGE RATE CLASS OF SERVICE OR FLAT RATE CLASS OF SERVICE WITHOUT REVERTING TRUNKS

A call to a subscriber on the same subscriber line as the calling subscriber is a reverting call. The talking connection in the office consists of a connection path between the subscriber line and an intra-office reverting trunk if the class of service of the calling line is a flat rate class and if reverting trunks are provided. This type of reverting call is described in paragraph 9. However, the reverting trunk cannot be equipped to provide message charging, therefore if the class of service of the calling line is a message rate class it is necessary to connect the calling subscriber to an operator and not to a reverting trunk if message charging is desired. Also, if the class of service of the calling line is a flat rate class but reverting trunks are not provided in the office it is necessary to connect the calling subscriber to an operator. The operator will initiate the ringing of the called subscriber and will supervise this reverting call. For a message rate class of service it is necessary to connect to an operator so that the proper message charging can be made. This type of reverting call is described in paragraph 10.

The marker circuit when assisting the completion of an intra-office, reverting, non-AMA, message rate class of service call performs or assists in the performance of eight major functions as follows:

a. Registration of information from the originating register which the marker requires in assisting an intra-office call.

b. The identification of the call or connection which the marker will assist.

c. Identification of the Location of the called line.

d. Identification of the intra-office call as a reverting type intra-office call.

e. The selection of an available idle special service trunk circuit which connects to an operator.

f. The selection of an idle connecting path between the called and calling subscriber line and the selected special service trunk.

g. Connecting the called and calling subscriber line to the selected special service trunk through the selected connecting path.

h. Release of the marker and associated circuits after the marker has completed the reverting intra-office call functions.

A reverting intra-office call is identified by the marker by comparing the identification of the location of the calling line, which is received from the originating register, and the identification of the location of the called line, which is received from the number group circuit. Before the marker receives the identification of the location of the called line from the number group circuit the marker will proceed to perform the functions necessary for a non-reverting intra-office call. If the marker waited until it received the location of the called line from the number group circuit and then determined that the intra-office call was a non-reverting call or a reverting call before proceeding, a much longer marker operating time would be required on non-reverting intra-office calls. Since the greater number of intra-office calls will be of the non-reverting type the marker will proceed to perform the non-reverting intra-office call functions whenever the marker is seized to assist an intra-office call. However, whenever the marker determines that a reverting intra-office call is involved, the marker must release the non-reverting intra-office call functions and initiate the reverting intra-office call functions.

10.01 Seizure of the Marker by the Originating Register

The seizure of the marker by the originating register for a reverting intra-office call is identical to the seizure of the marker by the originating register for a non-reverting intra-office call, as described in paragraph 8.01.

10.02 Registration of Information from the Originating Register

The registration of information from the originating register for a reverting intra-office call is identical to the registration of information from the originating register for a non-reverting intra-office call, as described in paragraph 8.02.

10.03 Identification of the Basic Call or Connection

The identification of the basic call or connection for a reverting intra-office call is identical to the identification of the basic call or connection for a non-reverting intra-office call, as described in paragraph 8.03.

10.04 Identification of the Location of the Called Line

The identification of the location of the called line for a reverting intra-office call with a message rate class of service is similar to the identification of the location of the called line for a reverting intra-office call with a flat rate class of service, as described in paragraph 9.04.

10.05 Intra-Office, Non-Reverting, Trunk Selection

The intra-office, non-reverting, trunk selection will be initiated when the marker has identified the call or connection as an intra-office call and will not wait until

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the marker has determined if the call is a reverting or non-reverting intra-office call. Since practically all intra-office calls will be of the non-reverting type the marker will proceed as for a non-reverting intra-office call. The intra-office, non-reverting, trunk selection will proceed at the same time as the marker and number group are identifying the location of the called line and the non-reverting intra-office trunk selection will be completed before the marker determines that this call is a reverting intra-office call. Therefore, when the marker determines that the call is a reverting intra-office call the marker will release the non-reverting intra-office trunk selection. The marker must then initiate the special service trunk selection, as described in paragraph 10.07.

The selection of the non-reverting trunk for a reverting intra-office call is similar to the selection of the non-reverting trunk for a non-reverting intra-office call, as described in paragraph 8.05.

10.06 Releasing the Non-Reverting Intra-Office Call Functions and Initiating the Reverting Intra-Office Call Functions

When the marker determines, by the operation of the RV, RV-1 and RV-2 relays, that the call is a reverting intra-office call, the marker must release those non-reverting intra-office call functions which are not required and must then initiate the reverting intra-office call functions which are required.

10.061 Release of the Non-Reverting Intra-Office Call Functions

The release of the non-reverting intra-office call functions for a reverting intra-office call with message rate class of service is similar to the release of the non-reverting intra-office call functions for a reverting intra-office call with a flat rate class of service, as described in paragraph 9.061.

10.062 Initiating the Intra-Office, Reverting, Call Functions

After the marker has released the non-reverting intra-office call functions the marker will initiate the reverting intra-office call functions.

The initiating of the intra-office, reverting call functions for a reverting intra-office call which will be routed to an operator is similar to the initiating of the intra-office, reverting call functions for a reverting intra-office call which was routed to a reverting trunk, as described in paragraph 9.062. However, the route R- relay associated with the special service operator assistance trunks must be operated instead of the route R- relay associated with the reverting trunks.

Two arrangements for routing reverting calls to an operator are possible. In the first, a separate group of special service trunks is equipped for reverting call service. The second arrangement does not equip a separate group of special service, trunks for reverting calls but routes reverting calls to a common group of special service trunks. In this arrangement, a class of service tone must be transmitted to the operator to identify the call as a reverting call.

If it is desired to transmit class of service tone from the special service trunk to the operator it is necessary to operate the OPS-0/3 and OPR relays as follows. Instead of the "S-" cross-connection terminal of figure 61 being cross-connected to operate the R- relay, as described in paragraph 9.0622, the "S-" cross-connection terminal of figure 61 must be cross-connected to the "OS" cross-connection terminal of figure 54 therefore operating the operator assistance OPS-0/3 relay. The operation of the OPS-0/3 relay will operate the OPR relay. The operation of the OPR and OPS-0/3 relays will extend ground to the "OP" cross-connection terminal of figure 54. The "OP" cross-connection terminal will be cross-connected to the "RC" cross-connection terminal of figure 51 associated with the operator assistance route the "R" cross-connection terminal of figure 51 associated with the operate assistance route will be cross-connected to the "NN" terminal of figure 53, thereby operating the non-charge non-coin, NCNC relay in series with the R-route relay associated with the operator assistance route.

The operation of the OPR relay will also place ground on the "TC" lead which will be extended to the trunk link frame and to the special service trunk to indicate that the special service trunk should transmit class of service tone to the operator.

If a separate group of special service trunks is equipped for reverting call service, the "S-" cross-connection terminal of figure 61 will be cross-connected to the "RC" terminal of figure 51 associated with the operator assistance route. The "R" cross-connection terminal of figure 51 associated with the operator assistance route will be cross-connected to the "NN" terminal of figure 53, thereby operating the non-charge non-coin, NCNC relay in series with the R- route relay associated with the operator assistance route.

10.07 Special Service Selection

The special service trunk selection will be initiated by the marker when the marker route relay associated with the reverting intra-office call is operated, as described in paragraph 10.062.

The method of selecting an idle special service trunk circuit for completion of the call is similar to the method of selecting an idle originating register circuit for completion of a dial tone connection, as described in paragraphs 7.32, 7.33, 7.34, 7.35, 7.36 and 7.37. However, since the special service trunk is associated with either the "A" or "B" appearance on the trunk link frame the FA- or FB- relay will be operated in the trunk link and connector circuit.

10.08 Selection of the Connecting Path

The selection of the connecting path to the calling line will be initiated as soon as the relays associated with the non-reverting intra-office call functions have been released and the call back relays have been operated to indicate that the marker should set up a call back connection from the selected special service trunk to the calling line.

The marker operations required for the selection of the connecting path between the calling line and the selected special service trunk circuit is similar to the selection of the connecting path between the calling line and the selected non-reverting intra-office trunk circuit, as described in paragraph 8.11.

10.09 Setting Up the Selected Connecting Path

After the connecting path to the calling line has been selected, the select and hold magnets on the line link frame and trunk link frame are operated, tests are made on the calling line and the connecting path supervision is transferred to the selected special service trunk.

10.091 Select Magnet Operation

The operation of the select magnets is similar to the select magnet operation for a dial tone connection, as described in paragraph 7.51.

10.092 Hold Magnet Operation

The operation of the hold magnet is similar to the hold magnet operation for a dial tone connection, as described in paragraph 7.52.

10.093 False Cross, Continuity and Double Connection Tests

To determine if the connecting path is in a proper condition for service a false cross and ground test, a continuity test, and a double connection test will be made on the selected connecting path.

10.0931 False Cross and Ground Test

The false cross and ground test on the connecting path to the calling subscriber for a reverting intra-office call is similar to the false cross and ground test for a dial tone connection, as described in paragraph 7.531.

10.0932 Continuity Test

The continuity test on the connecting path to the calling subscriber line for a reverting intra-office call is similar to the continuity test for a dial tone connection, as described in paragraph 7.532. However, if the calling subscriber is a tip party subscriber the RCTB relay, as described in paragraph 7.5322, will be operated before continuity test is made. The operation of the marker tip party TP relay will indicate that the calling subscriber is a tip party subscriber. The operation of the TP and SOG-3 relays will operate the RCTB relay which will release the RCTA relay which in turn will release the RCT relay. The release of the RCT relay, as described in paragraph 7.5322, will change the continuity test from the ring to the tip side of the subscriber line for such a condition.

10.0933 Double Connection Test

The double connection test on the connecting path to the calling subscriber for a reverting intra-office call is similar to the double connection test for a dial tone connection, as described in paragraph 7.533.

10.094 Transfer of the Connecting Path Supervision to the Special Service Trunk

The transfer of the connecting path supervision to the special service trunk for a reverting intra-office call is similar to the transfer of the connecting path supervision to the originating register for a dial tone connection, as described in paragraph 7.54. However, since the special service trunk is associated with either the "A" or "B" appearance on the trunk link frame, the FA- or FB- relay will be released in the trunk link and connector circuit.

10.10 Release of the Marker and Associated Circuits

After the marker circuit has completely performed the reverting intra-office call functions, the marker circuit will be released from this reverting call and will be recycled to the idle condition so as to be available for assistance to other calls or connections.

The release of the marker and associated circuits is similar to the release of the marker and associated circuits, as described in paragraph 9.11.

11. SUBSCRIBER OUTGOING CALL, NON-AMA

The detailed description of the marker operations in assisting this subscriber outgoing call is for a subscriber outgoing call in which an outgoing sender is required. However, the marker operations in assisting a subscriber outgoing call in which an outgoing sender is not required are similar, except that the marker does not perform the functions of selecting and connecting an outgoing sender to the marker and to the selected outgoing trunk circuit as described in paragraph 11.4.

The marker circuit when assisting the completion of a subscriber outgoing call requiring an outgoing sender performs or assists in the performance of seven major functions as follows:

(a) Registration of information from the originating register which the marker requires in assisting a subscriber outgoing call.

(b) The identification of the call or connection which the marker will assist.

(c) The selection and connection of an outgoing sender to the marker and to the selected outgoing trunk circuits.

(d) The selection of an available idle outgoing trunk circuit associated with the office of the called subscriber.

(e) The selection of an idle connecting path between the calling subscriber line and the selected outgoing trunk circuit.

(f) Connecting the calling subscriber line to the selected outgoing trunk circuit through the selected connecting path.

(g) Release of the marker and associated circuits after the marker has completed the subscriber outgoing call functions.

The marker operations from the marker seizure by the originating register marker connector until the identification of the call or connection which the marker will assist and until the operation of the route R- relay for a subscriber outgoing call are similar to the marker operations for an intra-office call. Until the type of call or connection has been determined and the route R- relay operated, the marker has no means of distinguishing between a subscriber outgoing call and an intra-office call.

11.1 Seizure of the Marker by the Originating Register

The seizure of the marker by the originating register for a subscriber outgoing call is similar to the seizure of the marker by the originating register for an intra-office call, as described in paragraph 8.01.

11.2 Registration of Information from the Originating Register

The registration of information from the originating register for a subscriber outgoing call is similar to the registration of information from the originating register for an intra-office call, as described in paragraph 8.02. However, the TH-0/7, HN-0/7, T-0/7 and U-0/7 relays will not be operated to identify and record the numericals of the called subscriber.

11.3 Identification of the Basic Call or Connection

To determine if this call is an intra-office call or if it is an outgoing call the marker will examine the office code of the called subscriber directory number. Since the called subscriber office code has been recorded in the marker on a "two-out-of-five" relay basis it may be more practical to translate certain digits to a one-out-of-ten" basis before proceeding to identify the destination of the call. For the purpose of translating the "A" digit and the "B" digit of the called subscriber directory number, when desirable, the marker may be equipped with "A" digit translator relays designated AT-2/9 and may be equipped with "B" digit translator relays designated BT-20/99. The marker will place ground on the one "code point" cross-connection terminal associated with the office destination of the call.

11.31 Operation of the TC-5/7 or 11X Relay

The operation of the TC-5/7 relay for a subscriber out-going call is similar to the operation of the TC-5/7 relay for an intra-office call, as described in paragraph 8.031.

The 11X relay will be operated on calls requiring foreign area translation associated with a 11 directing code. Ground on the "11" lead from the originating register marker connector will indicate that a call has been received with 1-1 for the first and second digits. With the "11" cross-connection terminal cross-connected to the "11X" cross-connection terminal, and with ground potential on the "11" lead, the 11X relay will be operated. The operation of the 11X relay with the "A" digit code register AC-0/7 relays operated will ground one of the "11X-0" or "11X-2/9" code points.

11.32 Operation of AT-2/9 Relay

The operation of the AT-2/9 relay for a subscriber outgoing call is similar to the operation of the AT-2/9 relay for an intra-office call, as described in paragraph 8.032.

11.33 Operation of BT-20/99 Relay

The operation of the BT-20/99 relay for a subscriber outgoing call is similar to the operation of the BT-20/99 relay for an intra-office call, as described in paragraph 8.032.

11.34 Operation of the R- Relay

11.341 Operation of the R- Relay in Calls Not Requiring Foreign Area Translation

The code point or code points associated with the office code or codes of the called subscriber will be cross-connected so as to operate a route R- relay associated with the call office route when the code point is grounded by the operation of the marker called subscriber directory number register relays and translator relays on a subscriber outgoing call. The cross-connection terminals which are used as local area code points are described in paragraph 8.034.

Before the marker can proceed to select an outgoing trunk associated with the called office and a connecting channel between the calling subscriber and the outgoing trunk the marker must determine the route and type of equipment which can provide the proper service for this call. For example, a calling subscriber with a coin class of service must be routed through an outgoing trunk associated with the called office and also equipped to provide coin service and supervision. In many offices certain outgoing trunks associated with the called office will be arranged to provide coin service while other outgoing trunks associated with the called office will not be arranged to provide coin service. Therefore, there may be provided more than one route R- relay associated with the called office, the number of routes required. The operation of the S00-44, S100,144, PSA0-1 or PSB0-1 relay associated with the calling subscribers class of service will select the particular route R- relay which is required from among the R- relays associated with the called office.

For a typical office the cross-connections for operating the route R- relay are as follows.

The operation of the CKG-1 relay and the AC-0/7 and where required the BC-0/7, the CC-0/7, the AT-2/9 and the BT-20/99 relays will place ground on the code point. The code point cross-connection terminal will be cross-connected to the associated "RC" cross-connection terminals of Figure 51 thereby extending the ground from the code point cross-connection terminal thru the winding of one or more route R- relays to the associated "R-" cross-connection terminals of Figure 51. The "R-" cross-connection terminals will be cross-connected to the associated "SC-" or "PSC-" cross-connection terminals of Figure 61 or 135. The operation of a particular S-, PSA- or PSB- relay associated with the calling subscribers class of service will extend the operating path of one of these R- relays to the "S-" cross-connection terminal of Figure 61 or to the A or "PSB" cross-connection terminal of Figure 135. The "S-", "PSA-" or "PSB-" terminal may be cross-connected to the "RB" cross-connection terminal of Figure 53, to the "NN", "NC", "TC" or "TN" cross-connection terminal of Figure 53 in accordance with the description in paragraph 26, or to the "MBS-0/9" cross-connection terminal of Figure 56. If these cross-connections are made, the outgoing route R-relay operating path will be through the winding of one of the route series NCNC, NCCN, TCNC, TCCN OR MBS-0/9 relays which will also operate with the R- relay to provide information to the marker.

If the class of service distinction is not necessary when selecting a particular outgoing route R- relay which should be operated, the "R-" cross-connection terminal would be cross-connected to the "RB", "NN", "NC", "TC", "TN" or "MBS-0/9" cross-connection terminal and the "SC-", "S-", "PSC-", "PSA-" or "PSB-" cross-connection terminals would not be required for this outgoing call.

The operation of a route R- relay associated with an outgoing route will identify this call as an outgoing call. The operation of a route R- relay associated with an outgoing route which requires an outgoing sender will further identify this call as an outgoing call requiring an outgoing sender.

11.342 Operation of the R- Relay in Calls Requiring Foreign Area Translation

The foreign area translation feature provides means for translating the local office codes, generally in adjacent foreign areas, in order to obtain route, billing, number structure and delete information.

The calling subscriber can reach a foreign area by dialing the called subscriber directory number or by prefixing the national area codes, XOX or XIX, or the 11 directing code to the called subscribers directory number. This feature is generally used where there is more than one routing or more than one billing treatment required.

Grounding a code point that is associated with a call requiring foreign area translation, will initiate actions which will cause the seizure of the foreign area translator. One foreign area translator group provides for translation to three foreign areas.

The operation of the CKG-1 relay and the AC-0/7, BC-0/7 and CC-0/7 relays with the AT-2/9 and BT-20/99 relays or the 11X relay operated, will ground the code point.

If the code point is associated with a code requiring foreign area translation, the code point will be cross-connected to a "FAT-" cross-connection terminal. Ground on the code point will be extended to the foreign area translator connector over the "FAT-" lead to initiate the operation of the foreign area translator connector. The operation of the foreign area translator connector will initiate the seizure of an idle foreign area translator. Ground potential on one of the "FAT-" leads will also identify the desired area.

The marker extends the "A", "B", "C", "D" and if required the "E", "F" and "G" digit information to the foreign area translator connector over similarly designated leads, on a two out of five basis. The marker also extends the class of call information over the "OR" lead to the foreign area translator connector.

The foreign area translator connector will extend the class of call information, the office code of the called subscriber directory number, and the identification of the foreign area to the foreign area translator. The foreign area translator will translate the office code in order to determine the necessary route information and will operate the route register relays in the foreign area translator connector. Ground will be extended from the marker with the CKG-1 relay operated and the DIS-2 relay non-operated, to the foreign area translator connector over the "CGD" lead, and with the operation of the route register relays, in the foreign area translator connector, this ground will be returned to the marker over the "FAR-" leads. Therefore, ground will be extended to the "FAR-" cross-connection terminals of Figure 140.

The "FAR-" cross-connection terminals of Figure 140 will be cross-connected to the "RC-" cross-connection terminals of Figure 51, to the "CV-" cross-connection terminals of Figure 118, or to the "VCG" cross-connection terminal of Figure 43.

Ground potential on a "FAR-" cross-connection terminal that has been cross-connected to the "RC-" cross-connection terminal will be extended through the winding of the R- relay to the "R-" cross-connection terminal of Figure 51. The "R-" cross-connection terminal will generally be cross-connected to the "SC-" cross-connection terminal of Figure 61. However, in offices where the presort feature is provided the "R-" cross-connection terminal may be cross-connected to the "PSC-" cross-connection terminal of Figure 135. The operation of the particular S-, PSA- or PSB- relay associated with the class of service will extend the operating path of the R- relay to the "S-", or to the "PSA-" or "PSB-" cross connection terminals. The "S-", "PSA-" or "PSB-" cross-connection terminals may be cross-connected to the route series relays used for trunk class signals, in accordance with the description in paragraph 26, or may be cross-connected to the "MBS-0/9" cross-connection terminals of Figure 56. Therefore, ground potential extended to one of the "RC-" cross-connection terminals will operate a route R- relay in series with a route series relay. The operation of the route relay and associated S- relay will provide billing treatment on a subscriber class basis. The operation of the route relay and associated PSA- or PSB- relay will provide billing treatment on a presort class basis.

However, ground potential on a "FAR-" cross-connection terminal, that has been cross-connected to a "CV-" cross-connection terminal will operate the CV- relay in a manner similar to the description in paragraph 11.4432. Ground potential on a "FAR-" cross-connection terminal, that has been cross-connected to the "VCG" cross-connection terminal, will provide vacant code treatment in that office.

11.35 Operation of the CB, CB-1/5, CB-7, CBF, CBD and CBD-1 Relays

The call back CB relay will be operated when the SOG-2 relay is operated, as described in paragraph 11.412, with the DIS-2, RV-2 and RV-1 relays non-operated. The operation of the CB relay will operate the CB-1, CB-2, CB-3, CB-4, CB-5, CB-7, CBD, CBD-1 and CBF relays.

11.4 Selection and Connection of an Outgoing Sender

Outgoing senders of each type, such as dial pulsing outgoing senders, multi-frequency outgoing senders, revertive pulsing outgoing senders or P.C.I. outgoing senders, are arranged in sender groups of a maximum of ten senders. Each sender group is subdivided into sender subgroup "A" and sender subgroup "B", with a maximum of five senders in each sender subgroup. The operation of the route relay associated with the subscriber outgoing call directs the marker to a sender group of the proper type of senders to determine if either sender subgroups contain idle senders.

After the marker has determined that an idle outgoing sender is available, the marker will seize the outgoing sender connector associated with the selected sender subgroup.

The marker in assisting a subscriber outgoing call when a sender is required must have access to the selected outgoing sender. The marker will have access to the selected outgoing sender through the outgoing sender connector circuit. The connection between the marker and the outgoing sender consists of two channels, a common channel which is common to all markers and to a sender subgroup, and an individual channel which is individual for each marker and each sender. The common channel is established by the operation of the outgoing sender connector MA, MB, MC, SA, SB and SC relays. The common channel extends the registration and route information leads to the selected sender and is released after the registration and route information has been transmitted to the outgoing sender and has been checked. After the release of the common channel associated with this outgoing call the common channel may be used by other markers for reaching other outgoing senders within the same sender subgroup.

The individual channel is established by the operation of the outgoing sender connector S relay and extends control leads from the marker to the selected outgoing sender so that the marker can retain control of the selected sender after releasing the common channel. The common and individual sender channel arrangement is used so that a marker will exclude the entire sender subgroup from other markers only a relatively short time and also be able to retain control over the selected sender until the marker is released from this outgoing call.

The marker must assist in establishing a connection between the selected outgoing sender and the selected outgoing trunk. The connection of the selected outgoing sender to the selected outgoing trunk is made by means of the outgoing sender link circuit. All outgoing senders of one type, up to a maximum of ten, have access to all of the outgoing trunks in the office which require senders of that type. When more than ten outgoing senders of the same type are required by a marker group, two or more sender groups of the required type of senders must be provided, each of these sender groups having access to a different group of outgoing trunks. When two or more sender groups of the same type are provided, the marker route relay will select the sender group associated with the outgoing trunks required for this outgoing call.

The outgoing senders appear on the horizontals of a crossbar switch in the sender link circuit and the outgoing trunks appear on the verticals of the switch. Since the outgoing senders appear on the horizontals of the outgoing sender link switch, the select magnet to be operated is determined by the outgoing sender selected. The select magnet is operated when the outgoing sender is selected.

The outgoing trunks appear on the verticals of the sender link switch therefore the sender link switch hold magnet to be operated is determined by the outgoing trunk selected.

11.41 Outgoing Sender Subgroup Selection

In general, the operation of the route R- relay associated with this outgoing call will select the outgoing trunks of the required route and will also select the outgoing sender group which is associated with the outgoing senders which have access to these outgoing trunks. However in certain cases, it may be necessary for one outgoing trunk subgroup associated with a particular outgoing route to have access to one sender group and another outgoing trunk subgroup associated with the same outgoing route to have access to another sender group. In this case the marker will be provided with a two-step allotter circuit in order to select the subgroup of outgoing trunks, as described in paragraph 11.51. The selection of the subgroup of trunks will also identify the sender group for this outgoing call.

After the marker has identified the outgoing sender group the marker will test the two sender subgroups within the sender groups to determine which sender subgroup is associated with available senders.

11.411 Operation of the OSG-0/4 and OSA-0/4 Relays

When the two-step allotter is required for the selection of an outgoing trunk or outgoing sender, the operation of the route R- relay operates one of the allotter AL-0/3 relays which will operate one of the GPA or GPB relays to select the sender group to be associated with this call. The operation of the GPA or GPB relay will in turn operate the outgoing sender group OSG-0/4 relay. If the two-step allotter is not required for the selection of an outgoing trunk or outgoing sender the operation of the route R- relay will operate the OSG-0/4 relay. The operation of the two-step allotter is described in paragraph 11.51.

The operation of the route R- relay associated with this outgoing call has extended ground to the associated "OS" cross-connection terminal of figure 51 when the GS-1/5, RCY, LR and RTST relays are non-operated. The "OS" cross-connection terminal is connected to the associated "OSG-0/3" cross-connection terminal of figure 64 where the operation of the GPA or GPB relay will extend the ground on the "OS" cross-connection terminal to the associated "OSA-0/3" or "OSB-0/3" cross-connection terminal. The "OSA-0/3" and "OSB-0/3" cross-connection terminals of figure 64 will be cross-connected to the associated "OSC" cross-connection terminals of figure 70 thereby operating the OSG-0/4 and OSA-0/4 relays associated with outgoing sender group from which an outgoing sender will be selected to assist this outgoing call. Thus with the two-step allotter one of two outgoing sender groups will be selected for service.

When the two-step allotter is not required for the selection of an outgoing trunk or outgoing sender the "OS" cross-connection terminal is connected to the associated "OSC" cross-connection terminal of figure 70 thereby operating the OSG-0/4 and OSA-0/4 relays.

11.412 Operation of the OGC, OSC, SOG-1/3, SON, GOS and TGS-1/3 Relays

The operation of the OSG-0/4 relay will operate the OGC, OSC, SOG-1/3 and SON relays to direct the marker to perform the functions required in assisting a sender subscriber outgoing call.

The operation of the OSG-0/4 relay with the RTST and DCK relays non-operated and the CKG-6 relay operated will operate the outgoing call OGC relay. With the MRL-1 relay and the RSC relay non-operated the operating path of the OGC relay will be extended to operate the outgoing sender call OSC relay.

The windings of the SOG-3 relay, the SOG-2 relay and the SOG-1 relay are in series with each other and the operating path will be extended thru the operated OR relay, thru the non-operated NSI relay, thru the operated OSG-0/4 relay, thru the RTST, LR, and TR2E relays non-operated and over the "TRK" lead to the originating register marker connector circuit where the "TRK" lead is grounded when the originating register marker connector MC relay is operated and the TR-1 relay is non-operated.

The operation of the OSG-0/4 relay will operate the SON relay which in turn will operate the GOS relay with the OSE and OSK relays non-operated.

The operation of the OGC relay with the OST-2 and RSC relays non-operated will operate the transmitting ground supply TGS-1/2 relays. In offices equipped for two and three digit code conversion, the TGS3 relay of Fig. 119 will also be operated when the OGC relay operates.

11.413 Operation of the SIA, SIB, GBA and GBB Relays

The operation of the OSG-0/4 relay extends from the associated outgoing sender circuits to the marker the "SIE" and "SIO" test leads for operating the sender idle in "A" subgroup SIA relay and the sender idle in "B" subgroup SIB relay. The SIA and SIB relays will test to determine if there are any idle outgoing senders in the associated subgroup of the selected sender group. The operation of the OSG-0/4 relay will operate the SIA if there are idle senders in subgroup "A" and the SIB relay will be operated if there are idle senders in subgroup "B". If any sender in a subgroup is idle, ground appears on two leads to the markers, the sender idle even "SIE" lead and the sender idle odd "SIO" lead. The even-numbered markers test a subgroup over the "SIE" lead and the odd-numbered markers test a subgroup over the "SIO" lead. This arrangement is a safety feature, so that an open "SIE" or "SIO" lead make the associated subgroup unavailable to only approximately half the markers, instead of putting the subgroup entirely out of service as would be the case if all markers tested over the same lead.

The winding of the SIA or SIB relay winding will be extended with the MT-2 and FKA relays non-operated and the OSG-0/4 relay operated to the associated "SIA" or "SIB" cross-connection terminal of figure 70. The "SIA" or "SIB" cross-connection terminals of figure 70 will be cross-connected to the associated "SIAC-0/4" or "SIBC-0/4" cross-connection terminals of figure 71. With the SCBA-0/2 and SCBB-0/2 relays non-operated the operating path of the SIA or SIB relays will be extended to the "SIE" or "SIO" leads and to the outgoing sender where the non-operated condition of the SB and MB relays will place ground potential on the "SIE" and "SIO" leads to operate the SIA and SIB relays in the marker.

The operation of the OSG-0/4 relay extends from the associated outgoing sender connector circuit to the marker the "GBO" or "GBE" test leads for operating the sender subgroup "A" busy GBA relay and the sender subgroup "B" busy GBB relay. The GBA and GBB relays will test to determine if the outgoing sender connector circuit associated with sender subgroup "A" or subgroup "B" is busy and unavailable for immediate service. From this information the marker will, if possible, select an idle outgoing sender within a sender subgroup associated with an outgoing sender connector which is idle and available for immediate service.

The windings of the GBA and GBB relays will be extended to the associated "GBA" and "GBB" cross-connection terminals with the FKA, SKA and SKB relay non-operated and the OSG-0/4 relay operated. The "GBA" and "GBB" cross-connection terminals are cross-connected to the associated "GBAC" and "GBBC" cross-connection terminals thereby extending the operating path of the GBA and GBB relays to the "GBO" or "GBE" leads which are extended to the associated outgoing sender connector circuits. The operation of an outgoing sender connection MA relay will place ground on the "GBO" and "GBE" leads thereby operating the GBA or GBB relay as an indication that this outgoing sender connector circuit is busy and unavailable.

11.414 Operation of the Outgoing Sender Connector MP Relay

The operation of the SIA or SIB relay, which indicates that one or more senders in subgroup "A" or subgroup "B" are idle will place battery potential on the start "A" lead or on the start "B" lead.

Battery potential is extended thru the OSA lamp, thru the contacts of the non-operated SP relay, thru the contacts of the operated OSC and FTCK relays, thru the contacts of the non-operated SKB relay, thru the contacts of the non-operated SZ or SIB relays or the operated GBB relay, thru the contacts of the operated SIA relay, thru the contacts of the operated OSG-0/4 relay to the "STA" cross-connection terminal. The "STA" cross-connection terminal is cross-connected to the associated "STAC" cross-connection terminal thereby extending the battery potential to the "ST" lead associated with the outgoing sender connector associated with those senders required by this outgoing call and with those senders associated with sender subgroup "A". Battery potential on the "ST" lead of the outgoing sender connector will operate the associated marker preference MP relay in the outgoing sender connector provided that no other MP relay of higher preference is operated in this outgoing sender connector circuit.

Battery potential is extended thru the OSB lamp, thru the contacts of the non-operated SP relay, thru the contacts of the operated OSC and FTCK relays, thru the contacts of the non-operated SKA relay, thru the contacts of the non-operated SIA relay or the operated SZ or GBA relays, thru the contacts of the operated SIB relay thru the contacts of the operated OSG-0/4 relay to the "STB" cross-connection terminal. The "STB" cross-connection terminal is cross-connected to the associated "STBC" cross-connection terminal thereby extending the battery potential to the "ST" lead associated with the outgoing sender connector associated with those senders required by this outgoing call and with those senders associated with sender subgroup "B". Battery potential on the "ST" lead of the outgoing sender connector will operate the associated marker preference MP relay in the outgoing sender connector provided that no other MP relay of higher preference is operated in this outgoing sender connector circuit.

The SZ relay will be operated on every other outgoing call requiring and outgoing sender circuit. Thus the traffic directed to senders associated with sender subgroup "A" and senders associated with sender subgroup "B" will be equalized.

11.415 Operation of the SKA or SKB and the SKA-1 or SKB-1 Relays

To indicate that the marker has seized the sender connector circuit, the operation of the outgoing sender connector MP relay will operate in the marker the sender connector check subgroup "A" SKA and SKA-1 relays if the selected outgoing sender connector is associated with sender subgroup "A" or will operate the sender connector check subgroup "B" SKB and SKB-1 relays if the selected outgoing sender connector is associated with sender subgroup "B".

The operation of the outgoing sender connector MP relay will extend ground over the "SKA" or "SKB" lead to the marker where the non-operated condition of the GBA and GBB relays will extend the ground to the winding of the SKA and SKA-1 relays or the SKB and SKB-1 relays thereby operating these relays.

11.42 Outgoing Sender Selection

After the marker has selected the sender subgroup and has seized the outgoing sender connector associated with the selected outgoing sender subgroup those outgoing senders within the selected subgroup will be tested to determine which are idle and available for service. The marker will then select the preferred outgoing sender which is idle and available for service.

11.421 Operation of the Outgoing Sender Connector OSGA or OSGB Relay and the Marker OS-0/4 Relays.

The operation of the SKA or SKB relays in the marker will extend battery potential thru the SKA or SKB lamp, thru the contacts of the operated OSG-0/4 relay and over the "OSGA" or "OSGB" lead to operate the OSGA or OSGB relay in the associated outgoing sender connector circuit.

The operation of the OSGA or OSGB relay in the outgoing sender connector circuit will extend from the selected outgoing senders to the marker a group of "OS-0/4" l leads for the individual testing of each outgoing sender of the selected subgroup. In the marker circuit the "OS-0/4" leads will be extended to the associated outgoing sender test OS-0/4 relays with the GOS relay operated and the MT-2 relay non-operated. If an outgoing sender within the selected subgroup is idle the associated "OS-0/4" lead will be grounded thereby operating in the marker circuit the associated outgoing sender test OS-0/4 relay as an indication that the outgoing sender may be selected for service.

11.422 Operation of the OSE Relay, Release of the GOS Relay and Release of the Non-Preferred OS-0/4 Relay

To indicate that one or more OS-0/4 relays have operated, the ground potential on the "OS-0/4" lead which is extended to the marker circuit will be extended to operate in the marker the OSE relay when any of the OS-0/4 relays are operated with the SON relay operated.

The operation of the OSE relay will release the GOS relay.

If two or more OS-0/4 relays have operated indicating more than one outgoing sender is idle and available for service, the one OS-0/4 relay among the operated OS-0/4 relays with the prior selection preference will be locked operated and all other OS-0/4 relays will be released. The OS-0/4 relay remaining operated will select the outgoing sender for this outgoing call.

The operation of the SON, OSE, the one preference selection SQ-0/9 relay has extended ground to lock operated only the one preferred OS-0/4 relay. When the GOS relay released the operating circuits for all OS-0/4 relays were removed thereby releasing all OS-0/4 relays except the one preferred OS-0/4 relay which has been locked operated. The selection preference of any OS-0/4 relay will vary with each connection set up by the marker and will depend upon the particular SQ-0/9 relay operated in the selection preference circuit at this time. The detailed operation of this selection preference circuit will be found in paragraphs 7.251, 7.252 and 7.253. The order of selection preference for the outgoing sender OS-0/4 relays are as follows:

OSO/4 Relay	SQ0/9 Relay Operated: SQ0 or SQ5	SQ1 or SQ6	SQ2 or SQ7	SQ3 or SQ8	SQ4 or SQ9
OS0	1	4	2	5	3
OS1	3	1	4	2	5
OS2	5	3	1	4	2
OS3	2	5	3	1	4
OS4	4	2	5	3	1

11.423 Operation of the OSK Relay

The release of the GOS relay operates the outgoing sender check OSK relay to indicate that the selection of an outgoing sender has been completed. The winding of the OSK relay is extended thru the contacts of the non-operated AVK relay, thru the contacts of the operated OSE relay, thru the contacts of the non-operated SLK-1 relay thru the SLK-2 coil, thru the contacts of the non-operated SLK and GOS relays, and thru the contacts of the operated SON relay to ground potential which operates the OSK relay. After operating the OSK relay will lock operated with the SON relay operated.

11.43 Marker Connection to the Selected Outgoing Sender

After the marker has checked the selection of an outgoing sender, the marker will operate in the outgoing sender connector the individual channel S relay associated with this marker and the selected outgoing sender circuit to establish the individual channel between this marker and the selected outgoing sender circuit. The marker will also operate in the outgoing sender connector those relays associated with the common channel between the marker and the selected outgoing sender circuit.

11.431 Operation of the Outgoing Sender Connector S Relay

The operation of the OSK relay with the CKG-6 relay operated and with the one OS-0/4 relay associated with the selected outgoing sender operated will extend ground potential to the associated "S-0/4" which will be extended from the marker to the selected outgoing sender connector to operate the outgoing sender connector S relay associated with the individual channel between this marker and the selected outgoing sender circuit.

11.432 Operation of the Outgoing Sender Connector MA, MB, SA and SB Relays

The MA, MB, SA and SB relays in the outgoing sender connector associated with the common channel between this marker and the selected outgoing sender will be operated to connect this marker thru the common channel to the selected outgoing sender. With the OSC relay operated, battery potential is extended thru the MA lamp in the marker to the "MA" lead and to the outgoing sender connector circuit. With the OSGA or OSGB relay in the outgoing sender connector operated, this battery potential on the "MA" lead will be extended to operate the MA relay in the outgoing sender connector. With the OSC relay operated, battery potential is extended thru the MB lamp in the marker to the "MB" lead and to the outgoing sender connector circuit. The operation of the MA relay in the outgoing sender connector extends the battery potential on the "MB" lead to operate the MB relay in the outgoing sender connector circuit.

With the OSC relay operated, battery potential is extended thru the SAM lamp to the "SAM" lead and thru the SBM lamp to the "SBM" lead to the outgoing sender connector. The operation of the S relay in the outgoing sender connector extends the battery potential on the "SAM" lead to operate the SA relay and the battery potential on the "SBM" lead to operate the SB relay in the outgoing sender connector circuit.

11.44 Transfer of Information From Marker To Outgoing Sender

The marker will transmit to the outgoing sender the following information:

a. The office code and numericals of the called line.

b. The number of digits to be outpulsed by the outgoing sender.

c. The arbitrary digits to be prefixed in outpulsing.

d. The speed and type of outpulsing that is required.

e. The type of trunk test that is required.

11.441 Transfer of Office Code and Numericals of Called Number

The office code and numericals of the called number will be transmitted to the selected outgoing sender over the called number registration "A-0/7", "B-0/7", "C-0/7", "D-0/7", "E-0/7", "F-0/7" and "G-0/7" leads for a called directory number consisting of seven digits, to operate the associated outgoing sender called number registration relays. This circuit description will assume a called directory number consisting of seven digits. If less than seven digits are required the operation of the marker will be similar except that the leads and relays associated with the digits which are not required will not enter into the marker circuit operations.

11.4411 Operation of the KG, KA, KBC, KDE, KFG, and KK Relays

The operation of the OGC relay with the OST-2, RSC and PCR relays non-operated will operate the KG relay. The operation of the KG relay will operate the "A" digit cut-in KA relay, the "B" and "C" digit cut-in KBC relay, the "D" and "E" digit cut-in KDE relay, and the "F" and "G" digit cut-in KFG relay. The operation of one of the KA, KBC, KDE or KFG, relays will operate the check cut-in KK relay.

11.4412 Operation of the A-0/7 B-0/7, C-0/7, D-0/7, E-0/7, F-0/7, and G-0/7 Relays in the Marker Circuit and in the Outgoing Sender Circuit

The A-0/7, B-0/7, C-0/7, D-0/7, E-0/7, F-0/7 and G-0/7 relays in the marker circuit and in the selected outgoing sender circuit will be operated to transmit to the outgoing sender the office code and numericals of the called line.

The operation of the KA relay with two AC-0/7 relays operated will operate the associated A-0/7 relays in the marker and will extend ground over the two associated "A-0/7" leads to the outgoing sender connector and to the outgoing sender circuit to operate the two associated A-0/7 relays in the outgoing sender.

The operation of the KBC relay with two BC-0/7 relays operated, if provided, will operate the associated B-0/7 relays in the marker and will extend ground over the two associated "B-0/7" leads to the outgoing sender connector and to the outgoing sender circuit to operate the two B-0/7 relays in the outgoing sender. If the BC-0/7 relays are not provided in the marker the "B-0/7" lead which have been extended from the originating register circuit, two of which are grounded to identify the "B" digit, will with the operation of the KBC relay be extended to operate the associated B-0/7 relays in the marker and extended over the "B-0/7" leads to the outgoing sender connector and to the sender circuit to operate the two associated B-0/7 relays in the outgoing sender.

The operation of the KBC relay with two CC-0/7 relays operated, if provided, will operate the associated C-0/7 relays in the marker and will extend ground over the two associated "C-0/7" leads to the outgoing sender connector and to the outgoing sender circuit to operate the two C-0/7 relays in the outgoing sender. If the CC-0/7 relays are not provided in the marker the "C-0/7" leads which have been extended from the originating register circuit, two of which are grounded to identify the "C" digit, will with the operation of the KBC relay be extended to the associated C-0/7 relays in the marker and extended over the "C-0/7" leads to the outgoing sender connector and to the sender circuit to operate the two associated C-0/7 relays in the outgoing sender.

The "D-0/7", "E-0/7", "F-0/7" and "G-0/7" leads which have been extended from the originating register circuit will with the operation of the KDE and KFG relays be extended to operate the associated D-0/7, E-0/7, F-0/7 and G-0/7 relays in the marker and extended over the "D-0/7", "E-0/7", "F-0/7" and "G-0/7" leads to the outgoing sender connector and to the sender circuit to operate the associated D-0/7, E-0/7, F-0/7 and G-0/7 relays.

After the operation of the ON-1 relay in the outgoing sender by the operation of the S relay in the outgoing sender connector circuit, a holding ground will be placed on the called number registration leads associated with the operated A-0/7, B-0/7, C-0/7, D-0/7, E-0/7, F-0/7 and G-0/7 relays in the outgoing sender thereby holding operated the associated relays in both the outgoing sender circuit and the marker circuit.

11.4413 Operation of the ST-7, ORK-1 and ORK-2 Relays

The operation of the outgoing registration check ORK-1 and ORK-2 relays will check that the proper number of "A", "B", "C", "D", "E", "F" and "G" digit register relays in the marker have operated and that the proper information has been sent to the outgoing sender.

In addition to grounding two of each of the "A-0/7", "B-0/7", "C-0/7", "D-0/7", "E-0/7", "F-0/7" and "G-0/7" leads to transmit the called office code and numericals the register circuit will place ground on the "-7" lead of the digit following the last numerical digit. In this case the register circuit would place ground on the "H-7" lead. With the operation of the KFG relay the ground on the "H-7" lead will be extended to operate the start signal ST-7 relay. The operation of the ST-7 relay will be an indication that seven digits have been received and that the marker should check all seven of these digits, the "A", "B", "C", "D", "E", "F" and "G" digits, to determine that the proper information has been received.

The ORK-1 and ORK-2 relays will operate, with the ST-7 relay operated, when for each digit two relays and only two relays of the A-0/7, B-0/7, C-0/7, D-0/7, E-0/7, F-0/7 and G-0/7 relays are operated.

On certain types of outgoing calls which the marker may assist the register circuit may not be required to transmit a full set of seven digits but will only transmit a smaller number of digits. For example, if some local area codes consist of only six digits the "A", "B", "C", "D", "E" and "F" digits only would be transmitted to the sender circuit. In this case the "H-7" lead will not be grounded, therefore, the ST-7 relay will not be operated. The non-operation of the ST-7 relay will be an indication that the number of digits that the marker should receive is less than seven digits and therefore the marker should disregard the check of those digits of which no information was received and which are preceded by a digit in which the "-7" relay is operated. The "-7" relay will be operated in the digit which follows the last digit information.

On other types of outgoing calls where the outgoing senders are not equipped with register relays to receive the "A", "A" and "B" or "A", "B" and "C" digit information the "SK-0/4" cross-connection terminal of Figure 49 will be cross-connected to the "SA", "SAB" or "SABC" cross-connection terminal of Figure 70 so that the ORK-1 and ORK-2 relays will be operated without checking the operation of the "A", "A" and "B" or "A", "B" and "C" digit register relays in the marker. This is to prevent a failure of the check of the office code transfer to, the sender, as described in paragraph 11.4454, because of the release of the "A", "A" and "B", or "A", "B" and "C" digit register relays in the marker circuit.

11.442 Number of Digits to be Outpulsed by the Outgoing Sender

For certain outgoing calls the outgoing sender will outpulse only the four numericals of the called number. For other outgoing calls the outgoing sender may be required to outpulse a directing digit in addition to the four numerical digits or the outgoing sender may be required to outpulse the entire called number. The digits omitted from the outpulsing are said to be "deleted".

11.4421 Operation of the DL-0/6 and DLK-1 Relays in the Marker and the DL-1/6 Relay in the Outgoing Sender

To determine the information which is to be deleted the route relay "DL" cross-connection terminal of Figure 51 associated with this outgoing call route will be cross-connected to one of the "DLP-0/6" or "DLS-0/6" cross-connection terminals of Figure 67 thereby operating the associated DL-0/6 relay and the DLP or DLS relay in the marker when the route R- relay associated with this outgoing call is operated.

The operation of the transmitting ground supply TGS-1 relay, as described in paragraph 11.412, with one of the marker DL-1/6 relays operated will place ground potential on the associated "DL-1/6" lead which is extended to the outgoing sender connector, and to the outgoing sender, thereby operating in the outgoing sender the associated DL-1/6 relay. The operation of a DL-1/6 relay will convey the following information to the outgoing sender.

DL-1/6 Relay Operated	Digits to Be Deleted From Sender Outpulsing
DL-0	None
DL-1	"A"
DL-2	"A" and "B"
DL-3	"A", "B" and "C"
DL-4	"A", "B", "C" and "D"
DL-5	"A", "B", "C", "D" and "E"
DL-6	"A", "B", "C", "D", "E" and "F"

If the DL-0 relay in the marker is operated this is an indication that there is to be no deletion of digits to be outpulsed. No signal, in this case is sent to the outgoing sender.

The operation of the TGS-1 relay will also operate the "DL" registration check DLK-1 relay.

11.443 The Arbitrary Digits to be Prefixed By the Sender in Outpulsing

When a dial pulsing or multifrequency pulsing outgoing sender is required to outpulse arbitary digits, the marker will transmit over the "AR-0/7", "BR-0/7", and "CR-0/7" leads on two out of the group of five leads the arbitary digits to be prefixed to the outpulsed digits.

The marker is arranged to signal the sender to outpulse as many as three arbitrary digits.

11.4431 Single Arbitary Digit to be Prefixed by the Sender in Outpulsing - Operation of the CR-0/10, CRP, and CRS Relays in the Marker and the CR-0/7 Relays in the Outgoing Sender

To determine the arbitrary digit to be outpulsed when a single arbitrary digit is necessary, the route relay "CR" cross-connection terminal of Figure 51 associated with this outgoing call route will be cross-connected to one of the "CRP-0/10" or "CRS-0/10" cross-connection terminal of Figure 67. If the "CR" cross-connection terminal is cross-connected to one of the "CRS-0/10" cross-connection terminals, the associated CR-0/10 and CRS relays, which are in series, in the marker will be operated when the route relay is operated., If the "CR" cross-connection terminal is cross-connected to one of the "CRP-0/10" cross-connection terminals the associated CR-0/10 and CRP relays, which are in series, will be operated.

The operation of the transmitting ground supply TGS-1 relay with one of the CR-0/9 relays operated will place ground potential on two of the associated "CR-0/7" leads which are extended to the outgoing sender connector and to the outgoing sender, thereby operating in the outgoing sender the two associated CR-0/7 relays. If the CR-10 relay and CRS relay in the marker are operated, this is an indication that there is to be no arbitrary digit and therefore, in this case, no signal is sent to the outgoing sender.

11.4432 Two and Three Arbitrary Digits to be Prefixed by the Sender in Outpulsing - Operation of the CV00-99, CVS, and R- relays

In offices where certain routes require that two or three arbitary digits be prefixed to the outpulsed number a CV00-99 relay is equipped for each code requiring this treatment. The code point associated with a code requiring two or three arbitrary digit code conversion will be cross-connected to terminal "CV" of figure 118 instead of to terminal "RC" of the route R- relay as specified in paragraph 11.34. Terminal "CVB" of figure 118 will be cross-connected to terminal "CVS" of figure 119. Therefore, ground appearing on the code point associated with a route requiring two or three digit code conversion will operate a CV00-99 relay in series with the CVS relay.

Cross-connection terminal "CVR" of the CV- relay will be cross-connected to the "RC" terminal of the route, R- relay associated with the desired route. Operation of the CV- relay will extend ground to operate the route R- relay on calls requiring two or three digit code conversion.

11.44321 Operation of the ARNO-5, BRNO-4, CR-0/10, ARP, ARS, BRP, BRS, CRP, CRS Relays in the Marker and the AR-0/7 BR-0/7 and CR-0/7 Relays in the Outgoing Sender.

When a converted code consists of two arbitrary digits the arbitrary tens digit is determined by the BRNO-4 and BRP or BRS relays of figure 121 and the arbitrary units digit by the CRO-9 and CRP and CRS relays of figure 67.

When a converted code consists of three arbitrary digits the arbitrary hundreds digit is determined by the ARNO-5 and ARP or ARS relays of figure 122, the arbitrary tens digit by the BRNO-4 and BRP or BRS relays of figure 121 and the arbitrary units digit by the CRO-9 and CRP or CRS relays of figure 67.

The "ARN" cross-connection terminal of the CV00-99 relays will be cross-connected to the primary or secondary windings of the ARNO-5 relays, thereby operating an ARNO-5 relay in series with either the ARP or ARS relay with the KCV, KCM, and GSA1-4 relays released. Operation of an ARNO-5 relay and an ARP or ARS relay, with the TGS3 relay operated will ground two leads of the five "AR-0/7" leads to the outgoing sender connector, thereby operating the corresponding BR-0/7 relays in the outgoing sender circuit.

Cross-connections to the ARNO-5 relays will be made according to the following table:

Cross Conn. to Relay	To Primary For Leads "AR-"	To Secondary For Leads "AR-"
ARNO	4,7	1,4
ARN1	0,1	2,4
ARN2	0,2	0,7
ARN3	1,2	1,7
ARN4	0,4	2,7
ARN5		None

The "BRN" cross-connection terminal of the CV00-99 relays will be cross-connected to the primary or secondary windings of the BRNO-4 relays thereby operating a BRNO-4 relay in series with either the BRP or BRS relay with the KCV, KCM and GSA1-4 relays released. Operation of a BRNO-4 relay and a BRS or BRP relay, with the TGS3 relay operated will ground two leads of the five "BF-0/7" leads to the outgoing sender connector, thereby operating the corresponding BR-0/7 relays in the outgoing sender circuit.

Cross-connections to the BRNO-4 relays will be made according to the following table:

Cross Conn. to Relay	To Primary For Leads "BR-"	To Secondary For Leads "BR-"
BRNO	4,7	1,4
BRN1	0,1	2,4
BRN2	0,2	0,7
BRN3	1,2	1,7
BRN4	0,4	2,7

The "CRN" cross-connection terminal of the CV00-99 relays will be cross-connected to the primary or secondary windings of the CRO-9 relays in the same manner as specified in paragraph 11.4431 for the "CR" cross-connection terminal of the route R- relay. Therefore, the CV00-99 relay in operating will operate a CRO-9 relay and the CRP or CRS relay with the KCV, KCM, and GSA1-4 relays released.

The operation of the TGS1 relay with one of the CRO-9 relays operated will place ground potential on two of the five "CR-0/7" leads to the outgoing sender connector circuit thereby operating the corresponding CR-0/7 relays in the outgoing sender circuit.

11.44322 Code Conversion Required on Some but not all Sender Routes Associated with a Particular Code - Operation of the KCV, CR10, and CRS relays.

When a particular code requires different sender routes depending upon the class of service treatment, and some of these routes require code conversion while others do not, the "CR" terminal of the route R-relay associated with the route requiring no code conversion will be cross-connected to terminal "KCV" of figure 137. When the R- relay associated with the route requiring no code conversion is operated, relay KCV will be operated. Relay KCV in operating will open the circuits to the ARNO-5, BRNO-4, and CRO-9 relays through the CV00-99 relay thereby cancelling the code conversion information to be transmitted to the sender. Relay KCV in operating will also operate relays CR10 in series with CRS, to indicate that no code conversion is required.

11.4433 Operation of the ARK-1/2, BRK-1/2, CRK-1/3 Relays in the Marker

The operation of the TGS3 relay will operate the ARK-1/2 and BRK-1/2 relays in the marker.

The operation of the TGS1 relay will operate the CRK-1/3 relays in the marker.

11.444 Speed and Type of Outpulsing, Type of Trunk Test and Compensating Resistance Required

To indicate to the revertive pulsing or panel call indicator sender the compensating resistance required the marker will transmit this information over the "CR-0/7" leads to the selected sender. To indicate to the outgoing sender the speed and type of outpulsing and type of trunk test to be made the marker will transmit this information over the "CL-1/6" leads to the selected sender.

11.4441 Operation of the CR-0/10, CRP, CRS and CRK-1/3 Relays in the Marker and the CR-0/7 Relays in the Outgoing Sender

The operation of these relays have previously been described in paragraphs 11.4431 and 11.44321. However, it is to be noted that when an outgoing call which requires a dial pulsing or multifrequency pulsing outgoing sender is involved the CR-0/10 relays in the marker and the CR-0/7 relays in the outgoing sender are used to identify the arbitrary digit to be outpulsed. When an outgoing call which requires a revertive pulsing or panel call indicator outgoing sender is involved the CR-0/10 relays in the marker and the CR-0/7 relays in the outgoing sender are used to identify the compensating resistance required.

11.4442 Operation of the CL-0/5, CLS, CLP and CLK-1/3 Relays in the Marker and the Cl-1/6 Relays in the Outgoing Sender

To operate the CL-0/5 and CLP or CLS relays the "CL" cross-connection terminal of Figure 51 associated with this outgoing call route will be cross-connected to one of the "CLS-0/5" or "CLP-0/5" cross-connection terminal of Figure 67. If the "CL" cross-connection terminal is cross-connected to one of the "CLS-0/5" cross-connection terminals the associated CL-0/5 and CLS relays, which are in series, in the marker will be operated when the route relay is operated. If the "CL" cross-connection terminal is cross-connected to one of the "CLP-0/5" cross-connection terminals the associated CL-0/5 and CLP relays, which are in series in the marker will be operated when the route relay is operated.

The operation of the transmitting ground supply TGS-1 relay with the CL-0/5, CLP and CRP relays operated will place ground potential on the "CL-1/6" leads as follows:

Relay Operated	"CL-1/6" Leads Grounded
CL-0	"CL-3"
CL-1	"CL-3" and "CL-4"
CL-2	None
CL-3	"CL-4"
CL-4	"CL-5"
CL-5	"CL-6"
CLP	"CL-2"
CRP	"CL-1"

The "CL-1/6" leads are extended to the outgoing sender connector and to the outgoing sender, thereby operating in the outgoing sender the CL-1/6 relays which are associated with grounded "CL-1/6" leads.

The following information is transmitted to the outgoing sender over the "CL-1/6" leads:

Transmitting Lead	Type of Outgoing Sender	Information Transmitted To Outgoing Sender
"CL-1"	Revertive Pulsing	Transmits information to indicate a call to a No. 1 Crossbar office and therefore short intervals between selections can be used on this call.
"CL-1"	Dial Pulsing and Multi-frequency	Transmits information to signal the sender to prefix digits 1-1 to the outpulsed number.
"CL-2"	Dial Pulsing	Transmits information to indicate that the call is to a community dial office or a toll call.
"CL-2"	Revertive Pulsing	Transmits information to indicate the call is to a 2 digit office in a 2/3 digit area.
"CL-2"	Panel Call Indicator	Transmits information to indicate that the call is to an office with no directory numbers above 9999.
"CL-2"	Multi-frequency	Transmits information to indicate that the call is a toll call so that the sender can give immediate trunk closure on this type of call.
"CL-3"	Dial Pulsing	Transmits a start dialing signal to the sender. This requires the sender to delay dialing until a start dialing signal is received from the distant sender or register.
"CL-3"	Revertive Pulsing	Transmits information to indicate that the call is to a non-repeating incoming or to a mixed non-repeating and repeating ground cut off panel office and that a marginal trunk test should be made.
"CL-3"	Panel Call Indicator	Transmits information to indicate that the call is to an office with directory numbers above 9999.
"CL-4"	Dial Pulsing	Transmits information to indicate that 20 pulses per second outpulsing is required.
"CL-4"	Revertive Pulsing	Transmits information to indicate that 5 should be added to incoming group selection numbers.

Transmitting Lead	Type of Outgoing Sender	Information Transmitted To Outgoing Sender
"CL-5"	Dial Pulsing	Transmits information to indicate that battery ground outpulsing is required.
"CL-6"	Dial Pulsing	Transmits information to indicate a call associated with a trunk with outgoing repeaters requiring loop compensation resistance.

The operation of the TGS-1 relay will also operate the "CL" registration check CLK-1/3 relays.

11.445 Checking the Information Transferred to the Outgoing Sender

To check that the proper register relays in the outgoing sender circuit have operated the marker will remove the operating grounds from the register relays in both the marker circuit and the outgoing sender circuit. The operation of any register relay in the outgoing sender circuit will ground the associated register lead thereby holding operated the associated register relays in the outgoing sender and holding operated in the marker the register relays if they are connected to the associated register lead or holding operated in the marker a check registration relay which is connected to the associated register lead. After the operating grounds for both the marker circuit and outgoing sender circuit register relays have been removed the operated register relays in the outgoing sender and the operated register relays or check registration relays in the marker will be held operated only by the outgoing sender register relay grounding the associated register leads. If for any reason a register relay in the outgoing sender fails to operate the associated register lead will not be grounded by the operation of this register relay therefore releasing the associated register relay or check registration relay in the marker circuit when the operating ground for the register relays are removed. The release of an operated register or check registration relay in the marker will be an indication to the marker that the associated register relay in the outgoing sender circuit has failed to operate.

The operation of the outgoing sender connector SA, SB, MA, and MB relays will operate the OST1 relay which in turn will operate the OST relay. The OST relay is condenser operated to allow enough time for all registration relays in the outgoing sender to operate. The registration relays in the outgoing sender which have operated will be locked operated. After the OST relay has operated the operating path for the outgoing sender registration relays will be removed. The OST relay is then condenser-timed released to allow any outgoing sender registration relay which has operated to be released if the registration relay has failed to lock operated. The marker will, before releasing the outgoing sender connector common channel, check that all registration relays in the outgoing sender remain operated.

11.4451 Operation of the OST1, OST, and OST2 Relays

The operation of the outgoing sender connector SA, SB, SC, MA, MB, and MC relays will extend ground over the "TSR" lead to the marker. In the marker, the "TSR" lead will be extended to operate the OST1 relay with the KK, ORK-1/2, and TGS-1/3 relays operated and the OST and OST2 relays non-operated. After operating the OST1 relay will lock operated with the TGS-1/3 or KK relay operated.

Before the operation of the OST-1 relay, approximately 12 volts of negative polarity were applied to the positive end of the primary winding of the OST relay due to the voltage divider resistances OST-2 and OST-3. This 12 volts potential applied to the primary winding of the OST relay, in the release polarity, resulted in the OST relay being in the non-operated condition. The operation of the OST-1 relay reverses the polarity of the current flow in the primary winding of the OST relay and removes the shunting ground potential from the secondary winding of the OST relay and allows current to flow through the secondary winding of the OST relay to charge the OST condenser. As the OST condenser is charged, the current flow in the secondary winding of the OST relay will be reduced until the reversed polarity current flow in the primary winding results in the operation of the OST relay.

The operation of the OST relay will extend the ground potential on the "TSR" lead to operate the OST-2 relay.

11.4452 Release of the TGS-1/3, KG, KA, KBC, KDE, KFG, and KK relays

The operation of the OST-2 relay will release the TGS-1/2 and KG relays. The release of the KG relay will release the KA, KBC, KDE and KFG relays which in turn will release the KK relay.

The release of the KA, KBC, KDE and KFG relays will remove the operating path for the marker and outgoing sender register relays A-0/7, B-0/7, C-0/7, D-0/7, E-0/7, F-0/7, and G-0/7.

The release of the TGS-1 relay will remove the operating path of the DLK-1, CRK-1/3 and CLK-1/3 relays in the marker circuit and the DL-1/6, CR-0/7 and the CL-1/6 relays in the outgoing sender.

When code conversion is employed, the release of the TGS3 will remove the operating path of the ARK-1/2 and BRK-1/2 relays in the marker and the AR-0/7 and BR-0/7 relays in the outgoing sender.

11.4453 Release of the OST1 and OST relays

The release of the KK relay with the TGS-1/3 relays released will release the OST1 relay

The release of the OST-1 relay will allow current to flow, in the release polarity, thru the OST relay primary winding. The release of the OST-1 relay will also allow the OST condenser to discharge through the OST relay secondary winding, in the operate polarity. When the OST condenser has been sufficiently discharged, the OST relay will be operated by the release polarity primary winding current to the non-operated position.

11.4454 Checking the Office Code and Numericals of the Called Number Which Have Been Transferred to the Outgoing Sender

The release of the KA, KBC, KDE and KFG relays will remove the operating path for the marker and the outgoing sender register A-0/7, B-0/7, C-0/7, D-0/7, E-0/7, F-0/7 and G-0/7 relays. If the office code and numericals of the called number information have been transferred to the outgoing sender and if the required register relays have been operated in the sender all of the operated register relays in the marker will be held operated by the locking ground potential from the outgoing sender.

As an indication that the required two-out-of-five register relays in the marker have remained operated the ORK-1 and ORK-2 relays will be held operated. Therefore, the marker, before releasing the outgoing sender connector common channel and operating the release sender connector RSC relay, will check that the ORK-1 and ORK-2 relays have remained operated.

11.4455 Checking the Number of Digits to be Outpulsed by the Outgoing Sender Which has been Transferred to the Outgoing Sender

The release of the TGS-1 relay will remove the operating path for the outgoing sender register DL-1/6 relays and the marker DLK-1 relay. If the number of digit to be outpulsed information has been transferred to the outgoing sender and if the required register relay has been operated in the sender the DLK-1 relay will be held operated by the locking ground potential from the outgoing sender.

11.4456 Checking the Arbitary Digits which have been transferred to the Outgoing Sender

The release of the TGS1 relay will remove the operating path for the outgoing sender register CR-0/7 relays and the marker CRK-1/3 relays.

Where code conversion is used, the TGS3 relay in releasing will remove the operating path for the outgoing sender AR-0/7 and BR-0/7 and the marker ARK-1/2 and BRK-1/2 relays. If the arbitary digit information has been transferred to the outgoing sender and if the required register relays have been operated in the sender, the ARK-1/2, BRK-1/2, and CRK-1/3 relays will be held operated from the outgoing sender.

11.4457 Checking the Speed and Type of Outpulsing, Type of Trunk Test and Compensating Resistance Information which have been Transferred to the Outgoing Sender

The release of the TGS-1 relay will remove the operating path for the outgoing sender register CR-0/7 relays and the marker CRK-1/2 relays. If the compensating resistance information has been transferred to the outgoing sender and if the required register relays have been operated in the sender the CRK-1/2 relays will be held operated from the outgoing sender.

The release of the TGS-1 relay will remove the operating path for the outgoing sender register CL-1/6 relays and the marker CRK-3, and CLK-1/3 relays. If the speed and type of outpulsing and type of trunk test information has been transferred to the outgoing sender and if the required register relays have operated in the sender one or more of the CRK-3 and CLK-1/3 relay will be held operated from the outgoing sender.

11.45 Outgoing Sender Connection to Outgoing Trunk

The marker connects the selected outgoing sender to the selected outgoing trunk through the outgoing sender link. This connection is initiated following the check that the outgoing sender selection has been completed and that the outgoing trunk selection has been completed. The outgoing trunk selection, as described in paragraph 11.5, has been proceeding while the outgoing sender was being selected.

Each outgoing sender link circuit is associated with one trunk link frame and connects the outgoing trunks associated with this trunk link frame to the required outgoing senders.

The outgoing trunk circuits associated with one trunk link frame and which require the same type of outgoing sender are terminated on the verticals of one outgoing sender link circuit crossbar switch, and the associated outgoing senders are terminated on the horizontals of the outgoing sender link circuit crossbar switch. The sender link circuit select magnet will be operated when the outgoing sender selection has been completed and the marker has seized the selected trunk link frame. However, the operation of the sender link circuit hold magnet must await completion of the outgoing trunk selection.

11.451 Operation of the SSA or SSB Relay in the Marker and the SS-0/9 Select Magnet in the Outgoing Sender Link

The operation of the SKA relay will operate the sender link switch select magnet "A" subgroup SSA relay in the marker or the operation of the SKB relay will operate the sender link switch select magnet "B" subgroup SSB relay in the marker. After operating the SSA or SSB relay will be held operated with the OSK relay operated.

The operation of the OSK relay will extend battery potential to the "SS-0/9" lead associated with the outgoing sender link select magnet of the selected outgoing sender. Battery potential will be extended thru the SMB lamp, thru the contacts of the operated TLC-1, MDK and OSK relays, thru the contacts of the one operated OS-0/4 relay and the one operated SSA or SSB relay to the "SS-0/9" lead. The "SS-0/9" leads will be extended to the trunk link and connector circuit, thru the operated trunk link and connector MCD relay contacts to the outgoing sender link circuit to operate the sender link SS-0/9 select magnets on all sender link switches associated with the selected trunk link frame. The "SS-0/9" leads are directed to the proper outgoing sender link circuit by the operation of the MCD relay in the selected trunk link frame.

11.452 Operation of the Outgoing Sender Link Hold Magnet and the Marker SLK and SLK-1 Relays

The ground potential for operating the sender link circuit hold magnet is extended thru the contacts of the XSS relay non-operated and the OGC relay operated, thru the primary winding of the SLK relay, over the "SLK" lead to the trunk link and connector circuit, thru the contacts of the operated trunk link and connector MCD relay contacts, thru the contacts of the operated outgoing trunk F relay, and thru the contacts of the operated sender link circuit select magnet off-normal contacts to operate the sender link circuit hold magnet and the SLK relay in series. The operating ground for the outgoing sender link circuit is directed to the proper outgoing sender link by the operation of the MCD relay in the selected trunk link frame and is directed to the proper outgoing sender link hold magnet by the operation of the F relay in the selected outgoing trunk.

The operation of the SLK relay indicates that a false ground is not present on the outgoing sender link hold magnet operating. If such a false ground was present the primary winding of the SLK relay would be shunted, therefore preventing the SLK relay from operating. The operation of the SLK relay with the SON relay operated and the GOS relay non-operated will operate the SLK-1 relay. After operating the SLK-1 relay will lock operated with the SON relay operated and the GOS relay non-operated.

11.453 Release of the SLK Relay and Operation of the SLK-2 Relay

After the outgoing sender link hold magnet is operated the outgoing sender off-normal ON relay operates when the outgoing sender link cross-points are closed. The outgoing sender ON relay operates the D relay in the trunk circuit, followed by the S1 relay in the trunk circuit. The outgoing sender LR relay will then operate to place ground on the "HM" lead which is extended to the sender link circuit. The operation of the LR relay provides a holding ground from the outgoing sender for the outgoing sender link hold magnet and shunts the primary winding of the SLK relay thereby releasing the SLK relay. The release of the SLK relay with the SLK-1 and SON relays operated and the GOS relay non-operated will operate the SLK-2 relay to indicate that the holding path for the outgoing sender link hold magnet has been transferred to the outgoing sender.

11.46 Release of the Outgoing Sender Connector

The marker, after checking that all registration relays in the outgoing sender remain operated, will release the outgoing sender connector common channel associated with this outgoing call.

11.461 Operation of the RSC Relay

The release of the outgoing sender timing OST relay will operate the release sender connector RSC relay in the marker if all of the register check relays, as described in paragraph 11.445, are operated. The operation of the RSC relay will initiate the release of the outgoing sender connector circuit. If there is a failure to register the information in the outgoing sender, one or more of the register check relays will be released thereby preventing the operation of the RSC relay.

The operating path of the RSC relay will be extended from the winding of the RSC relay, through the contacts of the non-operated XT5, ND1 and NDK relays, to the "CK" lead. If the code conversion feature is not equipped in the office the "CK" lead will be wired to contacts of the CRK1 and CR10 relays. If the code conversion feature is equipped but not used on the call, the "CK" lead will be routed through the non-operated CVS relay to the CRK1 and CR10 relay contacts. If code conversion is required on the call, but not on the sender route employed (paragraph 11.44322) the "CK" lead will be routed through the operated KCV relay to contacts of the CRK1 and CR10 relays. If code conversion is required on the call, and on the sender route employed, the "CK" lead will be routed through the operated CVS, ARK-1/2, and BRK-1/2 relays to the CRK1 and CR10 relay contacts. The operating path of the RSC relay will then be extended through the CRK1 and CRK2 or CR-10 relays, thru the contacts of the operated CRK-3 or CRS relay, thru the contacts of the operated CL-2 relay or thru the contacts of the operated CLK-1 or CLO and CLK-2, CL-3, CL-4 or CL-5 relays, thru the contacts of the CLS or CLK-3 relay, thru the contacts of the operated DLK-1, DL-0 or DL-7 relay, thru the contacts of the operated ORK-1 and ORK-2 relays, thru the contacts of the operated OST-2 relay, thru the winding of the OST coil, thru the contacts of the non-operated OST, OST-1 and OSE relays and thru the contacts of the operated OST-2 relay to ground potential thereby operating the RSC relay.

11.462 Release of the OSC Relay in the Marker and the MA, MB, SA, SB and MP Relays in the Outgoing Sender Connector

The operation of the RSC relay will release the OSC relay in the marker which in turn will release the MA, MB, SA, SB and MP relays in the outgoing sender connector. The release of the MA, MB, SA and SB relays in the outgoing sender connector will release the outgoing sender connector common channel associated with this outgoing call. However, the individual channel between the marker and the selected outgoing sender is not released at this time but is held until the marker is released from this outgoing call.

11.5 Outgoing Trunk Selection

The outgoing trunk selection will be initiated by the operation of the route R- relay. However, the selected trunk link frame will not be seized until the seizure of an outgoing sender connector circuit, as indicated by the operation of the SKA-1 or SKB-1 relay. By requiring the outgoing sender connector to be seized before the seizure of the trunk link frame, excessive holding time of the trunk link frame is prevented if the marker encounters a delay in seizing an outgoing sender connector.

The method of selecting an idle outgoing trunk circuit for completion of the call is, in general, similar to the method of selecting an idle originating register circuit for completion of a dial tone connection, as described in paragraphs, 7.32, 7.33, 7.34, 7.35, 7.36 and 7.37. However, it may be necessary to provide the two step allotter circuit where required.

11.51 Test and Selection of an Idle Trunk Link Frame With an Idle Outgoing Trunk

The test and selection of an idle trunk link frame with an idle outgoing trunk is similar to the test and selection of an idle trunk link frame with an idle originating register for a dial tone connection as described in paragraph 7.32. In addition to the operations described for a dial tone connection it may be necessary on an outgoing call to provide a two step allotter circuit.

The marker circuit is equipped to test a maximum of twenty outgoing trunk circuits on any one trunk link frame. However, in some offices two subgroups of twenty outgoing trunks may be associated with one trunk link frame. Therefore the two-step allotter circuit is provided so that the marker may select one of the two subgroups of outgoing trunk circuits for testing.

11.511 Operation of the BC and BCA Relays

The operation of the TLC-2 relay with the FML relay non-operated will operate the busy connector BC and BCA relays.

The BC and BCA relays in operating will extend from the marker circuit a trunk link frame busy test lead designated either "FBE" or "FBO" to each trunk link frame. Test leads designated "FBE" will connect to even number markers while test leads designated "FBO" will connect to odd numbered markers.

If the number of trunk link frames is ten or less the BCA relay is not required to be equipped and therefore will not enter into the circuit operation.

11.512 Operation of the FB- Relays

The operation of the FB- relay for an outgoing call is similar to the operation of the FB- relays for a dial tone connection as described in paragraph 7.322.

11.513 Operation of the AL-0/3, GPA or GPB, FC-, FCA-, FCK and FCKA Relays

When the two-step allotter is required for the selection of an outgoing trunk or an outgoing sender circuit, the operation of the route R- relay operates one of the allotter AL-0/3 relays which will operate one of the subgroup "A" or "B" GPA or GPB relays to select the subgroup of outgoing trunk circuits to be tested. The operation of the GPA or GPB relay will in turn operate the frame cut-in FC- and FCA- relays associated with the selected outgoing trunk circuits. If the two step allotter is not required for the selection of an outgoing trunk or an outgoing sender circuit the operation of the route R- relay will operate the FC- and FCA- relays.

The operation of the route R- relay with the GS-1/5, RCY and DISA relays non-operated will extend ground to the associated "FCR" cross-connection terminal of Figure 51. When the two-step allotter is required for the selection of an outgoing trunk or an outgoing sender circuit the "FCR" cross-connection terminal is connected to the associated "FCG-0/3" cross-connection terminal of Figure 64 thereby operating the AL-0/3 relay associated with the required outgoing trunk circuits. The operation of the AL-0/3 relay with the MT-1, GP-2 and GZ relays non-operated will operate the subgroup "A" GPA relay which will select the outgoing trunks associated with subgroup "A" for this call. If the GZ relay is operated the operation of the AL-0/3 relay with the MT-1 and GP-2 relays non-operated will operate the subgroup "B" GPB relay. The GZ relay is operated on every other seizure of the marker, excluding the marker seizures for the dial tone connection, so as to equally distribute the traffic to the outgoing trunks. The operation of the GPA or GPB relay with the AL-0/3 relay operated will place ground on the associated "FCA-0/3" or "FCB-0/3" cross-connection terminal of Figure 64. The "FCA-0/3" or "FCB-0/3" cross-connection terminal is connected to the associated "FC" cross-connection terminal of Figure 19 thereby operating the associated FC- and FCA- relays. Thus with the two-step allotter circuit one of the two subgroups of FC- and FCA- relays which are associated with this outgoing call are operated to select the particular subgroup of outgoing trunk circuits which are to be tested.

The operation of the route R- relay with the GS-1/5, RCY and DISA relays non-operated will extend ground to the associated "FCR" cross-connection terminal of Figure 51. When the two-step allotter is not required for the selection of an outgoing trunk or an outgoing sender circuit the "FCR" cross-connection terminal is connected to the associated "FC" cross-connection terminal of Figure 19 thereby operating the associated FC- and FCA- relays.

The FC- and FCA- relays in operating will extend from the marker circuit one trunk link frame test lead designated "FTC-" to each trunk link and connector circuit for the purpose of testing for the required outgoing trunk circuits associated with the trunk link frame.

To check that the FC- relay has operated the frame cut-in check FCK relay will be operated when the FC- relay has operated and to check that the FCA- relay has operated the frame cut-in check FCKA relay will be operated when the FCA- relay has operated.

If the number of trunk link frames is ten or less the FCA- relays are not required to be equipped and therefore will not enter into the circuit operation. Whenever the FCA- relays are not provided the FCKA relay is not equipped.

11.514 Operation of the FTC-, FTCK, and FTCK-1 Relays

The operation of the FTC-, FTCK and FTCK-1 relays for an outgoing call is similar to the operation of the FTC-, FTCK and FTCK-1 relays for a dial tone connection, as described in paragraph 7.325. However, the operating path for the FTC- relays will be extended to a group of trunk link frame test leads designated "FTC-" associated with the required outgoing trunk circuits instead of being associated with the originating registers. Also these "FTC-" leads will be extended to the required outgoing trunk circuits each of which will place ground on its associated "FT" test lead when that outgoing trunk circuit is idle and available for service.

11.515 Operation of the FS- Relay

The operation of the FS- relay to select an idle trunk link frame associated with an idle outgoing trunk circuit for an outgoing call is similar to the operation of the FS- relay for a dial tone connection, as described in paragraph 7.326.

11.52 Connection To The Selected Trunk Link Frame

The connection to the selected trunk link frame in the outgoing call is similar to the connection to the selected trunk link frame in a dial tone connection, as described in paragraph 7.33. However, the selected trunk link frame will not be seized until the seizure of the outgoing sender connector. Therefore, the operating circuit for the trunk link frame

MP relay will not be established until the SKA-1 or SKB-1 relay has operated.

11.53 Test and Selection of an Idle Outgoing Trunk

The test and selection of an idle outgoing trunk is similar to the test and selection of an originating register in a dial tone connection, as described in paragraph 7.34, with the exception that the proper TB-0/5 and TG-0/19 relays are operated so that the marker will test for an outgoing trunk circuit of the required route instead of an originating register. Also, to provide for selecting the correct trunk block group when the two-step allotter, as described in paragraph 11.513, is required the TB-0/5 relays in the marker are operated by cross-connecting the "TBC-0/5" cross-connection terminal of Figure 81 to the "TBA-0/3" or "TBB-0/3" cross-connection terminal of Figure 64 and by cross-connecting the "TB" cross-connection terminal of Figure 51 to the "TBG-0/3" cross-connection terminal of Figure 64.

11.54 Connection to the Selected Outgoing Trunk

After the marker has selected the outgoing trunk circuit by operating the test selection TS-0/19 relay associated with the selected outgoing trunk circuit and has checked the operation of the TS-0/19 relay by the release of the TSE-1, TSE-2 and TSE-3 relays the marker will then operate the F relay in the selected outgoing trunk circuit to secure access to the selected trunk circuit.

The connection to the selected outgoing trunk for an outgoing call is similar to the connection to the selected originating register for a dial tone connection, as described in paragraph 7.35.

The operation of the F relay in the selected outgoing trunk circuit, the FA- or FB-, LV-2/9 and LC-0/9 relays in the selected trunk link frame and the FAK or FBK and LCK relays in the marker will be operated in a manner similar to the operation of these relays for a dial tone connection, as described in paragraph 7.35. However, the outgoing trunk circuit may be associated with either the "A" or the "B" trunk appearance whereas the originating register is associated only with the "A" trunk appearance.

11.55 Trunk Link Frame Selection Preference

The trunk link frame selection preference for an outgoing call is similar to the trunk link frame selection preference for a dial tone connection, as described in paragraph 7.36.

11.56 Trunk Selection Preference

The trunk selection preference for an outgoing call is similar to the originating register selection preference for a dial tone connection, as described in paragraph 7.37.

11.6 Selection of the Connecting Path

The selection of the connecting path will be initiated when the trunk link frame is seized by the marker. However, the marker will be unable to test and select an idle connecting path until the line link frame associated with the calling line is seized and the outgoing trunk has been selected and seized.

The marker operations required for the selection of the connecting path between the calling line and the selected outgoing trunk circuit is similar to the selection of the connecting path between the calling line and the selected non-reverting intra-office trunk circuit, as described in paragraph 8.11.

11.7 Setting Up the Selected Connecting Path

After the connecting path to the calling line has been selected, the select and hold magnets on the line link frame and trunk link frame are operated, tests are made on the calling line and the connecting path supervision is transferred to the selected outgoing trunk. After the marker has checked that the selected connecting path has been established the marker will transmit an advance indication to the selected outgoing sender so that the outgoing sender may initiate the outgoing sender functions.

11.71 Select Magnet Operation

The operation of the select magnets is similar to the select magnet operation for a dial tone connection, as described in paragraph 7.51.

11.72 Hold Magnet Operation

The operation of the hold magnets is similar to the hold magnet operation for a dial tone connection, as described in paragraph 7.52.

11.73 False Cross, Continuity and Double Connection Tests

To determine if the connecting path is in the proper condition for service a false cross and ground test, a continuity test and a double connection test will be made on the selected connecting path.

11.731 False Cross and Ground Test

The false cross and ground test on the connecting path to the calling subscriber for an outgoing call is similar to the false cross and ground test for a dial tone connection, as described in paragraph 7.531.

During the assistance of connecting the outgoing trunk to the calling subscriber the false cross and ground test will be cancelled if a "heavy traffic" condition exists or if the calling subscriber is associated with a PBX line that has dial selected trunks. To indicate that the false cross and ground test will be cancelled when the calling subscriber is associated with a PBX line that has dial selected trunks, the HTR relay will be operated. The "HTG" cross-connection terminal of Figure J will be cross-connected to the "SC-" cross-connection terminal of Figure 61 associated with the class of service of the PBX subscriber that has dial selected trunks. Also the "HTR" cross-connection terminal of Figure 30 will be cross-connected to the "S-" cross-connection terminal of Figure 61 associated with the class of service of the calling subscriber. For a PBX subscriber that has dial selected trunks, the operation of the TK and SOG-2 relays will extend ground to the "HTG" and "SC-" cross-connection terminals and with the associated S relay operated ground will be extended to the "S-" and "HTR" cross-connection terminal thereby operating the HTR relay.

11.732 Continuity Test

The continuity test on the connecting path for an outgoing call is similar to the continuity test for a dial tone connection, as described in paragraph 7.532. However, if the calling subscriber is a tip party subscriber the RCTB relay, as described in paragraph 7.5322, will be operated before continuity test is made. The operation of the marker tip party TP relay will indicate that the calling subscriber is a tip party subscriber. The operation of the TP and SOG-3 relays will operate the RCTB relay which will release the RCTA relay which in turn will release the RCT relay. The release of the RCT relay, as described in paragraph 7.5322, will change the continuity test from the ring to the tip side of the subscriber line for such a condition.

11.733 Double Connection Test

The double connection test on the connecting path for an outgoing call is similar to the double connection test for a dial tone connection, as described in paragraph 7.533. However, the DCT-1 relay will not be operated until the advance indication has been sent to the outgoing sender and until the marker AVK-1 relay has been operated.

The winding of the DCT-1 relay is extended thru the non-operated LK-1 relay contacts, thru the non-operated RV-3 relay contacts, thru the operated SOG-2 relay contacts, thru the non-operated or operated OTT and TTK contacts, thru the operated CLK and non-operated NOC or the non-operated CLK and operated NOC relay contacts, thru the operated OGC and AVK-1 relay contacts, thru the operated SOG-3 relay contacts, thru the non-operated DT-2 and SP relay contacts, thru the DCT coil, thru the non-operated MT-14 relay contacts, thru the operated DCT and CKG-4 relay contacts thru the operated GT-2 and non-operated GT-5, GT and PU relay contacts to the ground potential which will operate the DCT-1 relay.

11.74 Advance Indication To Outgoing Sender

The marker will transmit an advance indication to the selected outgoing sender so that the outgoing sender may initiate the outgoing sender functions.

11.741 Operation of the Outgoing Sender AV Relay

When the marker has checked that the selected connecting path has been established, as indicated by the operation of the DCT relay, the marker operates the advance AV relay in the selected outgoing sender circuit. The outgoing sender AV relay operates in series with the primary winding of the marker circuit advance check AVK relay and the AVK-1 resistance. The operating circuit for the operation of the outgoing sender AV relay is through the winding of the marker AVK relay with a polarity to hold the AVK relay in the non-operated condition.

The operating path of the outgoing sender AV relay will be extended from the winding of the AV relay, over the "AV" lead from the outgoing sender to the outgoing sender connector, thru the operated S relay contacts, over the "AV" lead to the marker circuit, thru the operated RSC relay contacts, thru the non-operated PCL-3 relay contacts, thru the primary winding of the AVK relay, thru the AVK-1 resistance, thru the operated SLK-2 relay contacts, thru the operated SIK and SOG-3 relay contacts, thru the non-operated DT-2 and SP relay contacts, thru the DCT coil, thru the non-operated MT-14 relay contacts, thru the operated DCT and CKG-4 relay contacts, thru the operated GT-2 and non-operated GT-5, GT and PU relay contacts to ground potential. After operating the outgoing sender AV relay locks operated to ground potential with the outgoing sender ON relay operated.

11.742 Operation of the Marker AVK and AVK-1 Relays

The operation of the outgoing sender AV relay has placed ground on the "AV" lead in the outgoing sender to lock operated the outgoing sender AV relay. The ground potential on the "AV" lead will be extended to the marker thereby resulting in the operation of the AVK relay to check that the outgoing sender AV relay has locked operated. The ground on the "AV" lead from the outgoing sender will be extended, over the same path as the operating path of the sender AV relay, to the primary winding of the AVK relay to operate the AVK relay. The other side of the primary winding of the AVK relay is extended to battery potential thru the AVK-2 resistor with the BG relay operated.

The operation of the AVK relay with the OSK and SON relays operated will operate the AVK-1 relay.

11.75 Transfer of the Connecting Path Supervision to the Outgoing Trunk

The transfer of the connecting path supervision to the outgoing trunk for an outgoing call is similar to the transfer of the connecting path supervision to the originating register for a dial tone connection, as described in paragraph 7.54.

After the completion of the double connection test the DCT-1 relay operates and releases the F relay in the selected outgoing trunk. The release of the F relay releases the FA- or FB- relay in the trunk link frame.

The outgoing trunk connects ground potential thru 10 ohms resistance and through the contacts of the released FA- or FB- relays to the sleeve conductor associated with the calling line and calling line connecting path for holding operated the associated hold magnets.

11.8 Release of the Marker and Associated Circuits

After the marker circuit has completely performed the subscriber outgoing call functions, the marker circuit will be released from this subscriber outgoing call and will be recycled to the idle condition so as to be available for assistance to other calls or connections.

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously, this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

11.81 Recycle of the Marker Release Control

In light traffic periods, as indicated by the non-operated condition of the heavy traffic HTR relay, the marker remains connected to the outgoing sender through the individual channel until the outgoing sender performs trunk test. The outgoing sender will retain a ground closure on the "TG" lead until battery and ground have been detected over the trunk conductors.

11.811 Operation of the LK-1 Relay

Before the marker will give a release indication the marker will check that the connecting path or channel linkage between the calling subscriber line and the selected outgoing trunk has been set up and has been tested to determine that it is in a condition for service.

The linkage check LK-1 relay will be operated when the DCT relay is released with the DCT-1, CKG-4 and GT-2 relays operated and the DCT-2, TOG-2, ITR-2, GT-5, GT and PU relays released. The LK-1 relay will be locked operated with the CKG-4 relay operated.

11.812 Operation of the TG, TGT, DIS-1 DIS-2, and DISA relays

The marker trunk guard TG relay is operated when the sender ON relay operates to place ground on the "TG" lead to the marker circuit. The outgoing sender will retain a ground closure on the "TG" lead until battery and ground have been detected over the trunk conductors.

Under light traffic conditions, as determined by the HTR relay being non-operated, if the outgoing sender has completed trunk and the TG relay has released before the LK-1 relay has operated the operation of the LK-1 relay will extend ground to operate the DIS-1 and DIS-2 relays. However, if the outgoing sender has not completed trunk test the TG relay will be operated and therefore when the LK-1 relay is operated ground will be extended to operate the TGT relay. The operation of the TGT relay will extend ground to operate the DIS-1 and DIS-2 relays.

Under heavy traffic conditions, as determined by the HTR relay being operated, the operation of the LK-1 relay will operate the DIS-1 and DIS-2 relays whether or not the sender has completed trunk test.

The operating path of the TGT relay, under the light traffic condition, is extended from the winding of the TGT relay, thru the contacts of the operated TG relay, thru the contacts of the released HTR relay, thru the contacts of the non-operated RRK and RRC relays, thru the contacts of the non-operated PSR relay, thru the contacts of the non-operated TRS relay, thru the contacts of the operated SOG-3 relay, thru the contacts of the operated RK-3 relay, thru the contacts of the operated FMK and FML relays, thru the contacts of the non-operated MT-14 relay, thru the contacts of the non-operated ITR-2 relay, thru the contacts of the non-operated LHT relay, thru the contacts of the operated LK-1 relay to the operating ground potential.

Under the light traffic condition with the TG and TGT relays operated the operating path of the DIS-1 and DIS-2 relays in series is extended from the winding of the DIS-1 relay, with the MT-1, MON-1, TRL-1, TRR and TR-1 relays non-operated and with the TGT relay operated, to the operating ground potential.

Under the light traffic condition with the TG and TGT relays non-operated or under the heavy traffic condition the operating path for the DIS-1 and DIS-2 relays in series is extended from the winding of the DIS-1 relay, to the "DIS-1" lead with the MT-1, MON-1, TRL-1, TRR and TR-1 relays non-operated, to the "DIS-1" lead or to the "TG" lead if the TG relay is non-operated, to the "DIS-1" lead if the HTR relay is either operated or non-operated, to the "DIS-1" lead with the RRK and RRC relays non-operated, to the "DIS-1" lead with the PSR relay non-operated, to the "LLK-2" lead with the TRS relay non-operated, to the "LKK-1" lead with the SOG-3 relay operated, to the "LK-2" lead with the RK-3 relay operated, to the "LK-3" lead with the FMK and FML relays operated, to the "LK-2" lead with the MT-14 relay non-operated, to the "LK-2" lead with the ITR-2 relay non-operated, to the "LK-1" lead with the LHT relay non-operated and to operating ground potential with the LK-1 relay operated.

The DIS2 relay in operating will operate the DISA relay.

11.813 Release of the LLC-1, LLC-2, ONW, TLC-1/3, CKG-1/7, and CB Relays

The operation of the LK-1, DIS-1 and DIS-2 relays will release the LLC-1/2, TLC-1/3, ONW, CKG-1/3, CKG-6/7, and CB relays. The release of the CKG-3 relay will release the CKG-4/5 relays.

11.814 Operation of the Originating Register MRL Relay and the Release of the Marker Connector RS, RA, RB, RC, RD, MS, MA, MB, MC and MD Relays

The operation DIS-1 and DIS-2 relays with the marker MRL-1 relay non-operated will extend ground over the "MRL" lead to the originating register marker connector circuit and to the originating register circuit to operate the MRL relay in the originating register circuit. The operation of the MRL relay will release the originating register from this outgoing call and will also release the originating register marker connector circuit.

The operation of the MRL relay in the originating register circuit will release the RS and MS relays in the originating register marker connector. The release of the RS relay will release the RA, RB, RC and RD relays. The release of the MS relay will release the MA and MC relays which in turn will release the MB and MD relays in the originating register marker connector.

11.815 Release of the DIS-1 and DIS-2 Relays

The release of the originating register marker connector MA relay will release the DIS-1 and DIS-2 relays if the TGT relay is released, if the TGT relay has been operated the marker must wait until the sender has completed trunk test and released the TG relay before the TGT relay will be released and the DIS-1 and DIS-2 relays released.

11.816 Release of the MCB-1/6 Relays and the Marker Connector CB Relays

The release of the DIS-2 relay will release the MCB-1/6 relays which in turn will release the CB relays associated with this marker circuit in all marker connector circuits. The release of the CB relays associated with this marker circuit in all marker connectors will indicate to all marker connectors that this marker has been released and is now idle and available and that any marker connector circuit may select and seize this marker for service.

11.817 Release of the DISA Relay

The release of the MCB-1/6 relay will release the DISA relay.

11.82 Release of the Registration of Information from Originating Register Functions

11.821 Release of the CTA-0/2, CU-0/7, S-, FT-0/3, FU-0/7, VG-0/10, HG-0/7, VF-0/4, PSA, PSB, PSA-0/1, and PSB-0/1 Relays

The release of the originating register marker connector RA and RC relays will release the CTA-0/2 and the CU-0/7 relays. The operation of the DIS-2 relay will release the GTL-2/4 relays which in turn will release the FT-0/3, FU-0/7, VG-0/10, HG-0/7 and VF-0/4 relays. The release of the CKG-1 relay will release the S- relay and the operated PSA or PSB relay. The PSA and PSB relay in releasing will release the PSA-0/1 and PSB-0/1 relays.

11.822 The release of the OROA, OROB, OROC, OROD, and OR relays

In offices where the tandem screening feature is provided, the release of the originating register marker connector MA relay will release the marker OROA, OROB, OROC, and OROD relays. The OROA relay in releasing will release the OR relay.

In offices not equipped with the tandem screening feature, the OR relay will be released directly from the originating register marker connector MA relay.

11.823 Release of the AC-0/7, BC-0/7, and CC-0/7 Relays

The release of the originating register marker connector RB relay will release the AC-0/7, BC-0/7, and CC-0/7 relays.

11.83 Release of the Identification of the Call Functions

11.831 Release of the TC-5/7, AT-2/9, BT-20/99, CV-00/99, CVS, KCV, ARNO-5, BRNO-4, CR-0/10, ARP, ARS, BRP, BRS, CRP, CRS, KCV and R- Relays

The release of the originating marker connector MA relay will release the operated TC-5/7 relay. The release of the CKG1 relay will release the operated AT-2/9, BT-20/99. If code conversion was not used on the call, the CKG1 relay in releasing will also release the R- relay. If code conversion was used, the release of the CKG1 relay will release the operated CV-00/99 relay and the CVS relay. The CV- relay in releasing will release the operated ARNO-5, BRNO-4, CR-0/10, ARP, ARS, BRP, BRS, CRP, CRS, and R- relays. On calls in which the KCV relay was operated, the release of the R- relay will release the KCV relay.

11.84 Release of the Selection and Connection of an Outgoing Sender Functions

11.841 Release of the OSG-0/4, OSA-0/4, SOG-1/3, SON and OGC Relays

The release of the route R- relay will release the OSG-0/4 and OSA-0/4 relays if the TGT relay is released. If the TGT relay is operated the OSA-0/4 and OSG-0/4 relays will be held operated until the TGT relay is released. The release of the OSG-0/4 relay will release the SON and OGC relays. The release of the register marker connector MC relay will release the SOG-1/3 relays.

11.842 Release of the OS-0/4 and OSK Relays in the Marker and the S Relay in the Outgoing Sender Connector

The release of the SOG-1/3 relays will release the OS-0/4 and OSK relays in the marker. The release of the OSK or OS-0/4 relays will release the S relay in the outgoing sender connector.

11.843 Release of the DL-0/6, CL-0/5, CLS, and CLP Relays and Release of the CR-0/10, CRP, and CRS Relays on Calls not Employing Code Conversion

The release of the route R- relay will release the operated DL-0/6, CL-0/5, CLS, and CLP relays. On calls where code conversion is not employed, the R- relay in releasing will release the operated CR-0/10, CRP, and CRS relays.

11.85 Release of the Outgoing Trunk Selection Functions

11.851 Release of the AL-0/3, FC- FCA-, FCK, FCKA and FS- Relays

The operation of the DISA relay will release the operated AL-0/3 relay which will in turn release the FC- and FCA- relays if the AL-0/3 relays are operated. If the AL-0/3 relays are not operated, the operation of the DISA relay will release the FC- and FCA- relays. The release of the FC- and FCA- relays will release the FCK and FCKA relays. The release of the FCK, FCKA and TGT relays will release the FS- relay.

11.852 Release of the FTC-, FTCK, and FTCK1 Relays

All FTC- relays which are operated will be released when the FC- and FCA- relays are released. The release of the FTC-relays will release the FTCK and FTCK1 relays.

11.853 Release of the Trunk Link and Connector MP, MC, MCA, MCB, MCC and MCD Relays

The release of the TLC-1 relay will release the trunk link and connector MP, MCA, MCB, MCC and MCD relays. The release of the MP relay will release the trunk link frame MC relay.

11.854 Release of the TFK-1, TFK-2, MAK-1 and MDK Relays

The release of the trunk link and connector MP relay will release the TFK-1 and TFK-2 relays. The release of the trunk link and connector MCA relay will release the MAK-1 relay and the release of the trunk link and connector MCD relay will release the MDK relay.

11.855 Release of the TB-0/5, TG-0/19 and TS-0/19 Relays

The release of the operated route R- relay will release the operated TG-0/19 relay. The release of the operated route R- relay and the TGT relay will release the operated TB-0/5 relay. The release of the TLC-2 and TGT relays will release the operated TS-0/19 relay.

11.856 Release of the Trunk Link and Connector TB-0/5, LV-2/9 and LC-0/9 Relays

The release of the operated TB-0/5 relay in the marker circuit will release the associated TB-0/5 relay in the trunk link and connector circuit. The release of the trunk link and connector circuit FA- or FB- relay will release the operated LV-2/9 and LC-0/9 relays.

11.857 Release of the TBK and LCK Relays

The release of the TB-0/5 relay in the trunk link and connector circuit will release the TBK relay and the release of the LC-0/9 relay in the trunk link and connector circuit will release the LCK relay.

11.858 Release of the FMK and FML Relays

The release of the TLC-2 relay will release the FMK relay. The release of the TFK-1 relay will release the FML relays.

11.86 Release of the Selection of the Connecting Path Functions

11.861 Release of the CB, CB-1/5, CB-7, CBD, CBF, CBD-1, FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, VTK-1, HTK-1 and FTK-1 Relays

The operation of DIS-2 relay will release the CB relay. The release of the CB relay will release the CB-1/5, CB-7, CBF, CBD and CBD-1 relays which will release the FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, and VFT-0/4 relays which will in turn release the VTK-1, HTK-1 and FTK-1 relays.

11.862 Release of the Line Link Frame MP, MCA, MCB, VGB-0/11, HG-0/9 and LG-0/11 Relays

The release of the LLC-1 relay will release the line link and connector MP, MCA, MCB, HG-0/9 and LG-0/11 relays. The release of the line link frame MCA relay will release the VGB-0/11 relay.

11.863 Release of the STF, PR, 2TLF/10TLF, 20F, 40F, 7Q, RQ, PNR, PA, PB, PC, P-0/9, 2G, 3G, TCH-0/9, TCHK, JG-0/4 and JCK-0/1 Relays

The release of the TLC-3 relay will release the STF or PR relay and the operated 2TLF/10TLF relay. The release of the STF or PR relay will release the 20F or 40F relay and the release of the operated 2TLF/10TLF relay which will release the 7Q, or RQ, relay, if operated.

The release of the ONW and LLC-1 relay will release the STP-1 or STP-2 relay which will release the PNR, PA, PB or PC relay. The release of the operated PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the trunk link frame MCC relay will release the operated P-0/9 relay which will in turn release the 2G or 3G relay, if operated.

The release of the LLC-2 relay will release the JG-0/4 relay. The release of the trunk link frame MCB relay will release the JCK-0/1 relays.

11.864 Release of the Trunk Link and Connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER Relays

The release of the marker JG-0/4 relay will release the G-0/4, RF, EF, JC-0/19, L, R, EL and ER relays.

11.865 Release of the TLL-0/9, TJ-0/9, TTL-0/9, TK, CHT, CH-0/9 and CHA Relays

The release of the line link frame HG-0/9 relay will release the TTL-0/9 relays. The release of the trunk link frame MCB relay will release the TJ-0/9 relays. The release of the trunk link frame LC-0/9 relay will release the TTL-0/9 relays.

The release of the LLC-1 relay will release the CH-0/9 and CHA relays. The release of the LLC-2 relay will release the HMS-1 relay which in turn will release the TK relay which will release the CHT relay.

11.87 Release of the Setting Up the Selected Connecting Path Functions

11.871 Release of the Line Link and Trunk Link Frame Select Magnets.

The operation of the GT1 relay will release the ONX relay which in turn will release the operated select magnets on the line link frame line and junctor switches and on the trunk link frame junctor and trunk switches.

11.872 Release of the HMX-1, SL, LB-0/9, LTR, GLH and GLH-1 Relays

The release of the LLC-1 relay will release the HMS-1 relay. The release of the trunk link frame FA- or FB- relay will release the SL relay which in turn will release the LTR relay. The release of the SL relay will also release the GLH relay which will release the GLH-1 relay. The release of the line link frame HG-0/9 relay will release the LB-0/9 relay.

11.873 Release of the CON, CON1, CON3, GT1, GT2, LK1, DCT1, and FAK or FBK Relays

The operation of the GT2 relays will release the CON and CON3 relays. The release of the LLC1 relay will release the CON1 relay which in turn will release the GT1 and GT2 relays. The release of the CKG4 relay will release the LK1 and the DCT1 relays. The release of the trunk link frame FA- or FB- relay will release the FAK or FBK relay.

12. TERMINATING CALL ASSOCIATED WITH A NON-TANDEM, NON-INTERTOLL INCOMING TRUNK

The marker circuit when assisting the completion of a terminating call associated with a non-tandem, non-intertoll incoming trunk assists in the performance of eight major functions as follows:

(a) Registration of information from the incoming register which the marker requires in assisting a terminating call.

(b) The identification of the call or connection which the marker will assist.

(c) The identification of the location of the called subscriber line.

(d) The called subscriber line busy test.

(e) The selection of an idle connecting path between the called subscriber line and the incoming trunk associated with this terminating call.

(f) Connecting the called subscriber line to the incoming trunk through the selected connecting path.

(g) Setting up the selected ringing code.

(h) Release of the marker and associated circuits after the marker has completed the terminating call functions.

12.1 Seizure of the Marker by the Incoming Register

The incoming trunk recognizes a seizure by a remote office, which wishes to complete a call. The incoming trunk connects to an incoming register through the incoming register link. The distant office transmits the called numerical digits, and in some cases one additional digit, to the incoming register. The incoming reigster records the digits from the remote office, records the trunk link frame number associated with the incoming trunk so that the marker can reach the incoming trunk,and then the incoming register connects to a marker through an incoming register marker connector.

After the incoming register has recorded all of the digits from the remote office the incoming register will seize the incoming register marker connector with which it is associated if the incoming register marker connectors is idle. Since the incoming register marker connector will not be provided on a one per incoming register basis but instead will be provided on the basis of one incoming register marker connector for a number of incoming registers it is necessary for any incoming register in attempting to seize its associated incoming register connector to complete with the other incoming registers associated with this incoming register marker connector. If the incoming register marker connector is busy the incoming register must wait until it is idle before proceeding since no alternate incoming register marker connector is available.

The incoming register marker connector will have access to any marker and will test for and select an idle marker which will be seized and associated with the incoming register marker connector and incoming register.

12.11 Operation of Incoming Register MST Relay and the Register Marker Connector RS, RA, RB, RC, RD, MS, MA, MB, MC and MD Relays

When the incoming register desires to have access to a marker through its associated incoming register marker connector the marker start MST relay in the incoming register is operated. If the associated incoming register marker connector is idle and available the operation of the MST relay in the incoming register will seize the incoming register marker connector and start a chain of events which will lead to the operation of the register start RS relay in the incoming register marker connector associated with this incoming register. The operation of the RS relay associated with this incoming register will lockout all other incoming registers associated with this incoming register marker connector.

If the incoming register marker connects associated with the incoming register is not available the incoming register must wait until it becomes available.

The operation of the RS relay will operate the incoming register marker connector RA and RC relays, which in turn will operate the RB and RD relays associated with this incoming register. The operation of the RA, RB, RC, and RD relays will extend a group of leads from the incoming register to the associated incoming register marker connector.

The operation of the incoming register marker connector RD relay will extend a start lead through the non-operated CB relay in the incoming marker connector to operate a marker start MS relay associated with an idle and available marker. In each incoming register marker connector there is one MS relay for each marker circuit to which the incoming register marker connector may require access. By the operation of an MS relay associated with an idle and preferred marker the incoming register marker connector will select the marker circuit from which assistance is desired for this connection. The arrangement of the CB and MS relays in the incoming register marker connector is similar to the arrangement of these relays in the originating register marker connector and the originating register marker connector.

The operation of the MS relay will operate the incoming register marker connector MA and MC relays which in turn will operate the MB and MD relays associated with the selected marker. The operation of the MA, MB, MC and MD relays, extend a group of leads from the incoming register marker connector to the selected marker and with the RA, RB, RC and RD relays operated will further extend a group of leads from the incoming register to the selected marker

12.12 Operation of the CKG-1/7, TLC-1/3, LLC-1/2 and ONW Relays

To provide a large number of off-normal ground and battery potentials to the marker circuit the CKG-1/7, TLC-1/3, LLC-1/2 and ONW relays in the marker circuit will be operated.

The operation of the incoming register marker connector MA relay will ground the "CKG" lead in the register marker connector. The "CKG" lead is extended to the marker circuit and with the TRLA, DIS-1 and DIS-2 relays non-operated the ground on the "CKG" lead will be extended to operate the CKG-1/3 relays.

The operation of the CKG-3 relay will operate the CKG-4 relay, with the GP-2, RCY-1 and RAV-2 relays non-operated.

The operation of the CKG-3 relay will in turn operate the CKG-5 relay, and with the DIS-2 relay non-operated the CKG-6/7 relays will be operated.

The TLC-1/3 relay windings in series are extended over the "TLC-1" lead thru the non-operated MRL-1 relay over the "TLC-1" lead to the "TLC" lead. The operation of the CKG-3 relay with the DIS-1 and the TRLA relays non-operated will extend the "TLC" lead and the released condition of the RAV-1 and RCY relays have placed ground on the "TLC" lead thereby operating the TLC-1/3 relays.

The LLC-1/2 and ONW relay windings in series are extended over the "LLC-1" lead. The released condition of the MRL-1 relay will extend the "LLC-1" lead to the "LLC-A" lead and the DIS-1 and TRLA relays released will extend the "LLCA" lead to the "LLC" lead. The released condition of the BY and OV relays will extend the "LLC" lead and the operation of the CKG-4 and CKG-5 relays with the LK-1 and RCY-2 relays released will ground the "LLC" lead thereby operating the LLC-1/2 and ONW relays.

12.13 Operation of the MCB-1/6 Relays and the Operation of the CB Relays in the Marker Connectors

The MCB-1/6 relays in the marker and the CB relays in the marker connectors are operated as described for a dial tone connection in paragraphs 7.16 and 7.17.

12.2 Registration of Information from the Incoming Register

After the seizure of the marker, the office identifying digit if required, the numerical digits of the called line and the identification of the trunk link frame with which the incoming trunk circuit is associated will be transferred from the incoming register to the marker circuit.

12.21 Office Identification and Number of Called Line for a Four Digit Numerical Office

If the office consists of only one 10,000 directory number series no office identification will be required and the numericals of the called line will fully identify the called line. However, if the office consists of two, 10,000 directory number series an office identification will be required, in addition to the numericals of the called line, to fully identify the called line.

If the office consists of only one 10,000 directory number series the office "A" OA relay will be operated from the incoming register.

If the office consists of two 10,000 directory number series, and if there are provide one group of incoming trunks associated with one 10,000 directory number series and another group of incoming trunks associated with the other 10,000 directory number series, the office "A" OA relay or the office "B" OB relay will be operated. The OA relay will be operated when the incoming trunk circuit is associated with the office "A" 10,000 directory number series and the OB relay will be operated when the incoming trunk circuit is associated with the office "B" 10,000 directory number series.

If the office consists of two 10,000 directory number series, and if the incoming trunk circuits may be associated with either of the two 10,000 directory number series office identifying digits will be received from the remote office and will be transmitted from the incoming register to the marker. The office identifying digits will precede the numerical digits and will identify the office directory number series as an office "A" or office "B". In this case the office idenfying digits will be recorded by the operation of two of the AC-0/7 relays and BC-0/7 relays as necessary.

12.211 Operation of the OA, OB, AC-0/7 and BC-0/7 Relays

The OA relay winding will be extended over the "OA" lead through the incoming register marker connector to the incoming register circuit. If the incoming register has been informed that the incoming trunk is associated with the office "A" directory numbers ground potential will be placed on the "OA" lead to operate the marker OA relay.

The OB relay winding will be extended over the "OB" lead through the incoming register marker connector to the incoming register circuit. If the incoming register has been informed that the incoming trunk is associated with the office "B" directory numbers ground potential will be placed on the "OB" lead to operate the marker OB relay.

In offices consisting of two 10,000 directory number series with incoming trunk circuits associated with either of the two 10,000 directory number series, and a single identifying digit precedes the numerical digits, two AC-0/7 relays are operated to record the directory number series identifying digit. The incoming register marker connector will extend a group of leads, designated "A-0/7" from the incoming register to the marker. The incoming register will place ground on two of the "A-0/7" leads to identify the directory number series. In this case neither the OA or OB relays will be operated.

In offices consisting of two 10,000 directory number series with incoming trunk circuits associated with either of the two 10,000 directory number series, and two identifying digits precede the numerical digits, two AC-0/7 relays and two BC-0/7 relays are operated to record the directory number series identifying digit. The incoming register marker connector will extend a group of leads, designated "A-0/7" and "B-0/7" from the incoming register to the marker. The incoming register will place ground on two of the "A-0/7" and "B-0/7" leads to identify the directory number series. Again, neither the OA nor OB relays will be operated.

12.212 Identification of the Numericals of the Called Line

A number of groups of leads designated "A-0/7", "B-0/7", "C-0/7", "D-0/7", and where required "E-0/7" and "F-0/7" will be extended from the incoming register circuit to the marker. If only the four numericals are to be received by the marker the "A-0/7", "B-0/7", "C-0/7" and "D-0/7" lead will transmit this information. If an additional digit is required to determine the directory number series of the called subscriber the "A-0/7" leads will transmit this information and the "B-0/7", "C-0/7", "D-0/7", and "E-0/7" leads will transmit the numericals of the called line to the marker. If two additional digits are required to determine the directory number series of the called subscriber the "A-0/7" and "B-0/7" leads will transmit this information and the "C-0/7", "D-0/7", "E-0/7", and "F-0/7" leads will transmit the numericals of the called line to the marker. The incoming register will place ground on two leads of each group of leads to identify the digits. The leads representing the numerical digits of the called line will later be used to operate the TH-0/7, HN-0/7, T-0/7, and U-0/7 relays.

If the marker is equipped with the AC-0/7, BC-0/7 and CC-0/7 relays these relays will be operated by the ground potentials placed on the "A-0/7", incoming register circuit.

12.22 Identification of the Trunk Link Frame Associated with the Incoming Trunk and the Operation of the FG-0/1 and TF-0/7 Relays

The incoming register marker connector circuit has extended from the incoming register to the marker a group of five trunk link frame units "TF-0/7" leads and two trunk link frame tens "FG-0/1" leads in order to identify the trunk link frame associated with the incoming trunk. Ground potential has been placed on two of the group of five "TF-0/7" leads by the incoming register thereby operating in the marker the two associated trunk link frame units TF-0/7 relays. If the office is equipped with more than ten trunk link frames ground potential will be placed on one of the two "FG-0/1" leads by the incoming register thereby operating in the marker the one associated trunk link frame tens FG-0/1 relay. In offices equipped with ten trunk link frames or less neither "FG-0/1" lead will be grounded by the incoming register and no FG-0/1 relays will be provided in the marker. The operation of two TF-0/7 relays and one FG-0/1 relay, if provided, will identify the trunk link frame associated with the incoming trunk.

12.3 Identification of the Basic Call or Connection

To identify this call as a terminating, non-tandem, non-toll call the incoming trunk call INC relay and the terminating class TER-1/4 relays will be operated in the marker. The incoming trunk call INC relay in the marker will be operated by the incoming register circuit as an indication to the marker that the call is associated with an incoming trunk circuit and therefore is a call which will terminate within this office.

The operation of the INC relay with the OA, OB or where required, the LPA, LPB, LTA or LTB relay will operate the terminating class TER-1/4 relays which will initiate the marker functions required for completing a terminating call. If the office consists of only one 10,000 directory number series or if the office consists of two 10,000 directory number series with one group of incoming trunks associated with each 10,000 directory number series, the office "A" OA relay or the office "B" OB relay will be operated. The operation of the INC relay and the OA or OB relay will operate the terminating class TER-1/3 relays.

However, if the office consists of two 10,000 directory number series with the incoming trunk circuits associated with either of the two 10,000 directory number series the TC-5/7 relay and the LPA, LPB, LTA or LTB relay must be operated to identify the 10,000 directory number series of the called line. In this case the operation of the LPA, LPB, LTA or LTB relay will operate the terminating class TER-3 relays.

12.31 Operation of the INC Relay

The INC relay winding will be extended over the "INC" lead through the incoming register marker connector to the incoming register circuit. If the incoming register has been informed that the incoming trunk is associated with a call which will terminate in this office ground potential will be extended from the incoming register circuit on the "INC" lead to operate the marker INC relay.

12.32 Operation of the TC-5 and LPA, LPB, LTA, or LTB relays where a single directing digit is used to identify the directory number series ("FVD" translation).

If the office consists of two 10,000 directory number series with the incoming trunk circuits associated with either of the two 10,000 directory number series ground potential will be extended from the incoming register circuit over the "FVD" lead and through incoming register marker connector to the "FVD" cross-connection terminal in the marker. Where one digit is received from remote offices in addition to the four numerical digits, to identify the 10,000 directory number series associated with the called line the "FVD" cross-connection termanal of figure 38 in the marker will be cross-connected to the "TC-5" cross-connection terminal of figure 38 thereby resulting in the operation of the TC-5 relay.

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The operation of the TC-5 and INC relays with the CKG-1 relay and two of the AC-0/7 relays operated to identify the 10,000 directory number series will extend ground to one of the "C-2/9" cross-connections. The "C-2/9" code point will be cross-connected to the required "AP", "BP", "AT", or "BT" cross-connection terminal code point of figure 44 thereby operating the associated LPA, LPB, LTA or LTB relay. The code points "C-2/9" represent the initial digit received to identify the 10,000 directory number series. The operation of the LPA or LTA relay will identify the 10,000 directory number series as office "A" directory number series and the operation of the LPB or LTB relay will identify the 10,000 directory number series as office "B" directory number series.

12.33 Operation of the TC-6 and LPA, LPB LTA, or LTB relays where two directing digits are used to identify the directory number series ("2DT" translation).

In seven digit areas it is possible that two directing digits may be received to identify the office directory number series. An example of this would be an incoming from a seven digit office where the first digit is absorbed in that office. This necessitates special translation to prevent conflicts between the digits received and normal three digit translation in the office. This special translation is achieved through the use of the 2DT2-9 relays of figure 115.

When "2DT" translation is required the incoming register will ground the "2DT" lead to the marker through the incoming register marker connector. This will ground the "2DT" cross-connection terminal of figure 115. The "2DT" terminal of figure 115 will be cross-connected to the "TC6" cross-connection terminal of figure 38, thereby operating the TC-6 relay when ground is received over the "2DT" lead from the incoming register.

The operation of the TC-6 relay, INC relay, and CKG-1 relay with the two operated AC-0/7 relays, identifying the first digit received from the incoming register, will extend ground to one of the "6A2-9" cross-connection terminals of figure 38. The "6A2-9" cross-connection terminals will be cross-connected to the "2DT2-9" terminals of figure 115. Ground on one of the "6A2-9" terminals will operate the corresponding 2DT2-9 relays.

The operation of one of the 2DT2-9 relays, and CKG-1 relay with the two operated BC-0/7 relays, identifying the second digit received from the incoming register, will extend ground to one of the "C20-99" code points. The "C20-99" code points will be cross-connected as required to the "AP", "BP", "AT" or "BT" cross-connection terminal associated with the LPA, LPB, LTA, and LTB relays. The operation of the LPA or LTA relay will identify the 10,000 directory number series as office "A" directory number series and the operation of the LPB or LTB relay will identify the 10,000 directory number series as office "B" directory number series.

12.34 Operation of the TER-1/4 Relays

The operation of the OA, OB, LPA, LPB, LTA or LTB relay with the INC relay operated will operate the TER-1/3 relays. The windings of the TER-1/3 relays are in series with each other and the operating path will be extended thru the operated OA, OB, LPA, LTA, LPB or LTB relay contacts through the operated INC relay contacts through the non-operated RTST and LR relay contacts through the non-operated TR2E relay contacts to the "TRK" lead which is extended to the incoming register marker connector circuit where the "TRK" lead will be grounded. The operation of the TER-2 relay will operate the TER-4 relay.

12.4 Identification of the Location of the Called Line

The marker will select and seize a number group circuit and transmit the called directory number to the number group. The number group circuit will translate the called directory numerical digit into called line location. The number group will transmit this line location information to the marker. The number group will also transmit to the marker the identification of the proper ringing code for the called subscriber.

The number group is selected and seized by the marker in a similar manner to the selection and seizure for the intra-office call, as described in paragraph 8.041, except it is necessary for the marker to seize a trunk link frame prior to seizing the number group for this call. The operation of the TFK3 relay indicates that the trunk link frame has been seized. Operation of the TFK3 and SNG2 relays are necessary for number group seizure. The number group translation, marker identification of the location of the called line and the release of the number group are similar to the associated functions of an intra-office call, as described in paragraphs 8.042, 8.043, 8.044, and 8.046.

12.5 Called Line Busy Test

After the trunk link frame associated with the incoming trunk has been seized and the TFK3 relay has operated, and after the LLC1, FLG2, PTK, RCLA, one of the FUTO-9, and one of the FTTO-3 relays are operated and the SCB1 relay non-operated, the line link frame associated with the called line will be seized by the marker. After line link frame has been seized and after the location of the called line has been identified, the called line will be tested for a busy condition. The called line busy test will be similar to the line busy test for the intra-office call, as described in paragraph 8.06.

12.6 Selection of the Connecting Path

Before the marker may proceed with the selection of the connecting path to the called line the marker must seize the trunk link frame associated with the incoming trunk circuit and the marker must seize the line link frame associated with the called line.

12.61 Seizure of the Trunk Link Frame and Connection to the Incoming Trunks Circuit

The incoming register has informed the marker of the identity of the trunk link frame associated with the incoming trunk circuit, as described in paragraph 12.22. After the marker has identified this call as a terminating call, as indicated by the operation of the TER-1/4 relays the marker will initiate the seizure of the trunk link frame associated with the incoming trunk and will connect to the incoming trunk circuit through the trunk link frame.

12.611 Operation of the Trunk Link and Connector MP Relay and the Marker TFK-3 Relay

In each trunk link and connector circuit there is one marker preference MP relay associated with each marker circuit to which the trunk link frame has access. In order to secure access to a trunk link frame a marker will operate in the selected trunk link and connector circuit the MP relay associated with this marker. To indicate that the marker has seized the selected trunk link frame the trunk link frame check TFK-3 relay in the marker circuit will be operated.

Each trunk link and connector circuit MP relay winding will be extended, when the TR-0/5 (M.D.), T, or TA relay is non-operated, from the trunk link and connector circuit over the associated "ST-" lead to the marker circuit with which the MP relay is associated. The operation of one FG-0/1 and two TF-0/7 relays in the marker, as described in paragraph 12.22, will further extend the one "ST-" lead connecting to the trunk link frame associated with the incoming trunk to battery potential when the TER-3 relay operates, when the SPL-1 and SP relays are non-operated and when the TLC-1 relay is operated thereby operating in the trunk link frame associated with the incoming trunk the MP relay associated with the marker which is assisting in this terminating call.

The operation of the TFK-3 relay in the marker, indicates that the selected trunk link and connector circuit MP relay associated with this marker is operated and all other prior preferred MP relays within the same trunk link and connector circuit are non-operated. The operation of the trunk link and connector MP relay will ground the "CK" lead if no MP relay of prior preference in the same trunk link and connector circuit is operated. The grounded "CK" lead will be extended to the marker associated with the operated MP relay and to the marker TFK-3 relay when the marker TER-1 relay is operated and the PCL-3 relay is non-operated. The grounding of the "CK" lead will therefore operate the marker circuit TFK-3 relay as an indication that the trunk link frame has been seized.

12.612 Operation of the Trunk Link and Connector MC, MCA, MCB, MCC, and MCD Relays

The operation of the trunk link and connector MP relay with the associated TR-0/5 (M.D.), T, or TA relay released will operate the trunk link and connector MC relay associated with this marker.

The operation of the trunk link and connector MC relay will extend the associated trunk link and connector circuit MCA, MCB, MCC and MCD relay windings over the "BS-0/4" leads to the marker circuit. Since the marker circuit TLC-1 relay will be in the operated condition battery potential has been placed on the "BS-0/4" leads in the marker circuit thereby operating the trunk link and connector MCA, MCB, MCC and MCD relays.

12.613 Operation of the MAK-1 and MDK Relays

The operation of the trunk link and connector MCA relay will ground the "MAK" lead which is extended to the marker circuit to operate the MAK-1 relay as a check that the MCA relay has operated.

The operation of the trunk link and connector MCD relay will ground the "MDK" lead which is extended to the marker circuit to operate the MDK relay as a check that the MCD relay has operated.

12.614 Operation of the F Relay in the Incoming Trunk

The operation of the TFK-3 relay with the TER-4 and TLC-1 relays operated and the DCT-1 and OFH-1 relays non-operated will place battery potential on the "F" lead which is extended to the incoming register marker connector circuit and to the incoming trunk circuit to operate the

F relay in the incoming trunk circuit associated with this terminating call,

12.615 Operation of the FB-, LV-2/9 and LC-0/9 Relays in the Trunk Link and Connector Circuit

Each incoming trunk circuit is associated with a "B" trunk appearance on the trunk link frame. The operation of the F relay in the incoming trunk will place ground on the "FA" lead associated with the incoming trunk. The ground on the "FA" lead will be extended to the trunk link and connector circuit to operate the FB- relay associated with the incoming trunk.

In each trunk link and connector circuit there are eight LV-2/9 relays. Each LV-2/9 relay is associated with one of the ten horizontal levels, except horizontal levels 0 and 1, on all ten trunk switches of the trunk link frame. The operation of the FB- relay will operate the LV-2/9 relay associated with the horizontal level of the trunk switch which is associated with the incoming trunk.

Associated with each trunk switch on the trunk link frame is one LC-0/9 relay. The released condition of the LK-1 and TX relays in the marker circuit will place battery potential on the "BLC" lead which will be extended to the trunk link and connector circuit with the trunk link and connector MCB relay operated. The operation of the LV-2/9 relay with the associated FB- relay operated will extend the battery potential on the "BLC" lead to operate on LC-0/9 relay.

12.616 Operation of the FBK and LCK Relays

The operation of an LV-2/9 relay, an associated FB- relay and the MCB relay in the trunk link and connector circuit will place ground on the "FBK" lead which is extended to the marker circuit. The released condition of the LK-1 relay will further extend the "FBK" lead to operate the FBK relay.

The operation of an LC-0/9 relay with the MCB relay in the trunk link and connector circuit operated will place ground on the "LCK" lead which will be extended to the marker circuit to operate the marker LCK relay.

12.617 Operation of the Incoming Trunk Class Relays of Figure 65 and the LCH and TCH Relays

Ground potential furnished from the trunk or associated FB- relay trunk link and connector will operate one of the incoming trunk class relays ONN, 1TB, 2MB, 3FB, 4TT, 5MT, 6FT, 7TP, 8MP, and 9FT of figure 65.

The LCH or TCH relay will be operated if the associated incoming trunk class relay is operated and the TER-3 relay is operated. The LCH is used for local charging, while the TCH relay is used for toll charging. In this call only the LCH relay will be operated.

12.618 Operation of the TCK Relay

Low negative potential is transmitted to the trunk link and connector circuit on the "TC" lead, through the primary winding of the TCK relay, after the LCH relay has operated with the TER-2, TER-3, and LI relays operated and the FNA, FNB, OFH, and PUL relays non-operated. The operation of the LI relay for this call is similar to the operation for the intra-office call as described in paragraph 8.092. The low negative potential on the "TC" lead will operate the charge relay in the trunk, upon operating the charge relay locks up to ground. The charge relay upon locking will place ground potential on the "TC" lead to the marker. Ground potential on the "TC" lead will operate the TCK relay.

12.619 Operation of the RCK-1, RCK-2, and RCK-3 Relays

The operation of the RCK-1 relay will be similar to that described for the intra-office call, paragraph 8.093. The operation of the RCK-1 relay will operate the RCK-2 relay. The RCK-2 relay will in turn operate the RCK-3 relay if the TCK relay has operated.

12.62 Selection of the Line Link Group

The selection of the line link group for a terminating call is similar to the selection of the line link group for a dial tone connection, as described in paragraph 7.41.

12.63 Selection of the Subgroup of Junctors

The selection of the junctor subgroup for a terminating call is similar to the selection of the junctor subgroup for a dial tone connection as described in paragraph 7.42.

12.64 Selection of the Trunk Link Group

The selection of the trunk link group for a terminating call is similar to the selection of the trunk link group for a dial tone connection, as described in paragraph 7.43.

12.65 Test and Selection of an Idle Connecting Path

The test and selection of an idle connecting path for a terminating call is similar to the test and selection of an idle connecting path for a dial tone connection as described in paragraphs 7.44 and 7.45.

12.7 Setting Up the Selected Connecting Path

After an idle connecting path has been selected the marker will initiate the operations necessary for connecting the called subscriber line to the incoming trunk circuit thru the selected connecting path. The marker will operate the select magnets and hold magnets associated with the selected connecting path. The marker circuit will further extend the selected connecting path from the trunk link frame trunk switch to the incoming trunk circuit by releasing the associated trunk link frame FB- relay after the marker has selected and set up the connecting path to the called line. The marker will also perform certain tests on the connecting path and then transfer the connecting path supervision to the incoming trunk circuit.

12.71 Select Magnet Operation

The operation of the select magnets for setting up the connecting path for a terminating call is similar to the operation of the select magnets for setting up the connecting path to the originating register from the calling line for a dial tone connection, as described in paragraph 7.51. However, instead of operating the trunk link frame trunk switch select magnet A, the trunk link frame trunk switch select magnet B will be operated thru the contacts of the operated marker FBK relay since the connection of the incoming trunk circuit to the called line is associated with the "B" trunk appearance on the trunk link frame.

12.72 Hold Magnet Operation

The operation of the hold magnet is similar to the operation of the hold magnets for a dial tone connection, as described in paragraph 7.52.

12.73 False Cross and Ground, Continuity, Double Connector, Ground, Loop or Receiver-Off-Hook Tests

To determine if the connecting path is in a proper condition for service a false cross and ground test, a continuity test and a double, connection test will be made on the selected connecting path. Also, a ground, loop or receiver-off-hook test will be made on the selected connecting path. The false cross and ground test, the continuity test and the double connection test are similar to the tests which are made while setting up the connecting path to the calling line for a dial tone connection, as described in paragraph 7.53. Ground loop or receiver-off-hook test was not performed for a dial tone condition.

12.731 False Cross and Ground Test

The false cross and ground test on the connecting path to the called line for a terminating call is similar to the false cross and ground test for a dial tone connection as described in paragraph 7.531.

12.732 Continuity Test

The continuity test on the connecting path for a terminating call is similar to the continuity test for a dial tone connector, as described in paragraph 7.532. However, in a terminating call, the marker has been informed by the number group whether the called party is a tip or ring subscriber. Therefore, in the event of a continuity test failure it is not necessary to test both sides of the line, as is done in the dial tone connection. The operation of the RCT-7, RCT-9, or RCT-11/15 relay indicating a tip subscriber, will operate the RCTB relay which will release the RCT and the RCTA relays. Continuity test is then made on the tip lead. However, if the RCTB relay is non-operated, the RCT and the RCTA relays will remain operated and the continuity test will be made on the ring lead.

12.733 Ground, Loop or Receiver-Off-Hook Test

"Ground test" is made by the marker of any called subscriber line which is not a PBX line and is not a "ground start" coin line. "Loop Test" is made by the marker of any called subscriber line which is a PBX line. "Receiver-off-hook test" is made by the marker of any called line which is a coin line arranged for ground start non-PBX line for which it is establishing a connection. The "ground test" on the connecting path for a terminating call is similar to the "ground test" on the connecting path to the called line for an intra-office, non-reverting, call as described in paragraph 8.0833.

12.734 Double Connection Test

The sleeve conductor double connection test for a terminating call is similar to the double connection test for a dial tone connection as described in paragraph 7.53, however the operation of the DCT1 relay will be as follows. The operation of the DCT relay with the RNG, RCK-3, TER-3, CKG-4, and GT-2 relays operated and the LK-1, DCT-3 SP, MT-14, GT-5, GT, and PU relays non-operated will operate the DCT1 relay.

The operation of the DCT1 relay will release the F relay in the incoming trunk.

12.74 Transfer of the Connecting Path Supervision to the Incoming Trunk Circuit

The transfer of the connecting path supervision to the incoming trunk circuit for a terminating call is similar to the transfer of the connecting path supervision to the originating register for a dial tone connection, as described in paragraph 7.54. However, since the incoming trunk is associated with a "B" trunk appearance on the trunk link frame the FB- relay on the trunk link frame will be released, instead of the described FA- relay.

12.8 Setting Up the Selected Ringing Code

The number group has identified the ringing combinations for the called line and has transmitted the ringing combination to the marker. The marker will establish the ringing condition on the ringing selection switch and will then transfer the control of the ringing to the incoming trunk circuit.

The setting up of the selected ringing code for a terminating call is similar to the setting up of the selected ringing code for an intra-office call, as described in paragraph 8.09. However, in the terminating call the ringing code is set up to the incoming trunk rather than the intra-office trunk.

12.9 Release of the Marker and Associated Circuits

After the marker circuit has completely performed the terminating call functions, the marker circuit will be released from this terminating call and will be restored to the idle condition so as to be available for assistance to other calls or connections.

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously, this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

12.91 Recycle of the Marker Release Control

12.911 Release of the DCT Relay and the Operation of the LK-1 Relay

The release of the FB- relay in the trunk link frame releases the DCT relay. The release of the DCT relay will operate the LK-1 relay with the DCT-1, the CKG-4 and the GT-2 relays operated and the DCT-2, TOG-2, ITR-2, GT-5, GT and PU relays released. The LK-1 relay will be locked operated with the CKG-4 relay operated.

12.912 Release of the LLC-1/2 and ONW Relays and the Operation of the DIS-1, DIS-2 and DISA Relays

The operation of the LK-1 relay will release the LL-1/2 and ONW relays. The operation of the linkage check LK-1 relay will also operate the DIS-1/2 relays. The operating path for the DIS-1/2 relays in series is extended from the winding of the DIS-1 relay over the "DIS" lead to the "DIS-1" lead with the MT-1, MON-1, TRL-1, TRR and TR1 relays non-operated, and either with the TG relay non-operated and to the "TG" lead to the HTR relay non-operated to the "DIS-1" lead, or to the HTR relay operated to the "DIS-1 lead with RRK and RRC relays non-operated to the "DIS-1" lead with the PSR relay non-operated, to the "LKK-2" lead with the TRS relay non-operated, to the "LK-3" lead with the TER-3 and PTK relay operated, to the "LK-2" lead with the MT-14 relay non-operated, to the "LK-2" lead with the ITR-2 relay non-operated, to the "LK-1" lead with the LHT relay non-operated and to the operating ground potential with the LK-1 relay operated. The DIS-1/2 relays will lock operated with the TRLA relay non-operated and the incoming register marker connector MA relay operated. The DIS-2 relay in operating will operate the DISA relay.

12.913 Release of the TLC-1/3 and CKG-1/7 Relays

The operation of the DIS-1/2 relays will release the TLC-1/3, CKG-1/3 and CKG-6/7 relays. The release of the CKG-3 relay will release the CKG-4/5 relays.

12.914 Operation of the Incoming Register MRL Relay and the Release of the Register Marker Connector RS, RA, RB, RC, RD, MS, MA, MB, MC and MD relays

The operation of the DIS-1/2 relays with the marker MRL-1 relay non-operated will extend ground over the "MRL" lead to the incoming register marker connector circuit and to the incoming register circuit to operate the MRL relay in the incoming register circuit. The operation of the MRL relay will release the incoming register from the terminating call and will also release the incoming register marker connection circuit.

The operation of the MRL relay in the incoming register circuit will release the RS and MS relays in the incoming register marker connector. The release of the RS relay will release the RA, RB, RC and RD relays in the incoming register marker connector. The release of the MS relay will release the MA and MC relays which in turn will release the MB and MD relays in the incoming register connector circuit.

12.915 Release of the DIS-1/2 Relays

The release of the incoming register marker connector MA relay will release the DIS-1/2 relays.

12.916 Release of the MCB-1/6 Relays and the Marker Connector CB Relays

The release of the DIS-2 relay will release the MCB-1/6 relays which in turn will release the CB relays associated with this marker circuit in all marker connector circuits. The release of the CB relays associated with this marker circuit in all marker connectors will indicate to all marker connectors that this marker has been released and is now idle and available and that any marker connector circuit may select and seize this marker for service.

12.917 Release of the DISA Relay

The release of the MCB1 relay will release the DISA relay.

12.92 Release of the Registration of Information from the Incoming Register Functions

12.921 Release of the OA, OB and AC-0/7, BC-0/7 and CC-0/7 Relays

The release of the incoming register marker connector RA relay will release the OA, OB and AC-0/7, BC-0/7 and CC-0/7 relays if provided.

12.922 Release of the TF-0/7 and FG-0/1 Relays

The release of the incoming register marker connector MC relay will release the TF-0/7 and FG-0/1 relays.

12.93 Release of the Identification of the Call Functions

12.931 Release of the INC, TC-5, TC-6, 2DT2-9, LPA, LPB, LTA, and LTB Relays

The release of the incoming register marker connector relays will release the operated TC-5, TC-6 and INC relays. The release of the TC-6 relay will release the 2DT2-9 relay. The release of the CKG-1 relay will release the operated LPA, LPB, LTA, and LTB relay.

12.932 Release of the TER-1/4 Relays

The release of the incoming register marker connector will release the TER-1/3 relays. The release of TER-2 relay releases the TER-4 relay.

12.94 Release of the Identification of the Location of the Called Line Functions

12.941 Release of the FLG and FLG-1 Relays

The operation of the LK-1 relay will release the FLG and FLG-1 relays.

12.942 Release of the FTL, FUL, LLI, VGL-1/2, HGL-1, VFL-1, RCL, RCLA, FTT-0/3, FUT-0/9, VGT-0/13, HGT-0/9, VFT-0/4, RCT-1/15, VTK-1, HTK-1 and FTK-1 Relays

The release of the FLG-1 relay will release the LLI relay which in turn will release the FTL, FUL, RCL, and RCLA relays. The release of the FLG relay will release the VGL-1/2, HGL-1 and VFL-1 relays. The release of the FTL, FUL, RCL, VGL-1/2, HGL-1 and VFL-1 relays will release the operated FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4 and RCT-1/15 relays which in turn will release the VTK-1, HTK-1 and FTK-1 relays.

12.943 Release of the PN. TN or PTN Relays

The release of the LLI relay will release the operated PN, TN or PTN relay.

12.95 Release of the Line Link Frame

12.951 Release of the Line Link and Connector MP, MCA and MCB Relays and the Marker LFK Relay

The release of the LLC-1 relay will release the line link and connector MP, MCA and MCB relays. The release of the MCA relay will release the LFK relay in the marker.

12.952 Release of the Line Link and Connector VGB-0/11, HG-0/9 and LG-0/11 Relays

The release of the line link and connector MCA relay will release the line link frame VGB-0/11 relay. The release of the LLC-1 relay will release the operated HG-0/9 and LG-0/11 relays in the line link frame.

12.96 Release of the Selection of the Connecting Path Functions

12.961 Release of the Trunk Link and Connector MP, MC, MCA, MCB, MCC and MCD Relays

The release of the TLC-1 relay will release the trunk link and connector MP, MCA, MCB, MCC and MCD relays. The release of the MP relay will release the trunk link frame MC relay.

12.962 Release of the TFK-3 MAK-1 and MDK Relays

The release of the trunk link and connector MP relay will release the TFK-3 relay. The release of the trunk link and connector MCA relay will release the MAK-1 relay and the release of the trunk link and connector MCD relay will release the MDK relay.

12.963 Release of the Trunk Link and Connector LV-2/9, and LC-0/9 Relays and the Release of the Marker LCK Relay

The release of the trunk link and connector circuit FB- relay will release the operated LV-2/9 and LC-0/9 relays. The release of the LC-0/9 relay in the trunk link and connector circuit will release the marker LCK relay.

12.964 Release of the STF, PR, 2TLF/10TLF, 20F, 40F, 7Q, RQ, PNR, PA, PB, PC, P-0/9, 2G, 3G, TCH-0/9, TCHK, JG-0/4 and JCK-0/1 Relays

The release of the TLC-3 relay will release the STF or PR relay and the operated 2TLF/10TLF relay. The release of the operated 2/10TLF and if required the STF or PR relay will release the 20F or 40F relay. The release of the operated 2/10TLF relay will release the 7Q or RQ relay, if operated.

The release of the ONW and LLC-1 relays will release the STP-1 or STP-2 relay which will release the PNR, PA, PB or PC relay. The release of the operated, PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the trunk link frame MCC relay will release the operated P-0/9 relay which will in turn release the 2G or 3G relay, if operated.

The release of the LLC-2 relay will release the JG-0/4 relay. The release of the trunk link frame MCB relay will release the JCK-0/1 relays.

12.965 Release of the Marker RK and LK Relays and the Trunk Link and Connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER Relays

The release of the MCC relay in the trunk link and connector will release the marker RK or LK relay.

The release of the marker JG-0/4 relay will release the G-0/4, RF, EF, JC-0/19, L, R, EL and ER relays.

12.966 Release of the Trunk Link and Connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER Relays

The release of the marker JG-0/4 relay will release the G-0/4, RF, EF JC-0/19, L, R, EL and ER Relays.

12.967 Release of the TLL-0/9, TJ-0/9, TTL-0/9, TK, CHT, CH-0/9 and CHA Relays

The release of the line link frame HG-0/9 relay will release the TLL-0/9 relays. The release of the trunk link frame MCB relay will release the TJ-0/9 relays. The release of the trunk link frame LC-0/9 relay will release the TTL-0/9 relays.

The release of the LLC-1 relay will release the CH-0/9 and CHA relays. The release of the LLC-2 relay will release the HMS-1 relay which in turn will release the TK relay which will release the CHT relay.

12.97 Release of the Setting Up the Selected Connecting Path

12.971 Release of the Line Link and Trunk Link Frame Select Magnets

The operation of the CT-1 relay will release the ONX relay which in turn will release the operated select magnets on the line link frame line and junctor switches and on the trunk link frame junctor and trunk switches.

12.972 Release of the HMS-1, FBK, SL, LB-0/9, LTR, GLH and GLH-1 Relays

The release of the LLC2 relay will release the HMS-1 relay. The release of the trunk link frame FB-relay will release the SL relay which in turn will release the LTR relay. The release of the SL relay will also release the GLH relay which will release the GLH-1 relay. The release of the line link frame HG-0/9 relay will release the LB-0/9 relays. The release of the trunk link frame FB-relay will release the FBK relay.

12.973 Release of the CON, CON-1, CON-3, GT-1, GT-2, and DCT-1 Relays

The operation of the GT-2 relay will release the CON and CON-3 relays. The release of the LLC-1 relay will release the CON-1 relay which in turn will release the GT-1 and GT-2 relays. The release of the CKG-4 relay will release the DCT-1 relay.

13. TERMINATING CALL, ASSOCIATED WITH AN INCOMING TANDEM OR INTERTOLL TRUNK

The marker when assisting the completion of a terminating call associated with an incoming tandem or intertoll trunk performs or assists in the performance of eight major functions as follows:

(a) Registration of information from the incoming register which the marker requires in assisting a terminating call.

(b) The identification of the call or connection which the marker will assist.

(c) The identification of the location of the called subscriber line.

(d) The called subscriber line busy test.

(e) The selection of an idle connecting path between the called subscriber line and the incoming trunk associated with this terminating call.

(f) Connecting the called subscriber line to the incoming trunk through the selected connecting path.

(g) Setting up the selected ringing code.

(h) Release of the marker and associated circuits after the marker has completed the terminating call functions.

The marker operations when assisting a terminating call associated with a tandem or intertoll incoming trunk is similar to the marker operations when assisting a terminating call associated with a non-tandem or non-intertoll incoming trunk, as described in paragraph 12. However, for a terminating call associated with a tandem or intertoll trunk the marker must register and translate the called office code digits so as to determine if the call associated with the tandem or intertoll trunk is to terminate in this office or will be extended through this office to a distant office. For a terminating call associated with a non-tandem or non-intertoll incoming trunk, as described in paragraph 12, it was not necessary to register or to translate the called office code in the marker since any call associated with a non-tandem or non-intertoll incoming trunk will terminate in this office.

13.1 Seizure of the Marker by the Incoming Register

The incoming tandem or intertoll trunk recognizes a seizure by a remote office which wishes to complete a call. The incoming tandem or intertoll trunk connects to an incoming register through the incoming register link. The distant office transmits the called office code and numerical digits to the incoming register. The incoming register records the digits from the remote office, records the trunk link frame number associated with the incoming tandem or intertoll trunk so that the marker can connect to the incoming trunk, and then the incoming register connects to a marker through an incoming register marker connector.

The seizure of the marker by the incoming register for a terminating call associated with a tandem or intertoll incoming trunk is similar to the seizure of the marker by the incoming register for a terminating call associated with a non-tandem or non-intertoll incoming trunk, as described in paragraph 12.1.

13.2 Registration of Information From the Incoming Register

After the seizure of the marker the office code and the numerical digits of the called line and the identification of the trunk link frame with which the incoming tandem or intertoll trunk is associated will be transferred from the incoming register to the marker circuit.

13.21 Office Code and Number of Called Line

The office code of the called line will be transmitted from the incoming register to the marker where a group of register relays will be operated to indicate the office code. The particular register relays in the marker which will be required will be determined by the local area codes and the type of toll translation if required.

The operation of two of the AC-0/7 relays will record the identification of the first digit of the office code of the called subscribers number. Two of the BC-0/7 and CC-0/7 relays will be operated to record the second and third digits of the called number, if necessary.

13.211 Operation of the AC-0/7, BC-0/7 and CC-0/7 Relays

The incoming register marker connector will extend a group of leads designated "A-0/7" from the incoming register to the marker. Ground potential placed on the "A-0/7" leads by the incoming register will operate two of the AC-0/7 relays in the marker. The operation of two of the AC-0/7 relays will identify the first digit received. The incoming register will also extend groups of leads designated "B-0/7" and "C-0/7" from the incoming register to the marker. Ground potential placed on the "B-0/7" and "C-0/7" leads by the incoming register will operate two of the BC-0/7 relays, if provided, and two of the CC-0/7 relays, if provided.

13.212 Identification of the Numericals of the Called Line

The operation of the incoming register marker connector will extend a number of groups of leads designated "B-0/7", "C-0/7", "D-0/7" if only four numericals are to be received these leads will be used to operate the HN-0/7, T-0/7 and U-0/7 relays, the "A-0/7" lead will be used to operate the TH-0/7 relay. If additional digits are required to determine the directory number series of the called subscriber it may be necessary for the register to extend a number of groups of leads designated "E-0/7" and were required "F-0/7" and "G-0/7" leads. The incoming register will place ground on two leads of each group of leads to identify the digits. These grounded leads will later be used to operate the TH-0/7, HN-0/7, T-0/7 and U-0/7 relays to identify the numericals of the called line.

13.22 Identification of the Trunk Link Frame Associated With the Incoming Intertoll or Tandem Trunk and the Operation of the FG-0/1 and TF-0/7 Relays

The operation of the FG-0/1 and TF-0/7 relays for this terminating call is similar to the operation of the FG-0/1 and TF-0/7 relays as described in paragraph 12.22.

13.3 Identification of the Basic Call or Connection

To identify this call as a terminating call associated with a tandem or intertoll incoming trunk the tandem TAN or intertoll TOL relay and the terminating class TER-1/4 relays will be operated in the marker. The operation of the LPA, LPB, LTA or LTB relay will operate the terminating class TER-1/4 relays which will initiate the marker functions required for completing a terminating call associated with a tandem or intertoll trunk.

To determine if this call is to be terminated within this office or if the call is to be extended to a distant office the marker will examine the office code of the called subscriber directory number. The called subscriber office code has been recorded in the marker on a "two-out-of-five" relay basis on the AC-0/7 relays and if provided the BC-0/7 and CC-0/7 relays.

"A" digit translation can be achieved by using the AT-2/9, TA-2/9, or 2DT-2/9 relays, whichever is required. The AT-2/9 relays are used for "A" digit translation in both toll and tandem calls. The TA-2/9 relays are used to translate the "A" digit employed on toll calls in cases where the "A" digit for a toll call might conflict with the "A" digit for a tandem or local translation call. The 2DT-2/9 relays are used to translate the "A" digit in calls where "2DT" translation is required. The "B" digit translation is accomplished by using the BT-20/99 relays. The marker will place ground on the "code point" associated with the directory numbers for this call.

13.31 Operation of TC-5/7 Relay

When this terminating call is associated with a tandem incoming trunk ground will be extended over the "LT" lead from the incoming register to operate the TC-5/7 relay in a manner similar to the operation of the TC-5/7 relay for an intra-office call as described in paragraph 8.031. However, when this terminating call is associated with an intertoll incoming trunk ground will be extended over the "TT" lead from the incoming register to operate the TC-5/7 relay. Usually the ground on the "TT" lead will be extended to operate the same TC-5/7 relay as is operated when the "LT" lead is grounded. However, under certain conditions the "TT" cross-connection terminal may be cross-connected to one of the "TC-5/7" cross-connection terminals such as to operate some other TC-5/7 relay. In calls when "2DT" translation is required the TC-6 relay will be operated similar to the TC-6 relay in the terminating call associated with a non-tandem, non-intertoll incoming trunk, as described in paragraph 12.33.

13.32 Operation of the AT-2/9, TA-2/9, or 2DT-2/9 Relay

The AT-2/9 relay will be operated in a manner similar to the operation of the

AT-2/9 relay for an intra-office call, as described in paragraph 8.032.

The TA-2/9 relay will be operated when the "A" digit for a terminating intertoll call may conflict with the "A" digit for a terminating tandem call. Ground will be extended from the incoming register to the marker on the "LT" or local translation lead to operate the TC-5/7 relay for a terminating tandem call. However, on a terminating intertoll call ground will be extended from the incoming register to the marker on the "TT" or toll translation lead to operate the TC-5/7 relay. In general the operation of the TC-5/7 relay will operate one of the AT-2/9 relays, except in the case that the "A" digit for a terminating intertoll call might conflict with the "A" digit for a terminating tandem call. Where the "A" digit for a tandem call may conflict with the "A" digit for a intertoll terminating call, ground on the "TT" or toll translation lead will operate the TC-7 relay, which in turn will operate one of the TA-2/9 relays. Translation will be continued as explained for the intra-office call, paragraph 8.032.

The 2DT-2/9 relay will be operated in a manner similar to the operation of the 2DT-2/9 relay for terminating call associated with a non-tandem, non-intertoll incoming trunk, as described in paragraph 12.33.

13.33 Operation of BT-20/99 Relay

The BT-20/99 relay will be operated in a manner similar to the operation of the BT-20/99 relay for an intra-office call, as described in paragraph 8.032, except for calls in which the TA-2/9 relay is operated, the TA-2/9 relay instead of the AT-2/9 relay will initiate the operation of the BT-20/99 relay.

The BT-20/99 relay will not be operated when the 2DT-2/9 relay is operated since only two identifying digits have been received.

13.34 Operation of the LPA, LPB, LTA or LTB Relay

The LPA, LPB, LTA or LTB relay will be operated in a manner similar to the operation of the LPA, LPB, LTA or LTB relay for an intra-office call, as described in paragraph 8.034. However, in calls where "2DT" translation is required the LPA, LPB, LTA or LTB will be operated similarily to the operation of the LPA, LPB, LTA or LTB relay for the terminating call associated with a non-tandem, non-intertoll incoming trunk, as described in paragraph 12.33.

13.35 Operation of the TAN or TOL Relay

The TAN and TOL relay windings will be extended over the "TAN" or "TOL" leads through the incoming register marker connector to the incoming register circuit. If the incoming register has been informed that the incoming trunk is a tandem incoming trunk, the incoming register will place ground potential on the "TAN" lead to operate the marker TAN relay. However, if the incoming register has been informed that the incoming trunk is an intertoll incoming trunk the incoming register will place ground potential on the "TOL" lead to operate the marker TOL relay.

13.36 Operation of the TER-1/4 Relays

The operation of the LPA, LPB, LTA or LTB relay with the TAN or TOL relay operated will operate the TER-1/3 relays. The windings of the TER-1/3 relays are in series with each other and the operating path will be extended thru the operated LPA, LPB, LTA or LTB relay contacts through the operated TAN or TOL relay contacts through the non-operated RTST and LR relay contacts through the non-operated TR2E relay contacts to the "TRK" lead which is extended to the incoming register marker connector circuit where the "TRK" lead will be grounded. The operation of the TER-2 relay will operate the TER-4 relay.

13.4 Identification of the Location of the Called Line

The identification of the location of the called line for this terminating call is similar to the identification of the location of the called line for a terminating call associated with a non-tandem and non-intertoll incoming trunk, as described in paragraph 12.4.

13.5 Called Line Busy Test

The called line busy test for this terminating call is similar to the called line busy test for a terminating call associated with a non-tandem and non-intertoll incoming trunk, as described in paragraph 12.5.

13.6 Selection of the Connecting Path

The selection of the connecting path for this terminating call is similar to the selection of the connecting path for a terminating call associated with a non-tandem and non-intertoll incoming trunk, as described in paragraph 12.6. However, in this call either the LCH or TCH relay can be operated. The operation of the TCK relay will be initiated with the operation of either the LCH or TCH relays.

13.7 Setting Up the Connecting Path

The setting up the connecting path for this terminating call is similar to the setting up the connecting path for a terminating call associated with a non-tandem and non-intertoll incoming trunk, as described in paragraph 12.7.

13.8 Setting Up the Selected Ring Code

The setting up the selected ringing code for this terminating call is similar to the setting up the selected ringing code for a terminating call associated with a non-tandem and non-intertoll incoming trunk, as described in paragraph 12.8.

13.9 Release of the Marker and Associated Circuits

The release of the marker and associated circuits for this terminating call is similar to the release of the marker and associated circuit for a terminating call associated with a non-tandem and non-intertoll incoming trunk, as described in paragraph 12.9. However, in this call the release of the incoming register marker connector will release either the TAN or TOL relays instead of the INC relay. The release of the TC-5/7 relay will release the AT-2/9, TA-2/9, or 2DT-2/9 relay, whichever is operated. The release of AT-2/9 or TA-2/9 relay will release the BT-20/99 relay, if operated.

14. TANDEM CALL, NON-INTERTOLL

The detailed description of the marker operations in assisting this tandem call is for a tandem call in which an outgoing sender is required. However, the marker operations in assisting a tandem call in which an outgoing sender is not required is similar, except that the marker does not perform the functions of selecting and connecting an outgoing sender to the marker and to the selected outgoing trunk circuit as described in paragraph 14.4.

The marker when assisting the completion of a tandem call which requires an outgoing sender circuit and which is associated with an incoming tandem trunk performs or assists in the performance of eight major functions as follows.

(a) Registration of information from the incoming register which the marker requires in assisting a tandem call.

(b) The identification of the call or connection which the marker will assist.

(c) The identification of the location of the termination on the line link frame of the incoming tandem trunk circuit.

(d) Selection and Connection of an Outgoing Sender.

(e) The selection of an available idle outgoing trunk circuit.

(f) The selection of an idle connecting path between the selected outgoing trunk circuit and the incoming tandem trunk circuit associated with this tandem call.

(g) Connecting the selected outgoing trunk circuit to the incoming tandem trunk circuit through the selected connecting path.

(h) Release of the marker and associated circuits after the marker has completed the tandem call functions.

Since an incoming tandem trunk may be associated with a terminating call which will terminate within this office, as described in paragraph 13, or with a tandem call which will be extended thru this office to a distant office, it is necessary for the marker circuit to register and translate the called office code digits so as to determine if the call is to terminate in this office or will be extended through this office to a distant office.

An incoming tandem trunk is arranged so as to terminate on either the trunk link frame or on the line link frame. For any particular call the incoming tandem trunk will operate the proper relays to connect to either the trunk link frame or to the line link frame. If the marker determines that the call associated with the incoming tandem trunk is to be terminated within this office, the incoming tandem trunk relays will be operated to connect this trunk to the trunk link frame. A connecting path will then be established between the incoming tandem trunk which terminates on the trunk link frame and the subscriber line which terminates on the line link frame. This type of connection has been described in paragraph 13.

If the marker determines that the call associated with the incoming tandem trunk is to be extended to a distant office, the incoming tandem trunk relays will be operated to connect this trunk to the line link frame. A connecting path will then be established between the incoming tandem trunk which terminates on the line link frame and the outgoing trunk which terminates on the trunk link frame.

14.1 Seizure of the Marker By the Incoming Register

The incoming tandem trunk recognizes a seizure by a remote office which wishes to complete a call. The incoming tandem trunk connects to an incoming register through the incoming register link. The distant office transmits the called office code and numerical digits to the incoming register. The incoming register records the digits from the remote office, records the trunk number of the incoming tandem trunk associated with this tandem call so that the marker can connect to the incoming tandem trunk, and then the incoming register connects to a marker through an incoming register marker connector.

The seizure of the marker by the incoming register for a tandem call is similar to the seizure of the marker by the incoming register for a terminating call, as described in paragraph 12.1.

14.2 Registration of Information From the Incoming Register

After the seizure of the marker, the office code and the numerical digits of the called line and the trunk number to identify the incoming tandem trunk will be transferred from the incoming register to the marker circuit.

The marker will determine from the office code digits that this call is a tandem call. After an outgoing sender has been selected and seized the marker will transmit to the outgoing sender the office code and numericals of the called number.

14.21 Office Code and Number of Called Line

The office code of the called line will be transmitted from the incoming register to the marker where a group of register relays will be operated to indicate the office code. The particular register relays in the marker which will be required will be determined by the local area codes.

A group of register relays AC-0/7 which will record the first digit of the office code of the called subscriber number and if necessary a group of register relays BC-0/7 and CC-0/7 are provided to record the second and third digits.

14.211 Operation of AC-0/7, BC-0/7 and CC-0/7 Relays

The operation of the incoming register marker connector will extend a group of leads designated "A-0/7", "B-0/7" and "C-0/7" from the incoming register to the marker. The incoming register will place ground potential on two of the "A-0/7" leads to identify the first digit, on two of the "B-0/7" leads to identify the second digit and on two of the "C-0/7" leads to identify the third digit. Therefore, two AC-0/7 relays will be operated and if provided two BC-0/7 relays and two CC-0/7 relays will be operated.

14.212 Identification of the Numericals of the Called Line

The operation of the incoming register marker connector will extend a number of groups of leads designated "B-0/7", "C-0/7", "D-0/7", "E-0/7" and where required, "F-0/7" and "G-0/7" from the incoming register to the marker. The incoming register will place ground on two leads of each group of leads to identify the digits.

14.22 Registration of the Tandem Incoming Trunk Number

The tandem incoming trunk will be identified by the three digit number which has been assigned to this particular trunk circuit. The incoming register will transmit this trunk number to the marker over three groups of leads. Two leads of the group of "HT-0/7" leads will be grounded to indicate the hundreds digit of the trunk number, two leads of a group of "TT-0/7" leads will be grounded to indicate the tens digit and two leads of a group of "UT-0/7" leads will be grounded to indicate the units digit. These grounded leads will later be used to operate the HN-0/7, T-0/7 and U-0/7 relays to identify the digits of the trunk number.

14.3 Identification of the Basic Call or Connection

To determine if this call is to be terminated within this office or if the call is to be extended to a distant office the marker will examine the office code of the called subscriber directory number. The called subscriber office code has been recorded in the marker on a "two-out-of-five" relay basis on the AC-0/7 relays and if provided the BC-0/7 and CC-0/7 relays.

"A" digit translation can be achieved by using the AT-2/9 relays or the 2DT-2/9, whichever is required. Generally, the AT-2/9 relays are used for "A" digit translation. The 2DT-2/9 relays are used to translate the "A" digit in calls where "2DT" translation is required. The "B" digit translation if required is accomplished by using the BT-20/99 relays.

Ground is then placed on the "code point" representing the directing digits for this call.

14.31 Operation of the TC-5/7 Relay

The operation of the TC-5/7 relay for a tandem call is similar to the operation of the TC-5/7 relay for an intra-office call, as described in paragraph 8.031. However, the "LT" lead is grounded by the incoming register instead of by the originating register circuit. In calls where "2DT" translation is required the TC-6 relay will be operated in a similar manner to the description for the terminating call associated with a non-tandem, non-intertoll incoming trunk paragraph 12.33.

14.32 Operation of the AT-2/9 or 2DT-2/9 Relay

The AT-2/9 relay if required will be operated in a manner similar to the operation of the AT-2/9 relay for an intra-office call, as described in paragraph 8.032.

The 2DT-2/9 relay will be operated in a manner similar to the operation of the 2DT-2/9 relay for terminating call associated with a non-tandem, non-intertoll incoming trunk, as described in paragraph 12.33.

14.33 Operation of BT-20/99 Relay

The BT-20/99 relay will be operated in a manner similar to the operation of the BT-20/99 relay for an intra-office call, as described in paragraph 8.032.

The BT-20/99 relay will not be operated when the 2DT-2/9 relay is operated since only two identifying digits have been received.

14.34 Operation of the TAN and S-00/44 or S-100/144 and PSA or PSB and PSA-0/1 or PSB-0/1 Relays in Offices where only one Trunk Group Class is provided

In offices where only one trunk group class is provided the TAN relay winding will be extended over the "TAN" lead through the incoming register marker connector to the incoming register circuit. If the incoming register has been informed that the incoming trunk is a tandem incoming trunk the incoming register will place ground potential on the "TAN" lead to operate the TAN relay.

The operation of the TAN relay will in turn operate the S-00/44 or S-100/144 class of service relay associated with a tandem call. The operation of the TAN relay will extend ground potential to the "SWTA" cross-connection terminal of figure 43. The "SWTA" cross-connection terminal will be cross-connected to the "SWC-0/29" cross-connection terminal associated with the class of service of a tandem call. Each "SWC-0/29" cross-connection terminal associated with a class of service from which a class of service indication is required will be cross-connected to one or more "SW-00/44", "SW-100/144" cross-connection terminal or terminals. Therefore, the one or more S-00/44, S-100/144 relay associated with the class of service of a tandem call will be operated.

In certain cross-connection fields it may be desirable to operate the presort relays in addition to the S- relays. The presort PSA or PSB relay will be operated in series with the S- relay. The operation of the PSA or PSB relay will in turn operate the respective PSA-0/1 or PSB-0/1 relays. The operation of the presort relays is similar to the description for the intra-office call, paragraph 8.0212.

14.35 Operation of the TAN-0A/D, TAN-1A/D, TAN-2A/D, TAN-3A/D, or TAN-4A/D and TAN Relays in Offices where Two or More Trunk Group Classes are Provided (Tandem Screening Feature)

In offices where two or more trunk group classes are provided to identify incoming trunk groups, the tandem screening feature is used to provide different tandem class treatment. Tandem screening relays provide features similar to subscriber service treatment S- relays, except the tandem screening relays identify the class of service of the incoming trunks. The particular routing is determined by the directing digits of the call. Where tandem screening is provided route or denied access treatment for the office code is obtained from the operation of the tandem class relays (TAN-A/D) instead of the S-, or PSA-0/1 or PSB-0/1 relays as described in paragraph 14.34.

The tandem screening feature provides for a maximum of five different treatments for a tandem class, one treatment for a toll class, and one treatment for an originating class. The differentiation between different tandem trunk classes in addition to one general toll class of service provides means for establishing or denying access to routes for the different classes. Tandem screening also provides a feature to reorder a thru tandem call which comes in over a trunk group marked incoming.

The tandem screening feature is used to provide individual treatment for different trunk groups from the same or different outlying offices. As an example, this individual treatment would be necessary in cases where the outlying office or offices absorb the first directing digit of the dialed number. In this case it would be necessary to differentiate between calls where the first digits of a directing code were different and the second and the third digits are the same. Therefore, the remaining directing digits would be the same and yet each call might require different treatment. Consequently, each trunk group, whether from the same or different offices must operate different tandem screening relays to insure that the calls receive the proper treatment. This treatment could allow the call to progress to its ultimate destination, deny routing and return reorder, or deny routing and divert the call to an operator. By denying access to a route, tandem screening prevents intentional misdialing, dialing a vacant code, or dialing a denied route.

In offices where the tandem screening feature is provided the incoming trunk group will inform the register of the proper tandem screening class. When the proper class has been identified the incoming register will extend ground potential through the incoming register marker connector to ground one of the "TAN-0/4" leads in the marker. Ground on a "TAN-0/4" lead in the marker will operate the associated TAN-0A, TAN-1A, TAN-2A, TAN-3A, or TAN-4A relay. If additional service treatment points are needed the TAN-0A/0D, TAN-1A/1D, TAN-2A/2D, TAN-3A/3D, or TAN-4A/4D, relays will be operated; the aforementioned relays will be operated in parallel with the TAN-PA/4A relay windings. Therefore the one or more tandem screening relays TAN-0A-0D/4A-4D associated with the class of the incoming trunk group will be operated.

The operation of the TAN-0A/4A relay will operate the TAN relay.

14.36 Operation of the R- Relay

In offices where the tandem screening feature is not equipped (single tandem class mark) the code point or code points associated with the office code or codes of the called subscriber will be cross-connected so as to operate a route R- relay associated with the called office route. The route R- relay is operated when the code point is grounded by the operation of the code digit register relays and the translator relays, with the S- relays, or if provided the PSA-0/1 or PSB-0/1 relays associated with the tandem class of service operated. The cross-connection terminals which are used as local area code points are described in Paragraph 8.034, except that for a tandem call, non-intertoll the PSA and PSB relays will not be operated.

In offices where the foreign area translation feature is provided, and the code point associated with the call requires foreign area translation, the R- relay will be operated in a manner similar to the description in Paragraphs 11.31 and 11.342. However, the TAN class mark will be received instead of the OR class mark.

In offices where the tandem screening feature is equipped the code point or code points associated with the office code or codes of the called subscriber will be cross-connected so as to operate a route R- relay associated with the called office route. The route R- relay is operated when the code point is grounded by the operation of the code digit register relays and the translator relays, with one or more of the tandem screening TAN- relays operated. The operation of the TAN- relays extends the winding of the route R- relay between the "TSC-" and "TS-" cross-connection terminals. The "TSC-" cross-connection terminals are used when tandem screening is provided and are similar to the "SC-" cross-connection terminals associated with the identification of the subscriber or tandem class of service and can be cross-connected in the same manner. The "TS-" cross-connection terminals, used with tandem screening are similar to the "S-" cross-connection terminals associated with the "S-" relays and can be cross-connected in a similar manner.

The "PSC-" cross-connection terminals of the presort relays are similar to the "SC-" cross-connection terminals and can be cross-connected in a similar manner. The "PSA-" or "PSB-" cross-connection terminals of the presort relays are similar to the "S-" cross-connection terminals and can be cross-connected in a similar manner.

The "TSC-" and "TS-" cross-connection terminals, the "PSC-" and "PSA-" or "PSB-" cross-connection terminals, or the "SC-" and "S-" cross-connection terminals can be located either on the battery or the ground potential side of the R- relay. The only limitation for the connection of the aforementioned cross-connections terminals is to provide proper routing information.

Before the marker can proceed to select an outgoing trunk associated with the called office and a connecting channel between the incoming tandem trunk and the outgoing trunk the marker must determine the route and type of equipment which can provide the proper service. The operation of the class of service S-00/44, S-100/144, TAN-0A-0D/4A, or PSA-0/1 or PSB-0/1, relay or relays associated with the class of service of this tandem call will select the particular route R- relays which is required from among the route R- relays associated with the called office.

An example of the cross-connections necessary to operate the route R- relay in a typical office, is as follows:

The operation of the CKG1 relay, the TAN relay, and the AC-0/7 relays and where required the BC-0/7, the CC-0/7, the AT-2/9, the BT-20/99 and the 2DT-2/9 relays will place ground potential on the code point. The code point cross-connection terminal will be cross-connected to the associated "RC" cross-connection terminals of Figure 51 thereby extending the ground from the code point cross-connection terminal through the winding of the route R- relay to the associated "R-" cross-connection terminal of Figure 51. The "R-" cross-connection terminal will be cross-connected to the associated "SC-" cross-connection terminals of Figure 61 or to the "TSC-" cross-connection terminals of figure 110 or 112, or to the "PSC-" cross-connection terminals of Figure 135. The operation of the class of service S-00/44 or S-100/144 relay or the tandem screening TAN-0A-0D/4A-4D relay will extend the operating path of the route R- relay to the associated "S-" cross-connection terminal of Figure 61 or "TS-" cross-connection terminal of Figure 110, 111, 112 or 113, or to the "PSA-" or "PSB-" cross-connection terminals of Figure 135.

The "S-," "TS-," or "PSA-" or "PSB-" cross-connection terminal will generally be cross-connected to the "NN" cross-connection terminal of Figure 53 thereby operating the route R- relay and the NCNC relay in a series operating circuit. The "S-," "TS-," or "PSA-" or "PSB-" cross-connection terminal could be cross-connected to any of the route series relay cross-connection terminals as described for the intra-office call paragraph 8.034.

The operation of a route R- relay associated with a tandem call will direct the marker to perform the functions required for a tandem call.

14.4 Selection and Connection of an Outgoing Sender

The operation of the route R- relay associated with this tandem call directs the marker to a sender group of the proper type of senders. The marker will test to determine if there is an idle and available sender. The marker will select and seize one of the idle and available senders to assist this tandem call.

14.41 Outgoing Sender Subgroup Selection

The operation of the route R- relay associated with this tandem call will select the outgoing trunks of the required route and will also select the outgoing sender group which is associated with the outgoing senders which have access to these outgoing trunks. After the marker had identified the outgoing sender group the marker will test the two sender subgroups within the sender group to determine which sender subgroup is associated with available senders.

14.411 Operation of the OSG-0/4 and OSA-0/4 Relays

The operation of the route R- relay of Figure 51 associated with this tandem call has extended ground to the associated "OS" cross-connection terminal when the GS-1/5, RCY, LR and RTST relays are non-operated. The "OS" cross-connection terminal is connected to the associated "OSC" cross-connection terminal of Figure 70 thereby operating the OSG-0/4 and OSA-0/4 relays.

14.412 Operation of the OGC, OSC, TOG-1/3, SON, GOS and TGS-1/3 Relays

The operation of the OSG-0/4 relay will operate the OGC, OSC, TOG-1/3 and SON relays to direct the marker to perform the functions required in assisting a tandem call requiring a sender.

The operation of the OSG-0/4 relay with the RTST and DCK relays non-operated and the CKG-6 relay operated will operate the outgoing call OGC relay. With the MRL-1 relay and the RSC relay non-operated the operating path of the OGC relay will be extended to operate the outgoing sender call OSC relay.

The windings of the TOG-3 relay, the TOG-2 relay, and the TOG-1 relay are in series with each other and the operating path will be extended through the operated OSG-0/4 relay, through the operated TAN relay, through the RTST relay and the LR relays non-operated, through the non-operated TR2E relay and over the "TRK" lead to the incoming register marker connector circuit where the "TRK" lead is grounded by the incoming register marker connector.

The operation of the OSG-0/4 relay will operate the SON relay which in turn will operate the GOS relay with the OSE and OSK relays non-operated.

The operation of the OGC relay with the OST-2 and RSC relays non-operated will operate the transmitting ground supply TGS-1/2 relays. In offices equipped for two and three digit code conversion, the TGS3 relay of Figure 119 will also be operated when the OGC relay operates with the OST-2 and RSC relays non-operated.

14.413 Operation of the SIA, SIB, GBA and GBB Relays

The operation of the SIA, SIB, GBA and GBB relays for a tandem call is similar to the operation of the SIA, SIB, GBA and GBB relays for a subscriber outgoing call, as described in Paragraph 11.413.

14.414 Operation of the Outgoing Sender Connector MP Relay

The operation of the outgoing sender connector MP relay for a tandem call is similar to the operation of the outgoing sender connector MP relay for a subscriber outgoing call, as described in Paragraph 11.414.

14.415 Operation of the SKA or SKB and the SKA-1 or SKB-1 Relays

The operation of the SKA or SKB and the SKA-1 or SKB-1 relays for a tandem call is similar to the operation for a subscriber outgoing call, as described in Paragraph 11.415.

14.42 Outgoing Sender Selection

The outgoing sender selection for a tandem call is similar to the outgoing sender selection for a subscriber outgoing call, as described in Paragraph 11.42.

14.43 Marker Connection to the Selected Outgoing Sender

The marker connection to the selected outgoing sender for a tandem call is similar to the marker connection to the selected outgoing call, as described in paragraph 11.43.

14.44 Transfer of Information From Marker to Outgoing Sender

The transfer of information from the marker to outgoing sender for a tandem call is similar to the transfer of information from the marker to outgoing sender for a subscriber outgoing call, as described in Paragraph 11.44.

14.45 Outgoing Sender Connection to Outgoing Trunk

The outgoing sender connection to the outgoing tandem trunk for a tandem call is similar to the outgoing sender connection to the outgoing trunk for a subscriber outgoing call, as described in Paragraph 11.45.

14.46 Release of the Outgoing Sender Connector

The release of the outgoing sender connector for a tandem call is similar to the release of the outgoing sender connector for a subscriber outgoing call, as described in Paragraph 11.46.

14.5 Identification of the Location of the Incoming Tandem Trunk on the Line Link Frame

The marker will select and seize a number group circuit and transmit the trunk number, which consists of three digits, to the number group. The number group circuit will translate the trunk number into line link frame location in terms of the line link frame number, vertical group, horizontal group and vertical file with which the line link frame termination of the incoming tandem trunk is associated. The number group will then transmit this line link frame location information to the marker.

14.51 Selection and Connection to the Number Group

After the marker has selected and seized the outgoing sender connector and the preferred trunk link frame, the marker will select and seize the number group circuit. As an indication that the marker has selected and seized the trunk link frame the TFK-1 relay will be operated.

There will be two number groups equipped to translate trunk numbers. One will be designated the odd number group circuit and the other the even number group circuit. Both of these number group circuits will be equipped to translate all trunk numbers. Two number groups to provide trunk number translation have been provided as a safety precaution.

The two number groups equipped to translate trunk numbers may be either special number groups provided for this service or the two number groups may be two of the number groups which are also used for translating the called subscriber directory number. If the two number groups are also used for translating the called subscriber directory number, certain numbers within each number group, will be assigned for trunk number translation.

14.511 Operation of the FLG, FLG-1, NGC, SNG-1/2, LLI, VGL-1/2, HGL-1, VFL-1, UC and CBF Relays

To initiate the identification of the location of the incoming tandem trunk the first linkage FLG and FLG-1 relays, the seize number group SNG-1/2 relay and the number group control NGC relay will be operated. The operation of the TOG-2 relay with the CKG-3 relay operated and the LK-1 relay non-operated will operate the FLG relay. With the RCY and TNR relay non-operated the operating ground of the FLG relay will be extended to operate the FLG-1 relay. The operation of the FLG-1 relay with the RNG relay non-operated will operate the number group control NGC relay.

The operation of the FLG relay will operate the SNG-1/2 relays when the TNR, RNG, PUL, RCY-2, CKO and MRL-1 relays are non-operated.

The operation of the FLG-1 relay with the PUL and CKO relay non-operated will operate the lock line identification LLI relay. The operation of the FLG relay will operate the VGL-1/2, HGL-1, VFL-1 and CBF relays. The operation of the SNG-1 relay with the CKO relay non-operated will operate the UC relay.

14.512 Operation of the TRN, TRN-1, OCN or ECN, HN-0/7, T-0/7 and U-0/7

The digits of the trunk number of the incoming tandem trunk will be identified in the marker by the operation of two of the hundreds digit HN-0/7 relays, by the operation of two of the tens digit T-0/7 relays and by the operation of two of the units digit U-0/7 relays.

To indicate that a trunk number translation is required the TRN and TRN-1 relays will be operated. The operation of the TOG-3 relay with the NR relay non-operated and the CKG-1 relay operated will operate the TRN relay which in turn will operate the TRN-1 relay.

To indicate whether the odd or the even number group circuit associated with trunk number translation is to be seized the "OCN" or the "ECN" lead from the incoming register connector circuit will be grounded thereby operating in the marker the odd connector OCN or even connector ECN relay when the TRN relay is operated.

The operation of the TRN and TRN-1 relays will extend the operating path of the HN-0/7, T-0/7 and U-0/7 relays to the "HT-0/7," "TT-0/7" and "UT-0/7" leads which are extended to the incoming register marker connector and then to the incoming register circuit. The "HT-0/7," "TT-0/7" and "UT-0/7"

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leads have been grounded as described in paragraph 14.22, thereby operating two HN-0/7, two T-0/7 and two U-0/7 relays to identify the trunk number of this incoming tandem trunk.

14.513 Operation of the MP, MCA, MCB and MCC Relays in the Number Group and the Operation of the NGK and NGK-1 Relays in the Marker

Battery potential is extended through the NGS lamp and the non-operated SP relay contacts over the "NGS" lead and through the operated TLC-1 relay contacts over the "NGS" lead and through the operated TFK-1 relay contacts over the "NGS" lead and through the operated SNG-2 relay contacts over the "NGS" lead and the "TNS" lead, through the non-operated TR-2 relay contacts over the "TR-1" lead, through the non-operated NGP relay contacts over the "TR-1" lead, through the operated OCN relay contacts to the "STB" cross-connection terminals or through the operated ECN relay contacts to the "STA" cross-connection terminal. The "STA" and "STB" cross-connection terminals are either cross-connected directly to the "ST-" leads which extend to the associated number groups or the "STA" and "STB" cross-connection terminals are cross-connected to the associated "ST-" cross-connection terminals of figure 48 which connect to the "ST-" leads which are extended to the number groups. If the number groups associated with trunk number translation are special number group circuits provided only for trunk number translation the "STA" and "STB" should be cross-connected directly to the associated "ST-" lead. If however the number groups associated with trunk number translation are also associated with the translation of subscriber directory numbers the "STA" and "STB" should be cross-connected to the associated "ST-" cross-connection terminal of figure 48. In the number group circuit the battery potential on the "ST-" lead will be extended with the MB-0/1 and TR-0/3 relays non-operated to the winding of the MP relay thereby operating the MP relay associated with this marker in the selected number group.

The operation of the number group MP relay will result in the operation of the number group MCA, MCB and MCC relays which will connect a group of leads from the marker circuit to the number group. The operation of the number group MP relay with the TR-0/3 relay non-operated will operate the number group MCA (bottom) relay.

The operation of the SNG-2 relay in the marker has extended battery potential over the "BS-1/4" leads to the number group circuit. The operation of the number group MCA (bottom) relay will extend the battery potential on the "BS-1/4" leads to operate the number group MCA (top), MCB and MCC relays.

To check in the marker the operation of the number group MCA (bottom) relay the marker NGK relay will be operated. The operation of the number group MCA (bottom) relay will place ground on the "NGK" lead which will be extended to the marker to operate the NGK relay.

To check in the marker the operation of the number group MCA (top) and the MCB relays the marker NGK-1 relay will be operated. The operation of the number group MCA (top) and the MCB relays will place ground on the "W" lead which will be extended to the marker to operate the NGK-1 relay when the marker BN, RI, TBI relays are non-operated and the marker SNG-2 relay is operated.

14.52 Number Group Translation and Marker Identification of the Location of the Incoming Tandem Trunk on the Line Link Frame

The number group translation and marker identification of the termination on the line link frame of the incoming tandem trunk for a tandem call is similar to the number group translation and marker identification of the location of the called line for an intra-office call, as described in paragraph 8.042.

In an intra-office call or a terminating call ringing combination number ten has been used to indicate a PBX line by operating the PBX-1 and PBX-2 relays, as described in paragraph 8.04312. For a tandem call ringing combination number ten is also required. However, when the marker is assisting a tandem call the indication number ten will not operate the PBX-1/2 relays.

14.53 Release of the Number Group

After the line link frame location of the tandem trunk has been recorded in the marker the number group will be released.

14.531 Operation of the RNG and NR Relays and Release of the SNG-1/2, NGC, and TBW Relays in the Marker and the TB-00/99 Relay in the Number Group

The operation of the FTL, FUL, VGL, HGL, VFL and RCL relays with the LLI relay operated will extend ground over the "RNG" lead thru the non-operated OFK, MT-20, FTTB, XFTN, and XFUN relay contacts to operate the release number group RNG relay which in turn will operate the number release NR relay. The operation of the RNG relay will also release the SNG-1/2, NGC, and TBW relays in the marker and the TB-00/99 relay in the number group.

14.532 Release of the TRN, TRN-1, OCN or ECN, HN-0/7, TN-0/7 and U-0/7 Relays

The operation of the NR relay will release the TRN relay which in turn will release the TRN-1 and OCN or ECN relays. The release of the TRN and TRN-1 relays will release the operated HN-0/7, T-0/7 and U-0/7 relays.

14.533 Release of the MP, MCA, MCB and MCC Relays in the Number Group and the Release of the NGK and NGK-1 Relays in the Marker

The release of the SNG-2 relay will release the number group MP relay the MCB relay, the MCC relay, and the MCA (top) relay. The release of the number group MP relay will release the number group MCA (bottom) relay, which in turn will release the marker NGK relay. The release of the SNG-2 relay will also release the NGK-1 relay.

14.534 Release of the HB-0/9, TB-00/99 and U-0/9 Relays in the Number Group and Release of the UK Relay in the Marker

The release of the SNG-2 relay will release the operated HB-0/9, TB-00/99 and U-0/9 relays in the number group. The release of the operated U-0/9 relay in the number group will release the UK relay.

14.535 Release of the FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4 and RCN-1/15 Relays

The release of the SNG-2 relay will release this group of relays.

14.6 Outgoing Tandem Trunk Selection

The outgoing tandem trunk selection for a tandem call is similar to the outgoing trunk selection for an outgoing call, as described in paragraph 11.5.

14.7 Selection of the Connecting Path

The marker operations required for the selection of the connecting path between the line link frame termination of the incoming tandem trunk and the trunk link frame termination of the outgoing tandem trunk is similar to the selection of the connecting path between the calling line and the originating register circuit for a dial tone connection, as described in paragraph 7.41, 7.42, 7.43, 7.44 and 7.45. However, in addition, the marker must first seize the line link frame associated with the incoming tandem trunk before proceeding.

14.71 Seizure of the Line Link Frame

The line link frame associated with the incoming tandem trunk was identified by the number group, as described in paragraph 14.5, by the operation of the FTT-0/3 and FUT-0/9 relays. The location on the line link frame of the termination of the incoming tandem trunk has also been identified by the number group, as described in paragraph 14.5, by the operation of the VGT-0/11, HGT-0/9 and VFT-0/4 relays.

14.711 Seizure of the Line Link Frame and Operation of the Line Link Frame MP, MCA and MCB Relays

The operation of the FTT-0/3 and FUT-0/9 relays will initiate the seizure of the line link frame. Battery potential will be extended through the LFS lamp through the contacts of the non-operated SP relay through the contacts of the operated LLC-1 relay through the contacts of the operated TFK-2 relay through the contacts of the operated PTK relay through the contacts of the operated RCLA relay through the contacts of the non-operated SCB-1 relay and through the one operated FUT-0/9 relay and the one operated FTT-0/3 relay to place battery potential on the one "ST-00/39" lead associated with the line link frame which is to be seized. Battery potential on the "ST-00/39" lead is extended from the marker to the line link frame to operate the associated MP relay in the line link and connector circuit.

The operation of the MP relay with the TR-0/3 relay non-operated will operate the line link and connector MCA (bottom) relay. The operation of the MCA (bottom) relay with the marker LLC-1 relay operated will operate the MCA (top) and the MCB relay in the line link and connector circuit.

14.712 Operation of the VGB-0/11, HG-0/9 and LG-0/13 Relays in the Line Link Frame

In the line link and connector circuit will be one VGB-0/11 relay associated with each vertical group. The operation of the marker circuit VTK-1 relay and the VGT-0/11 relay will place battery potential on the associated "VGB-0/11" lead in the marker. The "VGB-0/11" leads will be extended from the marker to the line link and connector circuit when the line link and connector MCA relay is operated thereby operating the VGB-0/11 relay in the line link frame.

The operation of the HTK-1 relay, the HGT-0/9 relay and the LLC-1 relay will place battery potential on the associated "HG-0/9" lead. The operation of the line link and connector circuit MCA relay will extend the "HG-0/9" leads from the marker to the line link and connector circuit thereby operating the HG-0/9 relay in the line link and connector circuit.

The operation of one VGB-0/11 relay and one HG-0/9 relay will identify the line group and operate the associated line group

LG-0/11 relay in the line link and connector circuit. The operating path for the LG-0/11 relay will be extended through the contacts of the one operated HG-0/9 relay and the one operated VGB-0/11 relay, through the contacts of the operated MCA relay and over the "BS" lead to the marker circuit. In the marker circuit the operation of the HGK relay with the LLC-1 relay operated will place battery potential on the "BS" lead thereby operating the LG-0/11 relay in the line link and connector circuit.

14.72 Selection of the Line Link Group

The selection of the line link group is similar to the selection of the line link group for a dial tone connection, as described in paragraph 7.41.

14.73 Selection of the Junctor Subgroup

The selection of the junctor subgroup will be initialed when the line link frame identification FTT-0/3 and FUT-0/9 relays are operated. The selection of the junctor subgroup is similar to the selection of the junctor subgroup for a dial tone connection, as described in paragraph 7.42.

14.74 Selection of the Trunk Link Group

The selection of the trunk link group is similar to the selection of the trunk link group for a dial tone connection, as described in paragraph 7.43.

14.75 Test and Selection of an Idle Connecting Path

The test and selection of an idle connecting path is similar to the test and selection of an idle connecting path for a dial tone connection, as described in paragraphs 7.44 and 7.45.

14.8 Setting Up the Selected Connecting Path

After the connecting path has been selected, the select and hold magnets on the line link frame and trunk link frame are operated, tests are made and the connecting path supervision is transferred to the selected outgoing tandem trunk. After the marker has checked that the selected connecting path has been established the marker will transmit an advance indication to the selected outgoing sender so that the outgoing sender may initiate the outgoing sender functions.

14.81 Select Magnet Operation

The operation of the select magnets is similar to the select magnet operation for a dial tone connection, as described in paragraph 7.51.

14.82 Hold Magnet Operation

The operation of the hold magnets is similar to the hold magnet for a dial tone connection, as described in paragraph 7.52.

14.83 False Cross, Continuity and Double Connection Tests

To determine if the connecting path is in the proper condition for service a false cross and ground test, a continuity test and a double connection test will be made on the selected connecting path.

14.831 False Cross and Ground Test

The false cross and ground test on the connecting path for a tandem call is similar to the false cross and ground test for a dial tone connection, as described in paragraph 7.531.

14.832 Continuity Test

The continuity test on the connecting path for a tandem call is similar to the continuity test for a dial tone connection, as described in paragraph 7.532.

14.833 Double Connection Test

The double connection test on the connecting path for a tandem call is similar to the double connection test for a dial tone connection, as described in paragraph 7.533.

The winding of the DCT-1 relay is extended thru the non-operated LK-1 relay contacts, thru the operated SIK relay contacts, thru the operated OGC relay contacts, thru the operated TOG-3 relay contacts, thru the non-operated SP and DT-2 relay contacts, thru the DCT coil, thru the non-operated MT-14 relay contacts, thru the operated DCT and CKG-4 relay contacts, thru the operated GT-2 and non-operated GT-5, GT and PU relay contacts to the ground potential which will operate the DCT-1 relay.

14.84 Transfer of the Connecting Path Supervision to the Incoming Trunk and the Release of the Connection to the Outgoing Tandem Trunk

After the completion of the double connection test the DCT-1 relay operates and releases the F and TF relays in the incoming tandem trunk. The release of the TF relay in the incoming tandem trunk will extend ground potential to the sleeve conductor of the connecting path to hold operated the line link frame and trunk link frame hold magnets associated with the selected connecting path.

After the marker has checked that the holding path supervision has been transferred to the incoming trunk the marker will release its connection to the associated outgoing tandem trunk circuit.

14.841 Release of the F and TF Relays in the Incoming Tandem Trunk

After the marker has completed successfully the false cross and ground test, if required, and the continuity test the marker will perform the double connection test which if satisfactory will operate the DCT-1 relay. The operation of the marker DCT-1 relay will release the F relay in the selected incoming trunk circuit by removing the ground on the "F" lead in the marker which is extended to the incoming register marker connector, to the incoming register link and then to the F relay in the incoming tandem trunk.

The release of the incoming tandem trunk F relay will in turn release the TF relay in the incoming tandem trunk. The release of the TF relay will extend ground potential from the incoming tandem trunk to the line link frame and to the sleeve conductor of the associated connecting path thereby holding operated the hold magnets associated with this connecting path.

14.842 Release of the DCT and Operation of the DCT-3 Relay

Before releasing the ground potential supplied by the marker to hold operated the hold magnets associated with the selected path the marker will check that a holding ground has been extended from the incoming trunk circuit to hold these hold magnets operated after the marker has released. When the hold magnet holding ground has been extended from the incoming tandem trunk circuit and over the sleeve conductor the DCT relay will be released. The DCT relay has been operated in series with the hold magnets therefore the holding ground on the sleeve conductor will release the DCT relay by shunting its operating path. The release of the DCT relay will indicate that the holding ground has been extended from the incoming tandem trunk to the hold magnets.

The release of the DCT relay will operate the DCT-3 relay. The operating path of the DCT-3 relay is extended from the winding of the DCT-3 relay, through the operated NOC or CLK relay contacts, through the non-operated TMK relay contacts, through the non-operated NSO relay contacts, through the non-operated TTK and OTT relay contacts, through the operated TOG-2 and DCT-1 relay contacts, through the non-operated DCT-2 relay contacts, through the DCT-3 coil, through the non-operated DCT and operated CKG-4 relay contacts, through the operated GT-2 and non-operated GT-5, GT and PU relay contacts to the operating ground potential.

14.843 Release of the F Relay in the Outgoing Tandem Trunk and the FA- Relay in the Trunk Linkand Connector Circuit

The operation of the DCT-3 will release the F relay in the selected outgoing tandem trunk circuit by removing the ground on the test group lead "TG-0/19" in the marker which has been extended from the marker, thru the trunk link and connector circuit "TG-0/19" and "F" cross-connection terminals, over the "F" lead to operate the F relay in the outgoing tandem trunk circuit.

The release of the outgoing tandem trunk F relay will in turn release the trunk link and connector circuit FA- relay associated with the selected trunk circuit. The release of the FA- relay will transfer the tip, ring and sleeve conductors of the selected connecting path to the outgoing tandem trunk.

14.844 Operation of the TMK Relay

The tandem check TMK relay will be operated as an indication that the trunk link and connector FA- relay has released. The release of the FA- relay extends the ground on the sleeve conductor of the connecting path thru the outgoing tandem trunk with the TM relay operated, thru the sender link circuit and the outgoing sender connector circuit, over the "TM" lead to the marker circuit where the non-operated NSO and the operated DCT-3 relays will extend ground to the winding of the TMK relay.

14.85 Advance Indication to Outgoing Sender

The marker will transmit an advance indication to the selected outgoing sender so that the outgoing sender may initiate the outgoing sender functions.

14.851 Operation of the Outgoing Sender AV Relay

When the marker has checked that the selected connecting path has been established, as indicated by the operation of the TMK relay, the marker operates the advance AV relay in the selected outgoing sender circuit. The outgoing sender AV relay operates in series with the primary winding of the marker circuit advance check AVK relay and the AVK-1 resistance. The operating circuit for the operation of the outgoing sender AV relay flows through the winding of the marker AVK relay with a polarity to hold the AVK relay in the non-operated condition.

The operating path of the outgoing sender AV relay will be extended from the winding of the AV relay, over the "AV" lead from the outgoing sender to the outgoing sender connector, thru the operated S relay contacts, over the "AV" lead to the marker circuit, thru the operated RSC relay contact, thru the non-operated PCL-3 and AMA-5 relay contacts, thru the primary winding of the AVK relay, thru the AVK-1 resistance, thru the operated SLK-2 relay contacts, thru the operated SIK relay contacts, thru the operated DCT-3 relay contact, thru the non-operated MT-1 relay contacts, thru the TMK coil and operated TMK, DCT-3 and CKG-4 relay contacts to the operating ground potential for outgoing sender AV relay.

14.852 Operation of the AVK and AVK-1 Relays

The operation of the outgoing sender AV relay has placed ground potential on the "AV" lead in the outgoing sender to lock operated the outgoing sender AV relay. The ground potential on the "AV" lead will be extended to the marker thereby resulting in the operation of the AVK relay to check that the outgoing sender AV relay has locked operated. The ground on the "AV" lead from the outgoing sender will be extended, over the same path as the operating path of the sender AV relay to the primary winding of the AVK relay to operate the AVK relay. The other side of the primary winding of the AVK relay is extended to battery potential thru the AVK-2 resistor with the BG relay operated.

The operation of the AVK relay with the OSK and SON relays operated will operate the AVK-1 relay.

14.9 Release of the Marker and Associated Circuits

After the marker has completely performed the tandem call functions, the marker will be released from this call and will be recycled to the idle condition so as to be available for assistance to other calls or connections.

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously, this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

14.91 Recycle of the Marker Release Control

In light traffic periods, as indicated by the non-operated condition of the heavy traffic HTR relay the marker remains connected to the outgoing sender through the individual channel until the outgoing sender performs trunk test. The outgoing sender will retain a ground closure on the "TG" lead until battery and ground have been detected over the trunk conductors.

14.911 Operation of the LK-1 Relay

Before the marker will give a release indication the marker will check that the connecting path or channel linkage between the incoming tandem trunk and the outgoing tandem trunk has been set up and has been tested to determine that it is in a condition for service.

The linkage check LK-1 relay will be operated when the AVK-1 relay is operated. The operating path of the LK-1 relay is extended from the winding of the LK-1 relay, thru the operated DCT-3 relay contacts, thru the operated RNG relay contacts, thru the operated TOG-2 relay contacts, thru the operated CLK and non-operated NOC relay contacts, thru the operated OGC and AVK-1 relay contacts, thru the operated DCT-3 relay contacts, thru the non-operated MT-1 relay contacts, thru the TMK coil, thru the operated TMK, DCT-3 and CKG-4 relay contacts to the operating ground potential.

14.912 Operation of the TG, TGT, DIS-1, DIS-2 and DISA Relays

The marker trunk guard TG relay is operated when the sender ON relay operates to place ground on the "TG" lead to the marker circuit. The outgoing sender will retain a ground closure on the "TG" lead until battery and ground have been detected over the trunk conductors.

Under light traffic conditions if the outgoing sender has completed trunk test and the TG relay has released before the LK-1 relay has operated the operation of the LK-1 relay will extend ground to operate the DIS-1 and DIS-2 relays. However, if the outgoing sender has not completed trunk test the TG relay will be operated and therefore when the LK-1 relay is operated ground will be extended to operate the TGT relay. The operation of the TGT relay will extend ground to operate DIS-1 and DIS-2 relays.

Under heavy traffic conditions, as determined by the HTR relay being operated, the operation of the LK-1 relay will operate the DIS-1 and DIS-2 relays whether or not the sender has completed trunk test.

The operating path of the TGT relay, under the light traffic condition, is extended from the winding of the TGT relay, thru the contacts of the operated TG relay, thru the contacts of the released HTR relay, thru the contacts of the non-operated RRK and RRC relays, thru the contacts of the non-operated PSR relay, thru the contacts of the non-operated TRS relay, thru the contacts of the operated TOG-3 relay, thru the contacts of the operated FMK and FML relays, thru the contacts of the non-operated MT-14 relay, thru the contacts of the non-operated ITR-2 relay, thru the contacts of the non-operated LHT relay, thru the contacts of the operated LK-1 relay to the operating ground potential.

Under the light traffic condition with the TGT and TG relays operated the operating path of the DIS-1 and DIS-2 relays in series is extended from the winding of the DIS-1 relay, with the MT-1, MON-1, TRL-1, TRR and TR-1 relays non-operated and with the TGT relay operated, to the operating ground potential.

Under the light traffic condition with the TG and TGT relays non-operated or under the heavy traffic condition the operating path for the DIS-1 and DIS-2 relays in series is extended from the winding of the DIS-1 relay, to the "DIS-1" lead with the MT-1, MON-1, TRL-1, TRR and TR-1 relays non-operated, and either with the TG relay released and to the "TG" lead to the HTR relay non-operated to the DIS-1" lead, or to the HTR relay operated to the "DIS-1" lead with or to the "TG" lead if the TG relay is non-operated, to the "DIS-1" lead if the HTR relay is either operated or non-operated, to the "DIS-1" lead with the RRK and RRC relays non-operated, to the "DIS-1" lead with the PSR relay non-operated, to the "LLK-2" lead with the TRS relay non-operated, to the "LK-2" lead with the TOG-3 relay operated, to the "LK-3" lead with the FMK and FML relays operated, to the "LK-2" lead with the MT-14 relay non-operated, to the "LK-2" lead with the ITR-2 relay non-operated, to the "LK-1" lead with the LHT relay non-operated and to the operating ground potential with the LK-1 relay operated.

The DIS-2 relay in operating will operate the DISA relay.

14.913 Release of the LLC-1, LLC-2, ONW, TLC-1/3, and CKG-1/7 Relays

The operation of the LK-1 relay will release the LLC-1/2 and ONW relays. The operation of the DIS-1/2 relays will release the TLC-1/3, CKG-1/3 and CKG-6/7 relays. The release of the CKG-3 relay will release the CKG-4/5 relays.

14.914 Operation of the Incoming Register MRL Relay and the Release of the Register Marker Connector RS, RA, RB, RC, RD, MS, MA, MB, MC and MD Relays

The operation of the DIS-1/2 relays with the marker MRL-1 relay non-operated will extend ground over the "MRL" lead to the incoming register connector circuit and to the incoming register circuit to operate the MRL relay in the incoming register circuit. The operation of the MRL relay will release the incoming register from the tandem call and will also release the incoming register marker connector circuit.

The operation of the MRL relay in the incoming register circuit will release the RS and MS relays in the incoming register marker connector. The release of the RS relay will release the RA, RB, RC and RD relays in the incoming register marker connector. The release of the MS relay will release the MA and MC relays which in turn will release the MB and MD relays in the incoming register connector circuit.

14.915 Release of the DIS-1 and DIS-2 Relays

The release of the incoming register marker connector MA relay will release the DIS-1 and DIS-2 relays if the TGT relay is released. If the TGT relay has been operated the marker must wait until the sender has completed trunk test and released the TG relay before the TGT relay will be released and the DIS-1 and DIS-2 relays released.

14.916 Release of the MCB-1/6 Relays and the Marker Connector CB Relays

The release of the DIS-2 relay will release the MCB-1/6 relays which in turn will release the CB relays associated with this marker circuit in all marker connector circuits. The release of the CB relays associated with this marker circuit in all marker connectors will indicate to all marker connectors that this marker has been released and is now idle and available and that any marker connector circuit may select and seize this marker for service.

14.917 Release of the DISA Relay

The release of the MCB-1/6 relay will release the DISA relay.

14.92 Release of the Registration of Information from the Incoming Register Functions

14.921 Release of the AC-0/7, BC-0/7 and CC-0/7 Relays

The release of the incoming register marker connector RA relay will release the AC-0/7, BC-0/7 and CC-0/7 relays.

14.922 Release of the HN-0/7, T-0/7 and U-0/7 Relays

The release of the TRN and TRN-1 relays when the number group is released and the RNG relay and NR relay are operated will release the HN-0/7, T-0/7 and U-0/7.

14.923 Release of the CTA-0/2, CU-0/7, S-, PSA, PSB, PSA-0/1 and PSB-0/1 Relays

The release of the incoming register marker connector will release the CTA-0/2 and CU-0/7 relays. The release of the CKG-1 relay will release the S- relay and the PSA or PSB relay if operated. The release of the PSA or PSB relay will release the associated PSA-0/1 or PSB-0/1 relays.

14.924 Release of the TAN-0A-0D/4A-4D and TAN Relays

In offices where the tandem screening feature is provided, the release of the incoming register marker connector will release the marker TAN-0A/0D, TAN-1A/1D, TAN-2A/2D, TAN-3A/3D and TAN-4A/4D relays. The TAN-0A/4A relay in releasing will release the TAN relay.

In offices not equipped with the tandem screening feature the TAN relay in the marker will be released when the incoming register marker connector is released.

14.93 Release of the Identification of the Call Functions

14.931 Release of the AT-2/9, BT-2/9, 2DT-2/9, and R- Relays

The release of the CKG-1 relay will release the AT-2/9, the BT-20/99 if operated, or the 2DT-2/9 relay. The release of the CKG-1 relay will also release the R- relay.

14.932 Release of the TC-5/7 Relay

The release of the incoming register marker connector will release the operated TC-5/7 relay.

14.94 Release of the Selection and Connection of an Outgoing Sender Functions

14.941 Release of the OSG-0/4, OSA-0/4, TOG-1/3, SON and OGC Relays

The release of the route R- relay will release the OSG-0/4 and OSA-0/4 relays if the TGT relay is released. If the TGT relay is operated the OSG-0/4 and OSA-0/4 relays will be held operated until the TGT relay is released. The release of the OSG-0/4 relay will release the SON and OGC relays. The release of the incoming register connector will release the TOG-1/3 relays.

14.942 Release of the OS-0/4, OSK and AVK1 Relays in the Marker and the S Relay in the Outgoing Sender Connector

The release of the SON relay will release the OS-0/4, OSK and AVK1 relays in the marker. The release of the OSK or OS-0/4 release will release the S- relay in the outgoing sender connector.

14.943 Release of the DL-0/6, CR-0/10, CRP, CRS, CL-0/5, CLS and CLP Relays

The release of the route R- relay will release the operated DL-0/6, CR-0/10, CRP, CRS, CL-0/5, CLS and CLP relays.

14.95 Release of the Identification of the Incoming Tandem Trunk Functions

14.951 Release of the FLG and FLG-1 Relays

The operation of the LK-1 relay will release the FLG and FLG-1 relays.

14.952 Release of the FTL, FUL, HGL, VFL, VGL-1/2, HGL-1, VFL-1, RCL, FTT-0/3, FUT-0/9, VGT-0/13, HGT-0/9, VFT-0/4, RCT-1/15, VTF-1, HTK-1 and FTK-1 Relays

The release of the FLG-1 relay will release the LLI relay which in turn will release the FTL, FUL, HGL, VFL, and RCL relays. The release of the FLG relay will release the VGL-1/2, HGL-1 and VFL-1 relays. The release of the FTL, FUL, RCL, VGL-1/2, HGL-1 and VFL-1 relays will release the operated FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4 and RCT-1/15 relays which in turn will release the VTK-1, HTK-1 and FTK-1 relays.

14.96 Release of the Outgoing Tandem Trunk Selection Functions

The release of the outgoing tandem trunk selection functions for a tandem call is similar to the release of the outgoing trunk selection functions for a subscriber outgoing call, as described in paragraph 11.85.

14.97 Release of the Selection of the Connecting Path Functions

14.971 Release of the Line Link and Connector MP, MCA, MCB, VGB-0/11, HG-0/9 and LG-0/11 Relays

The release of the LLC-1 relay will release the line link and connector MP, MCA, MCB, HG-0/9 and LG-0/11 relays. The release of the operated VGT-0/11 relay in the marker will release the line link frame VGB-0/11 relay.

14.972 Release of the STF, PR, 2TLF/10TLF, 20F, 40F, 7Q, RQ, P-0/9, 2G, 3G, PNR, PA, PB, PC, TCH-0/9, TCHK, JG-0/4 and JCK-0/1 Relays

The release of the TLC-3 relay will release the STF or PR relay and the operated 2TLF/10TLF relay. The release of the STF or PR relay will release the 20F or 40F relay and the release of the operated 2TLF/10TFL will release the 7Q or RG relay, if operated.

The release of the trunk link frame MCC relay will release the operated P-0/9 relay which in turn will release the 2G or 3G relay, if operated.

The release of the LLC-1 and ONW relay will release the STP-1 or STP-2 relay. The release of the operated STP-1 or STP-2 relay will release the PNR, PA, PB and PC relays. The release of the operated PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay. The release of the LLC-2 relay will release the JG-0/4 relay. The release of the trunk link frame MCB relay will release the JCK-0/1 relays.

14.973 Release of the Trunk Link and Connector G-0/4, RF, EF, JC-0/19, L, EL, R and ER Relays

The release of the marker JG-0/4 relay will release the operated trunk link and connector JC-0/19, G-0/4, RF, EF, L, EL, R and ER relays.

14.974 Release of the TK, TLL-0/9, TJ-0/9, TTL-0/9, CHT, CHA, CH-0/9 and HMS1 Relays

The release of the line link frame HG-0/9 relay will release the TLL-0/9 relays. The release of the trunk link frame MCB relay will release the TJ-0/9 relays. The release of the trunk link frame LC-0/9 relay will release the TTL-0/9 relays.

The release of the LLC-1 relay will release the CH-0/9 and CHA relays. The release of the LLC-2 relay will release the HMS-1 relay which in turn will release the TK relay, which will release the CHT relay.

14.98 Release of the Setting Up of the Connecting Path Functions

14.981 Release of the Line Link and Trunk Link Frame Select Magnets

The operation of the GT1 relay will release the ONX relay which in turn will release the operated select magnets on the line link frame line and junctor switches and on the trunk link frame junctor and trunk switches.

14.982 Release of the SL, GLH, GLH-1, FAK and FBK Relays

The release of the LLC-1 relay will release the HMS-1 relay. The release of the trunk link and connector circuit FA- or FB- relay will release the SL and the FAK or FBK relays. The release of the CKG-2 relay will release the GLH relay which in turn will release the GLH1 relay.

14.983 Release of the CON, CON-1, CON-3, GT-1, GT-2, LK-1, DCT-1 and DCT-3 Relays

The operation of the GT-2 relay will release the CON and CON-3 relays. The release of the LLC-1 relay will release the CON-1 relay which in turn will release the GT-1 and GT-2 relays. The release of the CKG-4 relay will release the LK-1, DCT-1 and DCT-3 relays.

15. INTERTOLL CONNECTION, INCOMING WITH NON-LOCAL COMPLETION

When the No. 5 crossbar office is equipped for toll center operation the marker circuit will provide for assisting an intertoll connection. An intertoll connection is that part of a toll call connection wich connects one toll center to another toll center and which originates through an outgoing intertoll trunk and terminates through an incoming intertoll trunk circuit. An intertoll connection may originate in a No. 5 crossbar office which is a toll center, may terminate in a No. 5 crossbar office which is a toll center, or may be switched through a No. 5 crossbar office which is a toll center.

When a calling subscriber served by a No. 5 crossbar office wishes to initiate a toll call the subscriber will usually dial a special service code associated with toll service which will connect the calling subscriber to an operator in a manner similar to that described in paragraph 18. The operator will assist in the completion of the toll call to the desired number at the request of the calling subscriber. Usually the operator is associated with a No. 5 crossbar office which is a toll center and this operator will select and connect to an outgoing intertoll trunk which connects to the toll center associated with the called subscriber.

When the toll call terminates in this No. 5 crossbar office which is a toll center the incoming intertoll trunk will be connected to the called subscriber as described in paragraph 13.

When the toll call, which has been extended from a toll center, will not terminate in this No. 5 crossbar office which is also a toll center, the toll call will be extended through this office to another office which may or may not be a toll center. If the office to which the toll call is to be extended is another toll center the incoming intertoll trunk will be connected to an outgoing intertoll trunk, however if the office to which the toll call is to be extended is not a toll center the incoming intertoll trunk will be connected to an outgoing toll switching trunk. The circuit operations for this type of connection, an incoming intertoll connection with non-local completion, will be described in the following paragraph 15.

The detailed description of the marker operations in assisting an incoming intertoll connection, which will not complete to a local subscriber, is for an intertoll connection in which an outgoing sender is required. However, the marker operations in assisting an intertoll connection in which an outgoing sender is not required are similar, except that the marker does not perform the functions of selecting and connecting an outgoing sender to the marker and to the selected outgoing intertoll trunk or outgoing tollswitching trunk circuit as described in paragraph 15.4.

The marker when assisting the completion of an incoming intertoll connection for non-local completion which requires an outgoing sender circuit and which is associated with an incoming intertoll trunk performs or assists in the performance of eight major functions as follows:

(a) Registration of information from the incoming register which the marker requires in assisting an incoming intertoll connection.

(b) The identification of the call or connection which the marker will assist.

(c) The identification of the location of the termination on the line link frame of the incoming intertoll trunk circuit.

(d) Selection and connection of an outgoing sender.

(e) The selection of an available idle outgoing toll switching trunk circuit or outgoing intertoll trunk circuit.

(f) The selection of an idle connecting path between the selected outgoing trunk circuit and the incoming intertoll trunk associated with this intertoll connection.

(g) Connecting the selected outgoing trunk circuit to the incoming intertoll trunk circuit through the selected connecting path.

(h) Release of the marker and associated circuits after the marker has completed the intertoll connection functions.

Since an incoming intertoll trunk may be associated with an intertoll connection which will terminate within this office, as described in paragraph 13., or with an intertoll connection which will be extended through this office to a distant office, it is necessary for the marker circuit to register and translate the toll code or the called office code digits so as to determine if the call is to terminate in this office or will be extended through this office to a distant office.

An incoming intertoll trunk is arranged so as to terminate on either the trunk link frame or on the line link frame. In order to provide two points of access to the line link frames the intertoll trunk has one termination on one line link frame and another termination on one other line link frame. If a marker is unable to select a connecting path through one of these line link frames a marker will attempt to select a connecting path through the other line link frame associated with the intertoll trunk. For any particular call the incoming intertoll trunk will operate the proper relays to connect to either the trunk link frame or to the line link frame. If the marker determines that the call associated with the incoming intertoll trunk is to be terminated within this office, the incoming intertoll trunk relays will be operated to connect this trunk to the trunk link frame.

If the marker determines that the call associated with the incoming intertoll trunk is to be extended to a distant office, the incoming intertoll trunk relays will be operated to connect this trunk to the line link frame. A connecting path will then be established between the incoming intertoll trunk which terminates on the line link frame and the outgoing toll switching trunk or outgoing intertoll

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trunk which terminates on the trunk link frame.

15.1 Seizure of the Marker by the Incoming Register

The incoming intertoll trunk recognizes a seizure by a remote office which wishes to complete a call. The incoming intertoll trunk connects to an incoming register through the incoming register link. The distant office transmits the toll code if required, the called office code if required and the numerical digits to the incoming register. The incoming register records the digits from the remote office, records the trunk number of the incoming intertoll trunk associated with this intertoll connection so that the marker can connect to the incoming intertoll trunk, and then the incoming register connects to a marker through an incoming register marker connector.

The seizure of the marker by the incoming register for an intertoll connection is similar to the seizure of the marker by the incoming register for a terminating call, as described in paragraph 12.1.

15.2 Registration of Information from the Incoming Register

After the seizure of the marker, the toll code if required, the office code if required and the numerical digits of the called line and the trunk number to identify the incoming intertoll trunk will be transferred from the incoming register to the marker circuit. When assisting an intertoll connection the marker will receive a toll code with the office code and the numerical digits, or will receive a toll code with the numerical digits or will receive an office code and the numerical digits. The marker will determine, from the toll code or from the office code if a toll code is not received, that this intertoll call should be extended to a distant office. After an outgoing sender has been selected and seized the marker will transmit to the outgoing sender the toll code if the marker has received a toll code, the office code and the numerical digits of the called number.

15.21 Toll Code, Office Code and Number of Called Line

Where a toll code is received the toll code will be transmitted from the incoming register to the marker where a group of code register relays will be operated to indicate the toll code. A group of code register relays AC-0/7 will record the first digit of the toll code and the BC-0/7 and CC-0/7 relays are provided. These relays will record the second and third digit of the toll code.

If a toll code is not received the office code will be recorded by the operation of the AC-0/7 relays and if provided by the operation of the BC-0/7 and CC-0/7 relays.

The operation of the incoming register marker connector relays will extend a group of leads designated "A-0/7", "B-0/7" and "C-0/7" from the incoming register to the marker. The incoming register will place ground on two of the "A-0/7" leads to identify the first digit, on two of the "B-0/7" leads to identify the second digit and on two of the "C-0/7" leads to identify the third digit. Therefore two AC-0/7 relays will be operated and if provided two BC-0/7 relays and two CC-0/7 relays will be operated.

The operation of the incoming register marker connector relays will also extend a number of groups of leads designated "D-0/7", "E-0/7", and where required "F-0/7", "G-0/7", "H-0/7", "J-0/7", and "K-0/7" from the incoming register to the marker. The incoming register will place ground on two leads of each group of leads to identify the associated digit.

15.22 Identification of the Incoming Intertoll Trunk

The incoming intertoll trunk will be identified by the three digit number which has been assigned to this particular trunk circuit. The incoming register will transmit this trunk number to the marker over three groups of leads. Two leads of the group of "HT-0/7" leads will be grounded to indicate the hundreds digit of the trunk number, two leads of a group of "TT-0/7" leads will be grounded to indicate the tens digit and two leads of a group of "UT-0/7" leads will be grounded to indicate the units digit. These grounded leads will later be used to operate the HN-0/7, T-0/7 and U-0/7 relays to identify the digits of the trunk number.

15.3 Identification of the Basic Call or Connection

To determine if this connection is to be terminated within this office or if the connection is to be extended to a distant office the marker will examine the toll directing code, the national area code or the local office code of the called subscriber directory number if a toll code has not been transmitted to the marker. In order to translate the "A" digit and where necessary the "B" digit of the toll directing code, the national area code, or the local office code of the called subscriber directory number, the marker will be equipped with the "A" digit translator relays, the AT-0/9 relays or both the AT-0/9 and TA-2/9 relays; and may be equipped with the "B" digit translator relays designated BT-00/99. The marker will place ground on the one "code point" cross-connection terminal associated with the toll code or with the office destination of the call if a toll directing code or national area code has not been received.

When the marker is assisting an intertoll connection it will receive a toll code to direct the call to the proper destination or the marker will receive the office code when a toll directing code or the national area code is not transmitted.

15.31 Identification of the Call when a Toll Directing Code or the National Area Code is Not Received

When the marker does not receive a toll code the marker will use the office code to direct the call to the proper destination. Therefore, the "A" digit AT-2/9 or TA-2/9 relays will be required, and the "B" digit BT-20/99 relays may be required. The "A" digit AT-0/1 relays and "B" digit BT-00/19 relays are not required.

15.311 Operation of the TC-5/7 Relay

Ground potential will be extended over the "TT" lead from the incoming register to operate the TC-5/7 relay. Ground on the "TT" lead will operate the TC-5/7 relay in similar manner to ground on the "LT" lead for the intra-office call as described in paragraph 8.031.

15.312 Operation of the AT-2/9 or TA-2/9 Relay

The AT-2/9 relay will be operated in a manner similar to the operation of the AT-2/9 relay for an intra-office call, as described in paragraph 8.032.

The TA-2/9 relay will be operated similarly to the operation of the TA-2/9 relay described for a terminating call, associated with an incoming tandem or intertoll trunk paragraph 13.32.

15.313 Operation of the BT-20/99 Relay

The BT-20/99 relay will be operated in a manner similar to the operation of the BT-20/99 relay for an intra-office call, as described in paragraph 8.032; except for calls in which the TA-2/9 relay is operated, the TA-2/9 relay instead of the AT-2/9 relay will initiate the operation of the BT-20/99 relay.

The operation of the BT-20/99 relay with the CKG-1 relay operated and two of the CC-0/7 relays operated will extend ground potential to the "C-220/999" "code point" associated with the office code of the called subscriber directory number.

15.32 Identification of the Call when a Toll Code is Received

When the marker receives a toll code the marker will use this toll code to direct the call to the proper destination. The following codes are those codes used to direct a call for toll routing: the toll directing codes, 0XX and 1XX (operator service codes), 11X and 11XX (TX operator codes); and the national area codes, X0X and X1X. The 0XX and 1XX codes are dialed by the operator in the toll system and are followed by the office code and the numericals of the called subscriber directory number or by the numericals of the called subscriber. The 11X and 11XX codes are used to reach TX operator teams which will complete the call. The X0X and X1X national area codes are followed by the office code and the numericals of the called subscriber directory number.

The AT-0/1 relays will be provided to procure the necessary translation when the 0XX and 1XX codes are received. The BT-00/19 relays will be provided to procure the translation necessary for XLX and X1X codes. The AT-0/1 and BT-00/19 relays are used for translation when the 11X and 11XX codes are received.

"A" digit translation will be achieved by using the AT-0/9 relays or the TA-2/9 relays. The TA-2/9 relays are provided when toll codes are to be received in an office which is arranged for two digit local area codes but no three digit local area codes. The TA-2/9 relays prevent conflicts between local area codes and toll codes that have the same first and second digits. "B" digit translation will be achieved by using the BT-00/99 relays. "D" digit translation when required for areas provided with 11XX toll codes is accomplished by using the TXC-1/9 "D" digit translator relays.

15.321 Operation of the TC-5/7 Relay

Ground potential will be extended over the "TT" lead from the incoming register through the incoming register marker connector to operate the TC-5/7 relay. Ground on the "TT" lead will operate the TC-5/7 relay in a manner similar to the operation of the TC-5/7 as described for the intra-office call paragraph 8.031.

15.322 Operation of the AT-0/9 or TA-2/9 Relay

The operation of the TC-5/7 and TOL relays with the CKG-1 relay operated, with two of the AC-0/7 relays operated will extend ground on a one out of ten basis to the "7A-2/9" or "6A-2/9" cross-connection terminal of Fig. 38 or to the "A-0/1" cross-connection terminal of Fig. 43. The operation of the AT-0/9 or TA-2/9 relay is as follows:

(1) For OXX and 1XX (Operator Service Codes)

In calls involving either OXX or 1XX codes the operation of the associated ATO or AT1 relay is required. The "AT-0/1" cross-connection terminal of Fig. 39 for the associated AT-0/1 relay is cross-connected to the "A-0/1" cross-connection terminal of Fig. 43. Ground potential on the "A-0/1" cross-connection terminal will operate the associated AT-0/1 relay. The AT-0 relay will be operated when the OXX code is received; the AT-1 relay will be operated when the 1XX code is received.

(2) For XOX and X1X (National Area Codes)

In calls involving either XOX or X1X codes the operation of the AT-2/9 or TA-2/9 relay is similar to the operation of the AT-2/9 and TA-2/9 relays for a terminating call, associated with an incoming tandem or intertoll trunk as described in paragraph 13.32.

(3) For 11X and 11XX (TX Operator Codes)

In calls involving either 11X or 11XX codes the operation of the AT-1 relay is required. The "AT1" cross-connection terminal of Fig. 39 for the AT-1 relay is cross-connected to the "A1" cross-connection terminal of Fig. 43. Ground potential on the "A1" cross-connection terminal will operate the AT-1 relay.

15.323 Operation of BT-00/99 Relay

The marker will be equipped with "B" digit translator BT-20/99 relays if translation of national area toll XOX and XIX codes is required, with "B" digit translator BT-00/19 relays if translation of operator service OXX and 1XX codes is required. The operation of the CKG-1 relay, with two of the BC-0/7 relays operated with either the AT-0/9 relay operated will extend ground to one of the "C-00/99 cross-connection terminals of Fig. 39 or the TA-2/9 relay operated will extend ground to one of the "C-20/99 cross-connection terminals of Fig. 116. The operation of the BT-00/99 relays is as follows:

(1) For OXX and 1XX (Operator Service Codes)

In calls involving either OXX or 1XX codes the operation of the BT-00/19 relay is required. The "C-00/19" cross-connection terminals of Fig. 39 are cross-connected to the "BT-00/19" cross-connection terminals of Fig. 117. Ground potential extended to one of the "BT-00/19" cross-connection terminals will operate the associated BT-00/19 relay.

(2) For XOX and X1X (National Area Codes)

In calls involving either XOX or X1X codes the required BT-20/99 relays will be operated when grounded potential is extended to the "BT-20/99" cross-connection terminals of Fig. 117. The "BT-20/99" cross-connection terminals of Fig. 117 are cross-connected to the "C-20/99" cross-connection terminals of Fig. 39 or Fig. 116.

(3) For 11X and 11XX (TX Operator Codes)

In calls involving either 11X or 11XX codes the BT-11 relay will be operated when the "BT-11" cross-connection terminal of Fig. 117 is grounded. The "BT-11" cross-connection terminal is cross-connected to the "C-11" cross-connection terminal of Fig. 39.

The operation of the BT-00/99 relay with the CKG-1 relay operated and two of the CC-0/7 relays operated will extend ground potential to the "C-000/999" "code point" associated with the toll code.

15.324 Operation of the DX-0/7, EX-7, OPE, and TXD Relays of Fig. 124, the TXC-1/9 Relay of Fig. 123, and the ROA Relay of Fig. 82

In offices where it is desirable to translate the 11XX TX operator codes in addition to the normally translated 11X codes, the DX-0/7, EX-7, OPE, TXD, and TXC-1/9 relays will be provided. It should be noted that in offices equipped for the reception of 11XX codes, the "C" digits (third digit) used to identify a 11XX code can not be used in a 11X code.

The "A" and "B" digit translator relays will be operated in the same manner as described in paragraphs 15.322 and 15.323. The operation of the BT-11 relay with two CC-0/7 relays operated will extend ground potential to one of the "C-110/119" "code point" cross-connection terminals. All "code points" associated with the 11XX code (all "C" digits in this group require "D" digit translation) will be cross-connected to the "TXC-1/9" cross-connection terminals associated with the 11XX codes. When ground potential is extended to one of the "TXC-1/9" cross-connection terminals the associated TXC-1/9 relay ("D" digit translator relays) will be operated. The TXD relay will be operated in series with the TXC-1/9 relays.

In calls where a 11XX code is received two of the DX-0/7 relays ("D" digit register relays) and the EX-7 relay will be operated when the TXD relay operates with ground potential extended from the incoming register through the incoming register marker connector to the D-0/7 and E-7 leads in the marker. The EX-7 relay is operated as an end of digit indication, that all digits have been received.

The operation of two of the DX-0/7 relays with the TXD and one of the TXC-1/9 relays will ground one of the "C-1110/1199" "code points". The routing for this call will be determined by the grounded "code point".

The OPE relay will be operated when the TXD relay operates. If in dialing the operator dials a "C" digit that is associated with a 11XX code and fails to dial a "D" digit the DX-7 relay will be operated as an indication of end of dialing and the ROA reorder relay will be operated. The ROA relay is operated with the OPE and DX-7 relays operated and the DX-0, DX-1, DX-2, DX-4, and EX-7 relays non-operated. The ROA relay screens out operator errors in which a 11X code was dialed when the "C" digit indicated that a 11XX code was required for this call. The OPE relay is a slow operating relay to prevent false operation of the ROA relay by allowing for the maximum operating time of the DX-0/7 and EX-7 relays.

15.33 Operation of the TOL and S-00/44 or S-100/144 and PSA or PSB and PSA-0/1 or PSB-0/1 Relays in Office Where Only One Tandem Trunk Group Class Is Provided

The TOL relay winding will be extended over the "TOL" lead to the incoming register marker connector and with the incoming register marker connector relays operated will be further extended over the "TOL" lead to the incoming register circuit. The incoming register has been informed that the incoming trunk is an intertoll incoming trunk therefore the incoming register will place ground potential on the "TOL" lead to operate the marker TOL relay.

In offices where only one tandem trunk group class is provided (tandem screening feature not provided) the operation of the TOL relay will operate the S-00/44 or S-100/144 class of service relay associated with a toll call. The operation of the TOL relay will extend ground potential to the "SWTO" cross-connection terminal of Fig. 43. The "SWTO" cross-connection terminal will be cross-connected to the "SWC-0/29" cross-connection terminal associated with the class of service of a toll call. Each "SWC-0/29" cross-connection terminal associated with a class of service from which a class of service indication is required will be cross-connected to one or more "SW-00/44", "SW-100/144" cross-connection terminal or terminals. Therefore the one or more S-00/44, S-100/144 relay associated with the class of service of a toll call will be operated.

In certain cross-connection fields it may be desirable to operate the presort relays in addition to the S- relays. The presort PSA or PSB relay will be operated in series with the S- relay. The operation of the PSA or PSB relay will in turn operate the PSA-0/1 or PSB-0/1 relays. The operation of the presort relays is similar to the description for the intra-office call, paragraph 8.0212.

15.34 Operation of the TOL and TOL-0A/D Relays in Offices Where Two or More Tandem Trunk Group Classes Are Provided. (Toll Class Tandem Screening Feature)

The TOL relay winding will be extended over the "TOL" lead to the incoming register marker connector and with the incoming register marker connector relays operated will be further extended over the "TOL" lead to the incoming register circuit. The incoming register has been informed that the incoming trunk is an intertoll incoming trunk; therefore, the incoming register will place ground potential on the "TOL" lead to operate the marker TOL relay.

In offices where two or more tandem trunk group classes are provided, the toll class relays of the tandem screening feature are used to identify the class of service of the call. Where the toll class tandem screening feature is provided route access or denied access treatment for the directing code is obtained from the operation of the toll screening relays TOL-OA/D instead of the S- relays, as described in Paragraph 15.33.

The operation of the TOL relay will operate the TOLOA relay. Ground potential is extended from the "GRD" cross-connection terminal of Fig. 43 to the "TLC-1/4" cross-connection terminals of Fig. 43 and with the TOL relay operated ground is extended to the "TOL-1/4" cross-connection terminals to the "TOLO" cross-connection terminals of Fig. 43 and to the TOLOA relay winding of Fig. 111. If additional service treatment points are required, the TOL-OB/D relays of Fig. 113 will be operated; the aforementioned relays will be operated in parallel with the TANOA relay winding.

15.35 Operation of the Route R- Relay

The code associated with office code of the called subscriber's directory number, the toll directing code or the national area code will be cross-connected so as to operate the route R- relay associated with determining the proper routing for this call.

In offices where only one tandem trunk group class is provided (no tandem screening feature) the "code point" is grounded by the operation of the code digit register relays and the translator relays, with the S- relays, or if provided the PSA-0/1 or PSB-0/1 relays associated with the toll class of service operated.

In offices where the foreign area translation feature is provided, and the code point associated with the call requires foreign area translation, the R-relay will be operated in a manner similar to the description in Paragraphs 11.31 and 11.342. However, the TOL class mark will be received instead of the OR class mark.

In offices where two or more tandem trunk group classes are provided, the "code point" is grounded by the operation of the code digit register relays and the translator relays, with the toll class relays (TOL-OA/D relays) of the tandem screening feature associated with the class of service operated. The operation of the TOL-OA/D relay extends the winding of the route relay between the "TSC-" and "TS-" cross-connection terminals. The "TSC-" cross-connection terminals of the toll screening relays are similar to the "SC-" cross-connection terminals of the S- relays and the "PSC-" cross-connection terminals of the PSA-0/1 or PSB-0/1 relays and can be cross-connected in a similar manner. The "TS-" cross-connection terminals of the TOL-OA/D relays are similar to the S-cross-connection terminals of the S- relays and the "PSA-" or "PSB-" cross-connection terminals of the PSA-0/1 or PSB-0/1 relays and can be cross-connected in a similar manner.

An example of the cross-connections necessary to operate the route R- relay is similar to the description for the tandem call, non-intertoll, as described in Paragraph 14.36, except the operation of the R-relay will direct the marker to perform the functions required for a toll call.

15.4 Selection and Connection of an Outgoing Sender

The selection and connection of an outgoing sender for an intertoll connection is similar to the selection and connection of an outgoing sender for a tandem call, as described in Paragraph 14.4, except for this call the operating path of the TOG-1/3 relays is through the operated TOL relay contact instead of the TAN relay.

15.5 Identification of the Location of the Incoming Intertoll Trunk on the Line Link Frame

The identification of the location of the incoming intertoll trunk on the line link frame for an intertoll connection is similar to that for the tandem call, as described in Paragraph 14.5.

15.6 Outgoing Intertoll or Outgoing Toll Switching Trunk Selection

The outgoing intertoll or outgoing toll switching trunk selection for an intertoll connection is similar to the outgoing trunk selection for an outgoing call, as described in Paragraph 115. If the outgoing trunk is to connect to a distant office which is a toll center then an outgoing intertoll trunk will be associated with the connection. If the outgoing trunk is to connect to a distant office which is not a toll center then an outgoing toll switching trunk will be associated with the connection.

15.7 Selection of the Connecting Path

The selection of the connecting path for an intertoll connection is similar to the selection of the connecting path for a tandem call, as described in paragraph 14.7.

15.8 Setting Up the Selected Connecting Path

The setting up the selected connecting path for an intertoll connection is similar to the setting up the selected connecting paty for a tandem call, as described in paragraph 14.8.

15.9 Release of the Marker and Associated Circuits

The release of the marker and associated circuits for an intertoll connection is similar to the release of the marker for a tandem call, as described in paragraph 14.9.

16. INTERMARKER GROUP CONNECTIONS

An intermarker group connection is a connection from one No. 5 crossbar office to another No. 5 crossbar office located in the same building and served by a different group of markers. An intermarker group connection may be required for three types of calls as follows:

(a) Subscriber to subscriber intermarker group calls in which the subscribers are associated with different No. 5 crossbar offices located in the same building and served by a different group of markers.

(b) Subscriber to outgoing trunk intermarker group calls in which the local subscriber originates a call which requires the use of another No. 5 crossbar office located in the same building as a tandem office so as to be connected to the required outgoing trunk circuit.

(c) Incoming trunk to subscriber intermarker group calls in which a call associated with an incoming trunk requires that the office associated with the incoming trunk act as a tandem office so that the call may terminate to a subscriber in another No. 5 crossbar office located in the same building.

16.1 Subscriber to Subscriber Intermarker Group Call

A subscriber to subscriber intermarker group call will require the assistance of a marker in the office of the calling subscriber, that is, in the calling marker group and the assistance of a marker in the office of the called subscriber, that is, in the called marker group. The subscriber to subscriber intermarker group call will be set up through a subscriber to subscriber intermarker group trunk circuit.

16.11 Operation of the Marker in Calling Marker Group

The functions performed by the marker in the office of the calling subscriber when associated with a subscriber to subscriber intermarker group call are similar to the functions performed by the marker when assisting a subscriber outgoing call, as described in paragraph 11. However, the call will be associated with a subscriber to subscriber intermarker group trunk instead of an outgoing trunk and will be associated with an intermarker group sender instead of an outgoing sender.

The subscriber to subscriber intermarker group trunk will have one termination on a trunk link frame in the calling office and the other termination on a trunk link frame in the called office thus making it possible to interconnect the two offices through the intermarker group trunk.

The intermarker group sender will receive information from the marker associated with the calling office in the same manner as an outgoing sender receives information from a marker. However, instead of transmitting this information by pulsing over a trunk, the intermarker group sender will connect through a marker connector to a marker associated with the called office and will transmit this information to this marker in the same manner as for an incoming register circuit. Thus an intermarker group sender will operate, from a marker viewpoint, similar to the outgoing sender when associated with the marker in the calling office and will operate similar to the incoming register when associated with the marker in the called office.

16.111 Seizure of the Marker by the Originating Register

The seizure of the marker by the originating register is similar to a subscriber outgoing call as described in paragraph 11.1.

16.112 Registration of Information from Originating Register

The registration of information from the originating register is similar to a subscriber outgoing call, as described in paragraph 11.2.

16.113 Identification of the Basic Call or Connection

The identification of the basic call or connection is similar to a subscriber outgoing call, as described in Paragraph 11.3. However, instead of selecting a route associated with an outgoing trunk, a route relay will be operated which is associated with this intermarker group call and with a group of subscriber to subscriber intermarker group trunks. The called office code will be used by the marker to place ground on the code point and to operate a route relay associated with the other No. 5 crossbar office which is in the same building and which is served by a different marker group. In addition to the route R-relay associated with this intermarker group call being operated, the intermarker group IMG relay of Fig. 99 will be operated.

The IMG relay will be operated when the "IMG" cross-connection terminal of Fig. 99 is grounded. The OSA-0/4 relay upon operating grounds the "OSI-0/4" cross-connection terminal of Fig. 70, which is cross-connected to the "IMG" cross-connection terminal of Fig. 99, and operates the IMG relay.

16.114 Selection and Connection of an Intermarker Group Sender

The selection and connection of an intermarker group sender is similar to the selection and connection of an outgoing sender for a subscriber outgoing call, as described in Paragraph 11.4. A route indication which directs the marker to set up a connection to an office in the same building but served by another marker group, will direct the marker to seize the proper type of intermarker group trunk and an idle intermarker group sender. The marker will operate a number of relays in the intermarker group sender to register information which will be transmitted to the marker in the called marker group. The intermarker group sender will initiate the seizure of a marker in the called marker group when the marker associated with the calling marker group has been released.

Ordinarily, a marker obtains the class "INC" and "TAN" signals from an incoming register which obtains them from the incoming trunk through the incoming link. In the case of intermarker group operation an incoming register is not associated with the marker in the called marker group and the intermarker group sender performs the functions of an incoming register in the office of the called marker group. For an intermarker group call the class signal is determined by the type of trunk and the intermarker group sender could obtain the information from the intermarker group trunk in the same manner as an incoming register obtains this information from an incoming trunk. However, there is no incoming link between the intermarker group trunk and the intermarker sender over which to pass this information, so it is necessary for the intermarker group sender to obtain this information from the marker associated with the calling marker group. Since the class is a function of the type of trunk, it is also a function of the route and information can be obtained from cross-connections on the route relay. The "LT", "11", "X11", "FVD", "2DT" and "TT" signals are ordinarily obtained by a marker from either an originating register or an incoming register and the register may have to do a partial translating job to know which signal to give the marker in the called marker group. Since the intermarker group sender is not arranged to do any translation, the intermarker group sender will receive the "LT", "11", "X11", "FVD", "2DT" and "TT" signals from the marker associated with the calling marker group and will transmit these signals to the marker associated with the called marker group. The "CL-1/6" leads will transmit this information from the marker associated with the calling marker group as follows:

Class Signals Required	"CL-1/6" Lead Grounded	Indication to Called Marker
"LT", "INC"	None	Local translator, non-tandem
"11", "TAN"	"CL-1"	"11" prefix translator, tandem
"FVD", "INC"	"CL-2"	Five digit translator, non-tandem
"LT", "TAN"	"CL-1" "CL-2"	Local translator, tandem
"X11", "TAN"	"CL-3"	"X11" translator, tandem
"TT", "INC"	"CL-1" "CL-3"	Toll translator, non-tandem
"2DT", "INC"	"CL-2" "CL-3"	Two digit translator, non-tandem

In order to complete the call, the marker in the called marker group must know what trunk link frame to seize in order to find the intermarker group trunk. The number of the trunk link frame is passed from the trunk to the intermarker group sender through the sender link.

16.115 Intermarker Group Trunk Selection

The selection of a subscriber to subscriber intermarker group trunk is similar to the selection of an outgoing trunk for a subscriber outgoing call, as described in paragraph 11.5.

16.116 Selection of the Connecting Path

The selection of the connecting path is similar to the selection of a connecting path for a subscriber outgoing call, as described in paragraph 11.6.

16.117 Setting Up the Selected Connecting Path

The setting up the selected connecting path is similar to the setting up the selected connecting path for a subscriber outgoing call, as described in paragraph 11.7. When the advance indication "AV" signal is transmitted to the intermarker group sender by the marker in the calling office, the intermarker group sender will not seize a marker in the called office. The intermarker group sender will wait until the marker in the calling office is released, as indicated by the removal of ground from the "TG" lead, and will then initiate the seizure of a marker in the called office to complete the intermarker group connection.

16.118 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the release of the marker and associated circuits for a subscriber outgoing call, as described in paragraph 11.8 except the IMG relay will be released when the OSA-0/4 relay releases.

16.12 Operation of the Marker in Called Marker Group

The functions performed by the marker in the office of the called subscriber when associated with a subscriber to subscriber intermarker group call are similar to the functions performed by the marker when assisting a terminating call, as described in paragraph 12. However, instead of the incoming register initiating the seizure of the marker, the intermarker group sender will initiate the seizure of the marker through the register marker connector.

16.121 Seizure of the Marker by the Intermarker Group Sender

The seizure of the marker by the intermarker group sender is similar to the seizure of the marker by the incoming register for a terminating call, as described in paragraph 12.1. The intermarker group sender, from a marker viewpoint, will act in a manner similar to an incoming register and will seize the marker through the register marker connector. When the marker associated with the calling office is released the ground potential on the "TG" lead, which extends from the marker in the calling office to the intermarker group sender, will be removed. Removal of ground on the "TG" lead will indicate to the intermarker group sender to initiate the seizure of the marker associated with the called office. The intermarker group sender will provide information necessary for the marker operations which is normally supplied by the incoming register circuit.

16.122 Registration of Information from Intermarker Group Sender

The registration of information from the intermarker group sender is similar to the registration of information from the incoming register for a terminating call, as described in paragraph 12.2.

16.123 Identification of the Basic Call or Connection

The identification of the basic call or connection is similar to a terminating call, as described in paragraph 12.3.

16.124 Identification of the Location of the Called Line

The identification of the location of the called line is similar to a terminating call, as described in paragraph 12.4.

16.125 Called Line Busy Test

The called line busy test is similar to a terminating call, as described in paragraph 12.5.

16.126 Selection of the Connecting Path

The selection of the connecting path is similar to a terminating call, as described in paragraph 12.6.

16.127 Setting Up the Connecting Path

The setting up the connecting path is similar to a terminating call, as described in paragraph 12.7.

16.128 Setting Up the Selected Ringing Code

The setting up the selected ringing code is similar to a terminating call, as described in paragraph 12.8.

16.129 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to a terminating call, as described in paragraph 12.9.

16.2 Subscriber to Outgoing Trunk Intermarker Group Call

A subscriber to outgoing trunk intermarker group call will be set up through a subscriber to trunk intermarker group trunk to connect the calling subscriber in one marker group to an outgoing trunk in the other marker group.

16.21 Operation of the Marker in Calling Marker Group

The functions performed by the marker in the office of the calling subscriber when associated with a subscriber to outgoing trunk intermarker group call are similar to the functions performed by the marker on a subscriber to subscriber intermarker group call, as described in paragraph 16.11. However, instead of selecting a subscriber to subscriber intermarker group trunk for service the marker will select a subscriber to outgoing trunk intermarker group trunk for this call. The subscriber to outgoing trunk intermarker group trunk will have one termination on a trunk link frame in the calling office and another termination on a line link frame in the office associated with the outgoing trunk circuit.

16.22 Operation of the Marker in the Marker Group Associated with the Outgoing Trunk

The functions performed by the marker in the marker group associated with the outgoing trunk when associated with a subscriber to outgoing trunk intermarker group call are similar to the functions performed by the marker when assisting a tandem call, as described in paragraph 14. However, instead of the incoming register initiating the seizure of the marker, the intermarker group sender will initiate the seizure of the marker through the register marker connector. A connection will be established from the subscriber to outgoing trunk intermarker group trunk which is incoming to this marker group and which terminates on a line link frame to the outgoing trunk circuit which terminates on a trunk link frame.

16.221 Seizure of the Marker by the Intermarker Group Sender

The seizure of the marker by the intermarker group sender is similar to the seizure of the marker by the incoming register for a tandem call, as described in paragraph 14.1. The intermarker group sender, from a marker viewpoint, will appear similar to an incoming register and will seize the marker through the register marker connector. When the marker associated with the calling office is released the ground potential on the "TG" lead, which extends from the marker in the calling office to the intermarker group sender, will be removed. Removal of ground on the "TG" lead will indicate to the intermarker group sender to initiate the seizure of the marker associated with the outgoing trunk circuit. The intermarker group sender will provide information necessary for the marker operations which is normally supplied by the incoming register circuit.

16.222 Registration of Information from Intermarker Group Sender

The registration of information from the intermarker group sender is similar to the registration of information from the incoming register for a tandem call, as described in paragraph 14.2.

16.223 Identification of the Basic Call or Connection

The identification of the basic call or connection is similar to a tandem call, as described in paragraph 14.3.

16.224 Selection and Connection of an Outgoing Sender

If required, an outgoing sender will be selected and connected in a manner similar to a tandem call, as described in paragraph 14.4.

16.225 Identification of the Location of the Intermarker Group Trunk on the Line Link Frame

The identification of the line link frame location of the intermarker group trunk for a subscriber to outgoing trunk call, in the office associated with the outgoing trunk is similar to the identification of the location of the incoming tandem trunk on the line link frame, as described in paragraph 14.5 However for this call, the trunk number is determined by the sender link and is transmitted directly to the incoming register marker connector. The trunk link frame location of this trunk in the office associated with the outgoing trunk is transmitted from the intermarker group sender to the incoming register marker connector.

The determination of the trunk link frame number is necessary to afford a means of providing overflow tone in calls where all outgoing trunks are busy.

16.226 Outgoing Trunk Selection

The outgoing trunk selection is similar to a tandem call, as described in paragraph 14.6.

16.227 Selection of the Connecting Path

The selection of the connecting path is similar to a tandem call, as described in paragraph 14.7.

16.228 Setting Up the Connecting Path

The setting up the connecting path is similar to a tandem call, as described in paragraph 14.8.

16.229 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to a tandem call, as described in paragraph 14.9.

16.3 Incoming Trunk to Subscriber Intermarker Group Call

An incoming trunk to subscriber intermarker group call will be set up through a trunk to subscriber intermarker group trunk to connect the incoming tandem trunk in one marker group to the called subscriber in the other marker group.

16.31 Operation of the Marker in the Marker Group Associated with the Incoming Trunk

The functions performed by the marker in the marker group associated with the incoming tandem trunk when associated with an incoming trunk to subscriber intermarker group call are similar to the functions performed by the marker when assisting a tandem call, as described in paragraph 14. However, the call will be associated with an incoming trunk to subscriber intermarker group trunk instead of an outgoing trunk and will be associated with an intermarker group sender instead of an outgoing sender. The incoming trunk to subscriber intermarker group trunk will have one termination on a trunk link frame in the marker group associated with the incoming trunk and the other termination on a trunk link frame in the called office. A connection will be established between the appearance of the incoming tandem trunk on the trunk link frame in the office associated with the incoming tandem trunk and the appearance of the trunk on the line link frame in that office, to the trunk to subscriber intermarker group trunk which terminates on the trunk link frame of the called office.

16.311 Seizure of the Marker by the Incoming Register

The seizure of the marker by the incoming register is similar to a tandem call, as described in paragraph 14.1.

16.312 Registration of Information from the Incoming Register

The register of information from the incoming register is similar to a tandem call, as described in paragraph 14.2.

16.313 Identification of the Basic Call or Connection

The identification of the basic call or connection is similar to a tandem call, as described in paragraph 14.3. However, instead of selecting a route associated with an outgoing trunk, a route relay will be operated which is associated with this intermarker group call and with a group of incoming trunk to subscriber intermarker group trunks. The called office code when translated by the marker will be used to place ground on the associated code point and this ground will be used to operate a route relay associated with the other No. 5 crossbar office which is in the same building and which is served by a different marker group. In addition to the route R-relay associated with this intermarker group call being operated, the intermarker group IMG relay will be operated as described in paragraph 16.113.

16.314 Selection and Connection of an Intermarker Group Sender

The selection and connection of an intermarker group sender is similar to the selection and connection of an outgoing sender for a tandem call, as described in paragraph 14.4. A route indication which directs the marker to setup a connection to an office in the same building but served by another marker group, will direct the marker to seize the proper type of intermarker group trunk and an idle intermarker group sender. The marker will operate a number of relays in the intermarker group sender to register information which will be transmitted to the marker in the called marker group. The intermarker group sender will initiate the seizure of a marker in the called marker group when the marker associated with the incoming trunk has been released.

Class signals and other information will be transmitted to the intermarker group sender in the same manner as described in paragraph 16.114.

16.315 Identification of the Location of the Incoming Tandem Trunk on the Line Link Frame

The identification of the location of the incoming tandem trunk on the line link frame is similar to a tandem call, as described in paragraph 14.5.

16.316 Intermarker Group Trunk Selection

The selection of an incoming trunk to subscriber intermarker group trunk is similar to the selection of an outgoing trunk for a tandem call, as described in paragraph 14.6.

16.317 Selection of the Connecting Path

The selection of the connecting path is similar to a tandem call, as described in paragraph 14.7.

16.318 Setting Up the Selected Connecting Path

The setting up the selected connecting path is similar to a tandem call, as described in paragraph 14.8. When the advance indication "AV" signal is transmitted to the intermarker group sender by the marker associated with the incoming tandem trunk, the intermarker group sender will not seize a marker in the called office. The intermarker group sender will wait until the marker associated with the incoming tandem trunk is released, as indicated by the removal of ground from the "TG" lead, and will then initiate the seizure of a marker in the called office to complete the intermarker group connections.

16.319 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the release of the marker and associated circuits for a tandem call, as described in paragraph 14.9. The IMG relay will be released when the OSA-0/4 relay releases.

16.32 Operation of the Marker in Called Marker Group

The functions performed by the marker in the office of the called subscriber when associated with an incoming trunk to subscriber intermarker group call are similar to the functions performed by the marker on a subscriber to subscriber intermarker group call, as described in paragraph 16.12. However, an incoming trunk to subscriber intermarker group trunk will be associated with the call instead of a subscriber to subscriber intermarker group trunk.

17. PULSE CONVERSION CONNECTION

The marker circuit when assisting a pulse conversion connection performs or assists in the performance of five major functions as follows:

a. Registration of information from the incoming register which the marker requires in assisting a pulse conversion connection.

b. The identification of the call or connection which the marker will assist.

c. The seizure of the trunk link frame and connection to the outgoing trunk.

d. The selection and connection of an outgoing sender to the marker and to the outgoing trunk circuit.

e. Release of the marker and associated circuits after the marker has completed the pulse conversion connection functions.

17.1 Seizure of the Marker By the Incoming Register

The outgoing trunk to which the operator connects to complete this call recognizes that a seizure by an operator requires the pulse conversion connection and therefore connects the outgoing trunk to an incoming register through the incoming register link. The operator transmits the called subscriber directory number by means of multi-frequency key pulsing, to the incoming register. The incoming register records the digits of the called subscriber directory number, records the trunk link frame number associated with the outgoing trunk so that the marker can reach the outgoing trunk, and then the incoming register connects to a marker through an incoming register marker connector.

After the incoming register has recorded all the digits from the operator the incoming register will seize the incoming register marker connector with which it is associated if that incoming register marker connector is idle. Since the incoming register marker connector will not be provided on a one per incoming register basis but instead will be provided on the basis of one incoming register marker connector for a number of incoming registers, it is necessary for any incoming register in attempting to seize its associated incoming register marker connector to compete with the other incoming registers associated with this incoming register marker connector. If the incoming register marker connector is busy the incoming register must wait until it is idle before proceeding since no alternate incoming register marker connector is available.

The incoming register marker connector will have access to any marker and will test for and select an idle marker which will be seized and associated with the incoming register marker connector and incoming register.

17.11 Operation of the Incoming Register MST Relay and the Register Marker Connector RS and Connector Relays

When the incoming register desires to have access to a marker through its associated incoming register marker connector the marker start MST relay in the incoming register is operated. If the associated incoming register marker connector is idle and available the operation of the MST relay in the incoming register will seize the incoming register marker connector and operate the register start RS relay in the incoming register marker connector associated with this incoming register. The operation of the RS relay associated with this incoming register will lock-out all other incoming registers associated with this incoming register marker connector.

If the incoming register marker connector associated with the incoming register is not available the incoming register must wait until it becomes available.

The operation of the RS relay will operate the incoming register marker connector, register connector relays. The operation of the incoming register marker connector relays will extend a group of leads from the incoming register to the incoming register marker connector. The seizure of the incoming register marker connector will initiate the operation of the incoming register marker connector marker start MS relay associated with an idle marker. In each incoming register marker connector there is one MS relay for each marker circuit to which the incoming register marker connector may require access.

The operation of the MS relay will initiate the seizure of the associated marker. The operation of the MS relay will also operate the incoming register marker connector, marker connector relays. The operation of the incoming register marker connector will extend a group of leads from the incoming register to the marker circuit.

17.12 Operation of the CKG-1/7, TLC-1/3, LLC-1/2, and ONW Relays

To provide a large number of off-normal ground and battery potentials to the marker circuit the CKG-1/7, TLC-1/3, LLC-1/2 and ONW relays in the marker circuit will be operated.

The operation of the incoming register connector MA relay will ground the "CKG" lead in the register marker connector. The "CKG" lead is extended to the marker circuit and with the TRLA and DIS-1/2 relays non-operated the ground on the "CKG" lead will be extended to operate the CKG-1/3 relays.

The operation of the CKG-3 relay will operate the CKG-4 relay, with the GP-2, RCY-1 and RAV-2 relays non-operated.

The operation of the CKG-3 relay will in turn operate the CKG-5 relay and with the DIS-2 relay non-operated the CKG-6/7 relays will be operated.

The TLC-1/3 relay windings in series are extended over the "TLC-1" lead through the non-operated MRL-1 relay, over the "TLC-1" lead to the "TLC" lead. The operation of the CKG-3 relay with the DIS-1 and the TRLA relays non-operated will extend the "TLC" lead and with the RAV-1 and RCY relays non-operated ground will be placed on the "TLC" lead, thereby operating the TLC-1/3 relays.

The LLC-1/2 and ONW relay windings in series are extended over the "LLC-1" lead. The LLC-1/2 and ONW relays are operated with the CKG-4 and CKG-5 relays operated and with the MRL-1, DIS-1, TRLA, BY, OV, LK-1, and RCY-2 relays non-operated.

17.13 Operation of the MCB-1/6 Relays and the Operation of the CB Relays in the Marker Connectors

The MCB-1/6 relays in the marker and the CB relays in the marker connectors are operated as described for a dial tone connection in paragraph 7.16 and 7.17.

17.2 Identification of the Basic Call or Connection

To identify this call as a pulse conversion connection the pulse conversion revertive PCR relay or one of the pulse conversion dial PCD-0/1 relays will be operated. If a pulse conversion connection is required for converting the operator's multi-frequency key pulsing to revertive pulse signaling the PCR relay will be operated. If a pulse conversion connection is required for converting the operator's multi-frequency key pulsing to dial pulse signaling one of the PCD-0/1 relays will be operated. In some offices it may be necessary to require that two dial pulse sender groups be provided because of traffic requirements. The PCD-0/1 relays are provided to give an indication as to which dial pulse sender group is required for this pulse conversion connection.

The operation of one of the PCR or PCD-0/1 relays will operate the associated route R- relay. The operation of one of the PCR or PCD-0/1 relays and the route R- relay will initiate the marker functions required for a pulse conversion connection.

17.21 Operation of the PCR, PCD-0 or PCD-1 Relay

The PCR relay winding will be extended over the "PCR" lead, the PCD-0 relay winding will be extended over the "PCD" lead, and the PCD-1 relay winding will be extended over the "PCD-1" lead to the incoming register marker connector. Ground will be extended from the incoming register through the incoming register marker connector to operate the associated PCR, PCD-0, or PCD-1 relay.

17.22 Operation of the Route R- Relay

The operation of the PCR, PCD-0 or PCD-1 relay will operate the route R- relay associated with this pulse conversion connection. There will be one route R- relay associated with each of the PCR, PCD-0 and PCD-1 relays. The operation of the PCR relay, with the CKG-1 relay operated, will extend ground potential to the "PCR" cross-connection terminal of Fig. 95 or the operation of one of the PCD-0/1 relays, with the CKG-1 relay operated, will extend ground potential to the associated "PCD-0" or "PCD-1" cross-connection terminal of Fig. 96. The "PCR", "PCD-0" and "PCD-1" cross-connection terminals are cross-connected to the associated "RC" cross-connection terminal of Fig. 51 thereby operating the associated route R- relay of Fig. 51. The "R-" cross-connection terminal of Fig. 51 will be cross-connected to the "RB" cross-connection terminal of Fig. 53.

17.23 Operation of the PCL-1, PCL-2, PCL-3 and PCCL Relays

The operation of one of the associated route R- relays associated with this pulse conversion connection will operate one of the outgoing sender group OSG-0/4 relays and the outgoing sender connector OGC relay, as described in paragraph 17.4. The operation of the OSG-0/4 relay will result in the operation of the pulse conversion marker class PCL-1/3 relays while the operation of the OGC relay will initiate the operation of the pulse conversion class lead connector PCCL relay.

The windings of the PCL-3, PCL-2 and PCL-1 relays are in series with each other and the operating path will be extended through the operated PCR or PCD-0/1 relay contacts, through the non-operated NSI relay, through the operated OSG-0/4 relay, through the non-operated RTST, LR and TR2E to the "TRK" lead to the incoming register marker connector circuit where the "TRK" lead is grounded, thereby operating the PCL-1/3 relays.

The operation of the PCL-2 relay and the OGC relay with the RNT-2 relay non-operated will operate the PCCL relay.

17.3 Registration of Information from the Incoming Register

After the seizure of the marker, the called subscriber directory number and the identification of the trunk link frame with which the outgoing trunk circuit is associated will be transferred from the incoming register to the marker circuit.

17.31 Called Subscriber Number Registration

For a pulse conversion connection the assisting operator will select and manually connect to an outgoing trunk associated with the called office. Therefore, usually, the office code of the called subscriber will not be required and therefore the operator will not transmit this information to the incoming register. However, the operator will transmit to the incoming register the numerical digits of the called subscriber directory number. Also in certain cases it may be necessary to transmit a directing digit in addition to the numerical digits.

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17.311 Identification of the Numericals of the Called Line and the Operation of the AC-0/7, BC-0/7 and CC-0/7 Relays

A group of register relays AC-0/7 are provided which will record the first digit transmitted by the operator which may be the first numerical digit of the called subscriber directory number or which may be a directing digit. If the register BC-0/7 and CC-0/7 relays are provided they will record the second and third digits transmitted by the operator. The operation of the incoming register marker connector relays will extend a group of leads designated "A-0/7", "B-0/7" and "C-0/7" from the incoming register to the marker. The incoming register will place ground on two of the "A-0/7" leads to identify the first digit, on two of the "B-0/7" leads to identify the second digit and on two of the "C-0/7" leads to identify the third digit. Therefore two AC-0/7 relays will be operated and if provided two BC-0/7 relays and two CC-0/7 relays will be operated. To identify the fourth digit the incoming register will place ground on two of the "D-0/7" leads and if a fifth digit is required two of the "E-0/7" leads will be grounded.

17.32 Identification of the Trunk Link Frame Associated With the Outgoing Trunk and the Operation of the FG-0/1 and TF-0/7 Relays

The operation in the incoming register marker connector circuit has extended from the incoming register to the marker a group of five trunk link frame units "TF-0/7" leads and two trunk link frame tens "FG-0/1" leads in order to identify the trunk link frame associated with the outgoing trunk. Ground potential has been placed on two of the group of five "TF-0/7" leads by the operation of one TF-0/9 relay in the incoming register thereby operating in the marker the two associated trunk link frame units TF-0/7 relays. Also, ground potential has been placed on one of two "FG-0/1" leads by the operation of one FG-0/1 relay in the incoming register thereby operating in the marker the one associated trunk link frame tens FG-0/1 relay. The operation of two TF-0/7 relays and one FG-0/1 relay will identify the trunk link frame associated with the outgoing trunk.

17.4 Selection and Connection of an Outgoing Sender

When a pulse conversion connection is to be established an outgoing sender of the proper type and associated with the outgoing trunk must be selected and connected to the marker and also connected through the outgoing sender link circuit to the outgoing trunk associated with this connection. After the marker has identified this call or connection as a pulse conversion connection and has operated the route R-relay associated with this pulse conversion connection the selection and connection of an outgoing sender will be initiated.

The selection and connection of an outgoing sender for a pulse conversion connection is similar to the selection and connection for an outgoing sender for a subscriber outgoing call, as described in paragraph 11.4.

When the outgoing sender connector has been selected and seized the trunk link frame will be seized.

17.41 Outgoing Sender Subgroup Selection

The outgoing sender subgroup selection for a pulse conversion connection is similar to the outgoing sender subgroup selection for a subscriber outgoing call, as described in paragraph 11.41. However the SOG-1/3 relays will not be operated, as described in paragraph 11.412.

17.42 Outgoing Sender Selection

The outgoing sender selection for a pulse conversion connection is similar to the outgoing sender selection for a subscriber outgoing call, as described in paragraph 11.42.

17.43 Marker Connection to the Selected Outgoing Sender

The marker connection to the selected outgoing sender for a pulse conversion connection is similar to the marker connection to the selected outgoing sender for a subscriber outgoing call, as described in paragraph 11.43.

17.44 Transfer of Information From Marker to Outgoing Sender

The transfer of information from marker to outgoing sender for a pulse conversion connection is similar to the transfer of information from marker to outgoing sender for a subscriber outgoing call, as described in paragraph 11.44. However, since the office code of the called subscriber is not required and has not been transmitted by the operator, the office code information will not be received by the marker and therefore will not be transmitted to the outgoing sender.

The leads which transmit the office code and numericals of the called number for a subscriber outgoing call were extended to the outgoing sender circuit by the operation of the KG, KA, KBC, KDE and KFG relays, as described in paragraph 11.441. For a pulse conversion connection associated with a pulse conversion from multi-frequency pulsing to dial pulsing the leads which transmit the numericals of the called number are extended to the outgoing sender circuit by the operation of the KG, KA, KBC, KDE and KFG relays in a manner similar to a subscriber outgoing call.

For a pulse conversion connection associated with a pulse conversion from multi-frequency pulsing to revertive pulsing the leads which transmit the numericals of the called number are extended to the outgoing sender circuit by the operation of the digit cut-in and shift KGS-1/2 relays instead of the KA, KBC, KDE and KFG relays. The KGS-1/2 relays in series will be operated when the OGC relay operates, with the pulse conversion revertive pulsing PCR relay operated and the RSC and OST-2 relays non-operated. The operation of the KGS-1/2 relays not only extend the leads which transmit the numericals of the called number to the outgoing sender but also shift the position of the digit information which is transmitted to the outgoing sender. If the office codes of the local area panel offices consist of only two digits, the marker is wired so that the "A" digit information which the marker has received will be transmitted to the outgoing sender circuit over the "C" digit leads. Likewise the "B", "C" and "D" digits which the marker has received will be transmitted to the outgoing sender circuit over the "D", "E", and "F" digit leads. If the office codes of the local area panel offices consist of only three digits or a combination of two or three digits, the marker is wired so that the "A", "B", "C" and "D" digits which the marker has received will be transmitted to the outgoing sender circuit over the "D", "E", "F" and "G" digit leads. This digit shift is necessary for the proper operation of the revertive outgoing sender circuit.

The operation of the DL-0/6 relay for this call is similar to the description in paragraph 11.4421, except that for a call requiring pulse conversion only the DL-0 relay will be operated as an indication to transfer no delete information to the sender. The "DL" cross-connection terminal of Fig. 51 is cross-connected to the "DLOP" cross-connection terminal of Fig. 67 and with the R- relay operated and the GS- and TX relays non-operated the DL-0 relay will be operated in series with the DLP relay.

The operation of the CR-0/10 relay for this call is similar to the description in paragraph 11.443, except that for a call requiring pulse conversion only the CR-0S relay will be operated in calls associated with revertive sender routes and the CR-10S relay will be operated in calls associated with dial sender routes. The "CR" cross-connection terminal of Fig. 51 associated with a dial sender route is cross-connected to the "CR-10S" cross-connection terminal of Fig. 67 and with the R- relay operated and the GS- and TX relays non-operated the CR-10 relay will be operated in series with the CRS relay. The "CR" cross-connection terminal of Fig. 51 associated with a revertive sender route will be cross-connected to the "CR-0S" cross-connection terminal of Fig. 67 and with the R- relay operated and the GS- and TX relays non-operated the CR-0 relay and the CRS relay will be operated in series. The operation of the CR-10 relay will not transmit any information to the outgoing sender. However, the operation of the CR-0 relay with the TGS1 relay operated will extend ground to the "CR4" and "CR7" leads to the outgoing sender connector, and with the outgoing sender connector relays operated will operate the associated CR-4, 7 relays in the outgoing sender. After the CR-4, 7 relays in the outgoing sender operate they will be locked operated to an off-normal ground in the outgoing sender and this ground will be extended back to the marker on the "CR-4,7" leads to supply a holding ground for the CRK-1/2 relays after the TGS-1 relay releases.

The operation of the CL-0/5 relay for this call is similar to the description in paragraph 11.4442, except that for a call requiring pulse conversion only the CL-2 relay will be operated as an indication that no incoming trunk class information will be transmitted to outgoing sender by the CL- relays. However, the incoming trunk class information will be transmitted to the outgoing sender when the PCN-2, PCN-3, or PCN-5 relays are operated. The operation of the PCN-2, PCN-3, and PCN-5 relays is described in paragraph 17.57. The "CL" cross-connection terminal of Fig. 51 is cross-connected to the "CL-2S" cross-connection terminal of Fig. 67 and with the R- relay operated and the GS- and TX relays non-operated the CL-2 relay will be operated in series with the CLS relay; no trunk class information will be transmitted to the outgoing sender. The CLK-1 and CLK-2 relays will release when the TGS-1 relay releases. The operating ground for the PCN-2, PCN-3 and PCN-5 relays will also be extended to the associated "CL-2", "CL-3" and "CL-5" leads to the outgoing sender connector with the PCL-1 relay operated, and with the outgoing sender connector operated will operate the associated CL-2, CL-3, or CL-5 relay in the outgoing sender to identify the incoming trunk class.

After the CL- relay in the outgoing sender operates it will be locked operated to an off-normal ground in the outgoing sender and this ground will be extended back to the marker on the "CL-" lead to supply a holding ground for the PCN- relay after the PCCL relay releases.

17.45 Outgoing Sender Connection to Outgoing Trunk

The outgoing sender connection to the outgoing trunk for a pulse conversion connection is similar to the outgoing sender connection to the outgoing trunk for a subscriber outgoing call, as described in paragraph 11.45, except the trunk F relay for this call is operated in the manner described in paragraph 17.54.

17.46 Release of the Outgoing Sender Connector

The release of the outgoing sender connector for a pulse conversion connection is similar to the release of the outgoing sender connector for a subscriber outgoing call, as described in paragraph 11.46, except the operation of the RSC relay will be different. In this call, with the XT-5, AMA-4, ND1, NDK, and CVS relays non-operated, with the CR-10 relay operated (for dial senders) or the CRK-1/2 relays operated (for revertive senders), the CRS, CL-2, CLS, and DL-0 relays operated, with the AMA-3 relay non-operated, the ORK-1, ORK-2, and OST-2 relay operated, and with the OST, OST-1, and OSE relays non-operated and the OST-2 relay operated the RSC relay will be operated.

17.47 Advance Indication to Outgoing Sender

After the marker has checked that the common channel of the outgoing sender connector has been released the marker will transmit an advance indication to the outgoing sender so that the outgoing sender may initiate the outgoing sender functions.

17.471 Operation of the Outgoing Sender AV Relay

When the marker has checked that the common channel of the outgoing sender connector has been released, as indicated by the release of the OSC relay, the marker operates the advance AV relay in the selected outgoing sender circuit. The outgoing sender AV relay operates in series with the primary winding of the marker circuit advance check AVK relay and the AVK-1 resistance. The operating circuit for the operation of the outgoing sender AV relay is through the winding of the marker AVK relay with a polarity to hold the AVK relay in the non-operated condition.

The operating path of the outgoing sender AV relay will be extended from the winding of the AV relay, over the "AV" lead from the outgoing sender to the outgoing sender connector, through the operated S relay contacts, over the "AV" lead to the marker circuit, through the operated RSC relay contacts, through the operated RNK-1/2 relay contacts, through the operated PCL-3 relay contacts, through the primary winding of the AVK relay, through the AVK-1 resistance, through the operated SLK-2 relay contacts, through the operated SIK relay contacts, through the operated PCL-2 relay contacts, and through the operated RSC relay contacts to ground potential. After operating the outgoing sender AV relay locks operated to ground potential with the outgoing sender ON relay operated.

17.472 Operation of the Marker AVK and AVK-1 Relays

The operation of the outgoing sender AV relay has placed ground on the "AV" lead in the outgoing sender to lock operated the outgoing sender AV relay. The ground potential on the "AV" lead will be extended to the marker thereby resulting in the operation of the AVK relay to check that the outgoing sender AV relay has locked operated. The ground on the "AV" lead from the outgoing sender will be extended, over the same path as the operating path of the sender AV relay, to the primary winding of the AVK relay to operate the AVK relay. The other side of the primary winding of the AVK relay is extended to battery potential through the AVK-2 relay with the BG relay operated.

The operation of the AVK relay with the OSK and SON relays operated will operate the AVK-1 relay.

17.5 Seizure of the Trunk Link Frame and Connection to the Outgoing Trunk

The incoming register has informed the marker of the identity of the trunk link frame associated with the outgoing trunk circuit, as described 17.3. After the marker has identified this connection as a pulse conversion connection, as indicated by the operation of the PCL-2 relay, and after the marker has seized an outgoing sender connector, as indicated by the operation of the SKA-1 or SKB-1 relay, the marker will initiate the seizure of the trunk link frame associated with the outgoing trunk and will connect to the outgoing trunk circuit through the trunk link frame.

17.51 Operation of the Trunk Link and Connector MP Relay and the Marker TFK-3 Relay

In each trunk link and connector circuit there is one marker preference MP relay associated with each marker circuit to which the trunk link frame has access. In order to secure access to a trunk link frame a marker will operate in the selected trunk link and connector circuit the MP relay associated with this marker. To indicate that the marker has seized the selected trunk link frame the trunk link frame check TFK-3 relay in the marker circuit will be operated.

Each trunk link and connector circuit MP relay winding will be extended when the TR-0/5 relay is non-operated from the trunk link and connector circuit over the associated "ST-" lead to the marker circuit with which the MP relay is associated. After the outgoing sender has been seized the SKA-1 or SKB-1 relay will be operated thereby extending the "ST-" lead, with the FG-0/1 and TF-0/7 relays operated, the SPL-1 relay non-operated, the PCL-2 relay operated, the SP relay non-operated, and the TLC1 relay operated, to the battery potential in series with the TFS lamp thereby operating in the trunk link frame associated with the outgoing trunk the MP relay associated with this marker.

To indicate that this marker has seized the selected trunk link frame the TFK-3 relay in the marker circuit will check that the selected trunk link and connector circuit MP relay associated with this marker is operated and all other prior preferred MP relays within the same trunk link and connector circuit are non-operated. The operation of the trunk link and connector MP relay will ground the "CK" lead if no MP relay of prior preference in the same trunk link and connector circuit is operated. The grounded "CK" lead will be extended to the marker and to the marker TFK-3 relay when the marker PCL-3 relay is operated. The grounding of the "CK" lead will therefore operate the marker circuit TFK-3 relay as an indication that the trunk link frame has been seized.

17.52 Operation of the Trunk Link and Connector MC, MCA, MCB, MCC and MCD Relays

The operation of the trunk link and connector MP relay with the associated TR-0/5 (M.D.), T, or TA relay non-operated, will operate the trunk link and connector MC relay associated with this marker.

The operation of the trunk link and connector MC relay will extend the associated trunk link and connector circuit MCA, MCB, MCC and MCD relay windings over the "BS-0/4" leads to the marker circuit. Since the marker circuit has been operated battery potential has been placed on the "BS-0/4" leads in the marker circuit thereby operating the trunk link and connector MCA, MCB, MCC and MCD relays.

17.53 Operation of the MAK-1 and MDK Relays

The operation of the trunk link and connector MCA relay will ground the "MAK" lead which is extended to the marker circuit to operate the MAK-1 relay as a check that the MCA relay has operated.

The operation of the trunk link and connector MCD relay will ground the "MDK" lead which is extended to the marker circuit to operate the MDK relay as a check that the MCD relay has operated.

17.54 Operation of the F Relay in the Outgoing Trunk

The F relay in the trunk is operated to give an indication as to which trunk in the seized trunk link frame is associated with this call. The operation of the trunk F relay, and the operation of the outgoing sender link select magnet, and the operation of the trunk link frame connector relays will operate the outgoing sender link hold magnet associated with this call.

When the marker TFK-3 relay operates with the PCD-0/1 or PCR and TLC-1 relays operated and the DCT-1 and OFH-1 relays non-operated battery potential will be extended over the "F" lead in the marker through the operated incoming register marker connector and through the operated incoming register link crosspoints to operate the F relay.

17.55 Operation of the FA- or FB-, LV-2/9 and LC-0/9 Relays in the Trunk Link and Connector Circuit

The operation of the F relay in the outgoing trunk will operate either the FA- or FB- relay in the trunk link and connector circuit which in turn will operate the associated LV-2/9 relay.

Battery potential will be extended to the trunk link and connector on the "BLC" lead with the TX and LK-1 relays in the marker non-operated and on the "ALC" lead with the TX, LK-1 and ITR-2 relays non-operated. The operation of the trunk link and connector relays and LV-2/9 relay with the associated FA- relay operated will extend the battery potential on the "ALC" lead to operate the LC-0/9 relay. The operation of the trunk link and connector relays and LV-2/9 relay with the associated FB- relay operated will extend the battery potential on the "BLC" lead to operate the LC-0/9 relay.

17.56 Operation of the ONN, 2MB, 3FB, or 5MT Relays of Fig. 65

The operation of the FA- or FB- relay in the trunk link and connector will extend ground potential to the marker on the "ONN," "2MB", "3FB", and "5MT" leads to operate the associated ONN, 2MB, 3FB, or 5MT relays. The operation of the ONN, 2MB, 3FB, or 5MT relay will identify the incoming trunk class.

17.57 Operation of PCN-0, PCN-2, PCN-3, and PCN-5 Relays

The pulse conversion trunk class relays PCN-0, PCN-2, PCN-3, or PCN-5 will be operated when its associated ONN, 2MB, 3FB, or 5MT relay operates with the PCCL relay operated. The PCN-0, 2, 3 and 5 relays check that only one incoming trunk class has been received.

17.58 Operation of the RNT-1, RNT, and RNT-2 Relays and the Release of the PCCL Relay

The RNT-1 relay will be operated when one and only one of the PCN-0, 2, 3 and 5 relays operated, with the RNT-2 and RNT relays non-operated, and the CKG-6 and OST-2 relays operated. After operating, the RNT-1 relay will lock operated with the PCCL relay operated.

The marker transmits the class of the incoming trunk to the outgoing sender on the "CL-2, 3, or 5" leads. The marker supplies the operating ground for the outgoing sender CL- relays and then must check that the sender CL- relays have operated. After the CL- relays in the outgoing sender operate they will be locked operated to an off-normal ground in the outgoing sender and a holding ground for the PCN- relay will be transmitted to the marker. The ground potential supplied by the marker on the "CL-" leads will be removed and if the PCN- relay remains operated it will indicate that the outgoing sender CL- relay has operated and locked operated. The RNT relay is condenser timed operated to allow enough time for the operation of the sender CL- relays before the circuit is checked. The RNT relay is also condenser timed released to allow any outgoing sender registration relay which has operated to be released if the sender CL- relay has failed to lock operated.

Before the operation of the RNT-1 relay, approximately 12 volts of negative polarity was applied to the positive end of the primary winding of the RNT relay due to the voltage divider resistances RNT-2 and RNT-3. This 12 volt potential applied to the primary winding of the RNT relay biases the RNT relay in the non-operate direction. The operation of the RNT-1 relay reverses the direction of current flow through the primary winding of the RNT relay and removes the shunting ground potential from the secondary winding of the RNT relay. Current will flow through the secondary winding in the non-operate direction to charge the RNT condenser. As the RNT condenser charges, the current flow in the secondary winding will be steadily reduced. The RNT relay will be operated when the non-operate current flow in the secondary winding is reduced to such a magnitude that the current in primary winding will operate the relay.

The operation of the RNT relay will operate the RNT-2 relay with the RNT-1, CKG-6, OST-2 and one and only one of the PCN-0, 2, 3 and 5 relays operated. The RNT-2 relay will be locked operated to ground with the OGC relay operated.

The operation of the RNT-2 relay will release the PCCL relay.

17.59 Operation of the RNK-1 and RNK-2 Relays and the Release of the RNT-1 and RNT Relays

The release of the PCCL relay will release the RNT-1 relay.

The release of the RNT-1 relay will cause a reversal in the direction of current flow in the primary winding of the RNT relay, which will initiate the return of the RNT relay to the non-operated position. The release of the RNT-1 relay will also allow the RNT condenser to discharge through the secondary winding of the RNT relay in the opposite direction. When the RNT condenser has been sufficiently discharged the reverse current flow in the primary winding will return the RNT relay to the non-operated position. The time interval between the release of the RNT-1 relay and the return of the RNT relay to the non-operated position will allow the sender CL- relay to release if it has not locked operated.

The release of the PCCL relay will remove the operating ground from the PCN-0, 2, 3, or 5 relay and the PCN-2, 3, or 5 relay will be held operated by the outgoing sender CL- relay locking ground returned to the marker on the "CL-" lead, while the PCN-0 relay will be locked operated with the PCL-3 relay operated. The RNK-1/2 relay will be operated when the RNT relay returns to the non-operated position and with the RNT-2 and CKG-6 relays operated and one and only one of the PCN-0, 2, 3, and 5 relays operated.

17.6 Release of the Marker and Associated Circuits

After the marker circuit has completely performed the pulse conversion connection functions, the marker circuit will be released from this pulse conversion connection and will be recycled to an idle condition so as to be available for assistance to other calls or connections.

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously, the circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

17.61 Recycle of the Marker Release Control

In light traffic periods the marker remains connected to the outgoing sender through the individual channel until the outgoing sender performs trunk test. The outgoing sender will retain a ground closure on the "TG" lead until battery and ground have been detected over the trunk conductors.

17.611 Operation of the LK-1 Relay

Before the marker will give a release indication the marker will check that the outgoing sender has received the advance signal from the marker and has operated the outgoing sender AV relay.

The linkage check LK-1 relay will be operated when the AVK-1 relay is operated with the PCL-2 and RSC relays operated. The LK-1 relay will be locked operated with the CKG-4 relay operated.

17.612 Operation of the TG, TGT, DIS-1, DIS-2 and DISA Relays

The marker trunk guard TG relay is operated when the sender ON relay operates to place ground on the "TG" lead to the marker circuit. The outgoing sender will retain a ground closure on the "TG" lead until battery and ground have been detected over the trunk conductors.

Under light traffic conditions, as determined by the HTR relay being non-operated, if the outgoing sender has completed trunk test and the TG relay has released before the LK-1 relay has operated the operation of the LK-1 relay will extend ground to operate the DIS-1 and DIS-2 relays. However, if the outgoing sender has not completed trunk test the TG relay will be operated and therefore when the LK-1 relay is operated ground will be extended to operate the TGT relay. The operation of the TGT relay will extend ground to operate the DIS-1 and DIS-2 relays.

Under heavy traffic conditions, as determined by the HTR relay being operated, the operation of the LK-1 relay will operate the DIS-1 and DIS-2 relays whether or not the sender has completed trunk test.

The operating path of the TGT relay, under the light traffic condition, is extended from the winding of the TGT relay, through the contacts of the operated TG relay, through the contacts of the non-operated HTR relay, through the contacts of the non-operated RRK and RRC relays, through the contacts of the non-operated PSR relay, through the contacts of the non-operated TRS relay, through the contacts of the operated PCL-2 relay, through the contacts of the non-operated MT-14 relay, through the contacts of the non-operated ITR-2 relay, through the contacts of the non-operated LHT relay, through the contacts of the operated LK-1 relay to the operating ground potential.

Under the light traffic condition with the TG and TGT relays operated the operating path of the DIS-1 and DIS-2 relays in series is extended from the winding of the DIS-1 relay, with the MT-1, MON-1, TRL-1, TRR and TR-1 relays non-operated and with the TGT relay operated, to the operating ground potential.

Under the light traffic condition with the TG and TGT relays non-operated or under the heavy traffic condition the operating path for the DIS-1 and DIS-2 relays

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in series is extended from the winding of the DIS-1 relay, to the "DIS-1" lead with the MT-1, MON-1, TRL-1, TR-R and TR-1 relays non-operated, to the "DIS-1" lead or to the "TG" lead if the TG relay is non-operated, to the "DIS-1" lead if the HTR relay is either operated or non-operated, to the "DIS-1" lead with the RRK and RRC relays non-operated, to the "DIS-1" lead with the PSR relay non-operated, to the "LLK-2" lead with the TRS relay non-operated, to the "LK-2" lead with the MT-14 relay non-operated, to the "LK-2" lead with the ITR-2 relay non-operated, to the "LK-1" lead with the LHT relay non-operated and to operating ground potential with the LK-1 relay operated.

The DIS-2 relay in operating will operate the DISA relay.

17.613 Release of the TLC-1/3, CKG-1/7, LIC-1/2 and ONW Relays

The operation of the LK-1, DIS-1 and DIS-2 relays will release the LLC-1/2, TLC-1/3, ONW, CKG-1/3 and CKG-6/7 relays. The release of the CKG-3 relays will release the CKG-4/5 relays.

17.614 Operation of the Incoming Register MRL Relay and the Release of the Register Marker Connector and the Incoming Register

The operation of the DIS-1/2 relays with the marker MRL-1 relay non-operated will extend ground over the "MRL" lead to the incoming register marker connector and to the incoming register circuit to operate the MRL relay in the incoming register circuit. The operation of the MRL relay will release the incoming register from this pulse conversion connection and will also release the incoming register marker connector circuit.

17.615 Release of the DIS-1 and DIS-2 Relays

The release of the incoming register marker connector will release the DIS-1 and DIS-2 relays if the TGT relay is released. If the TGT relay has been operated the marker must wait until the sender has completed trunk test and released the TG relay before the TGT relay will be released and the DIS-1 and DIS-2 relays released.

17.616 Release of the MCB-1/6 Relays and the Marker Connector CB Relays

The release of the DIS-2 relay will release the MCB-1/6 relays which in turn will release the CB relays associated with this marker circuit in all marker connector circuits. The release of the CB relays associated with this marker circuit will indicate that this marker is idle and available for service.

17.617 Release of the DISA Relay

The release of the MCB1 relay will release the DISA relay.

17.62 Release of the Identification of the Call Functions

17.621 Release of the PCR, PCD-0 or PCD-1 and R- Relays

The release of the incoming register marker connector will release the operated PCR, PCD-0 or PCD-1 relays which in turn will release the associated R- relay.

17.622 Release of the PCL-1/3 Relays

The release of the operated PCR, PCD-0 or PCD-1 relay will release the operated PCL-1/3 relays.

17.63 Release of the Registration of Information from the Incoming Register Functions

17.631 Release of the AC-0/7, BC-0/7 and CC-0/7 Relays

The release of the incoming register marker connector will release the operated AC-0/7, BC-0/7 and CC-0/7 relays.

17.632 Release of the TF-0/7 and FG-0/1 Relays

The release of the incoming register marker connector will release the TF-0/7 and FG-0/1 relays.

17.64 Release of the Selection and Connection of an Outgoing Sender Functions

The release of the selection and connection of an outgoing sender functions for a pulse conversion connection is similar to the release of the selection and connection of an outgoing sender functions for a subscriber outgoing call, as described in paragraph 11.84.

17.65 Release of the Seizure of the Trunk Link Frame and Connection to the Outgoing Trunk Functions

17.651 Release of the Trunk Link and Connector MP, MC, MCA, MCB, MCC and MCD Relays

The release of the TLC-1 relay will release the trunk link and connector MP, MCA, MCB, MCC and MCD relays. The release of the MP relay will release the trunk link frame MC relay.

17.652 Release of the TFK-3, MAK-1 and MDK Relays

The release of the trunk link and connector MP relay will release the TFK-3 relay. The release of the trunk link and connector MCA relay will release the MAK-1 relay and the release of the trunk link and connector MCD relay will release the MDK relay.

17.653 Release of the Trunk F Relay, the Trunk Link and Connector FA- or FB-, LV-2/9 and LC-0/9 Relays

The release of the TLC-1 relay will release the F relay in the trunk. The trunk F relay upon releasing will release the operated FA- or FB- relay in the trunk link and connector. The release of the FA- relay will release the LV-2/9 and LC-0/9 relays in the trunk link and connector.

17.654 Release of the ONN, 2MB, 3FB and 5MT Relays

The release of the FA- or FB- relay in the trunk link and connector will release the operated ONN, 2MB, 3FB or 5MT relay.

17.655 Release of the PCN-0, PCN-2, PCN-3, PCN-5, RNK-1, RNK-2 and RNT-2 Relays

The release of the PCL-1 or PCL-3 relays will release the operated PCN-0, 2, 3, or 5 relay.

The release of the CKG-6 relay will release the RNK-1 and RNK-2 relays.

The release of the OGC relay will release the RNT-2 relay.

18. SUBSCRIBER SERVICE CALLS

There are three types of subscriber service calls which require special operations by a marker.

a. Manual subscriber originating call.

b. Zero operator calls.

c. Special service code calls.

It is sometimes necessary to serve certain originating traffic in a dial office on a manual basis. Such subscribers are referred to as manual subscribers, and calls from such lines are manual calls. In this system, such lines are given a manual class of service. A call originating from a manual subscriber is routed to an originating register in the normal dial tone connection manner. The marker when it makes class of service identification, identifies that the call is of the manual class and transmits this information to the originating register, and the marker releases. The originating register does not transmit dial tone but immediately engages a marker which assists in the connection of the subscriber to an outgoing trunk which connects to an operator. The operator completes the call to the desired number at the request of the subscriber.

A subscriber who wishes to be connected to a zero operator dials zero when dial tone is transmitted from the originating register. The register records the zero digit and immediately engages a marker. The marker establishes a connection between the calling subscriber and an outgoing trunk which connects to an operator.

A subscriber making a special service code call to an X11 operator (long distance, repair service, etc.) dials the X11 code when dial tone is transmitted from the originating register. The register records the dialed code and engages a marker. The marker establishes a connection between the calling subscriber and an outgoing trunk which connects to the proper X11 operator.

The marker operations required in assisting a manual subscribers originating call, a zero operator call or a special service code call are similar. In each case the marker must assist a connection from the calling subscriber to an outgoing trunk circuit which connects to the operator required for service.

The marker will operate in a manner similar to a subscriber outgoing call, as described in paragraph 11., except that an outgoing sender circuit will not be required to complete this call, since it is not necessary to transmit dial pulse, revertive pulse or multi-frequency pulse information to a distant office. Therefore, these types of calls are, from a marker viewpoint, sometimes called a non-sender outgoing call.

The marker circuit when assisting the completion of one of these subscriber non-sender outgoing calls performs or assists in the performance of six major functions as follows:

a. Registration of information from the originating register which the marker requires in assisting a subscriber outgoing call.

b. The identification of the call or connection which the marker will assist.

c. The selection of an available idle outgoing trunk circuit connecting to the required destination.

d. The selection of an idle connecting path between the calling subscriber line and the selected outgoing trunk circuit.

e. Connecting the calling subscriber line to the selected outgoing trunk circuit thru the selected connecting path.

f. Release of the marker and associated circuits after the marker has completed the required functions.

18.1 Seizure of the Marker By the Originating Register

After the calling subscriber has dialed the zero operator or X11 code into the originating register or, as in the case of a manual call, after the originating register has recognized a manual call, the originating register will seize the originating register marker connector. The seizure of the originating register marker connector and the marker is similar to the seizure for an intra-office call, as described in paragraph 8.01.

18.2 Registration of Information From the Originating Register

After the seizure of the marker the class of service identification of the calling line, the calling line identification and the subscriber service call information will be transmitted from the originating register to the marker circuit.

18.21 Class of Service Identification

The class of service identification for a subscriber service call is similar to the class of service identification for an intra-office call, as described in paragraph 8.021.

18.22 Calling Line Identification

The calling line identification for a subscriber service call is similar to the calling line identification for an intra-office call, as described in paragraph 8.023.

18.23 Type of Service Information

The type of service information will be transmitted from the originating register to the marker, so that the marker may determine the type of subscriber service call. To identify a manual subscriber originating call or a zero operator call the AC-4 and AC-7 relays will be operated in the marker. To identify an X11 special service code call the X11 relay and two of the AC-0/7 relays will be operated in the marker.

18.231 Operation of the AC-0/7 Relays

The operation of the originating register marker connector MA and RA relays will extend a group of leads designated "A-0/7" from the originating register to the marker. The originating register will place ground on the "A-4" and "A-7" leads for a manual subscriber originating call or a zero operator call or will place ground on two of the "A-0/7" leads to identify the first digit of an X11 special service code call. Therefore, in the marker two AC-0/7 relays will be operated.

18.232 Operation of the X11 Relay

For an X11 special service code call the originating register will place ground on the "X11" lead which is extended to the marker and the "SV" cross-connection terminal in the marker. The "SV" cross-connection terminal is cross-connected to the "X11" cross-connection terminal thereby operating the X11 relay in the marker.

18.3 Identification of the Basic Call or Connection

The operation of the AC-4 and AC-7 relays will place ground on the zero operator "ZO" code point which will be cross-connected to operate the route relay associated with the zero operator route. The operation of two of the AC-0/7 relays and the X11 relay will place ground on one of the "X11" code points which will be cross-connected to operate the route relay associated with this X11 special service route.

18.31 Operation of the TC-5/7 Relay

The operation of the TC-5/7 relay for a subscriber service call is similar to the operation of the TC-5/7 relay for an intra-office call, as described in paragraph 8.031. The operation of the TC-5/7 relay, in this case, will indicate to the marker that a local area translation is required.

18.32 Operation of the R-, OPS-0/3 and OPR Relays

When it is desired to transmit a class of service tone distinction from the special service trunk to the operator it is necessary to cross-connect the OPS-0/3 relay to the subscriber service call code point so that this relay will be operated. The operation of the OPS-0/3 relay will operate the OPR relay which will in turn result in the operation of the route R- relay associated with this subscriber service call. If it is not necessary to transmit this class of service distinction the route R- relay, instead of the OPS-0/3 relay. will be cross-connected to the subscriber service call code point and the R- relay will be operated without operating the OPS-0/3 and OPR relays.

For a typical office the cross-connections for operating the OPS-0/3, OPR and R- relays are as follows.

The operation of the CKG-1 relay, with the non-operated SCN relay, the operated SCK relay, the non-operated CR relay, the non-operated PS relay, the operated PK relay, the non-operated PD relay, and the SCN relay non-operated, will extend ground to the "CG" lead. For an X11 special service call the grounded "CG" lead will be extended to one of the "X11" code points the "C-211/911" cross-connection terminals of figure 38 with two of the AC-0/7 relays and the X11 relay operated. For a manual subscriber originating call or a zero operator call the grounded "CG" lead will be extended to the "ZO" cross-connection terminal of figure 43 with the A-4, A-7, TC-5/7 and OR relays operated. The "ZO" cross-connection terminal and the special service code "C-211/911" cross-connections will be cross-connected to the associated "SC-" cross-connection terminals of figure 61. The operation of a particular class of service S-00/44 or S-100/144 relay associated with the class of service of the calling subscriber will extend ground to the particular "S-" cross-connection terminal of figure 61 associated with the type of call and class of service of the calling line. The "S-" cross-connection terminals of figure 61 will be cross-connected to the associated "RC" cross-connection terminal of figure 51 or to the associated "OS" cross-connection terminal of figure 54 thereby extending ground to operate either the operator assistance OPS-0/3 relay or the route R- relay associated with this subscriber service call and with the class of service of the calling subscriber.

The operation of the OPS-0/3 relay will operate the OPR relay. The operation of the OPR and OPS-0/3 relays will extend ground to the "OP" cross-connection terminal of figure 54. The "OP" cross-connection terminal will be cross-connected to the "RC" cross-connection terminal of figure 51 associated with the operator assistance route of this subscriber service call thereby operating the associated route R- relay.

To indicate to the special service trunk circuit that class of service tone distinction is required the operation of the OPR relay with the CLG relay operated will ground the "TC" lead which is extended to the trunk link and connector circuit and to the special service trunk.

18.33 Operation of the NSO, SOG-1/3, CB, CB-1/5, CB-7, CBF, CBD-1 and CBD Relays

The operation of one of the associated route R- relays on a subscriber service call results in the operation of the no sender outgoing NSO relay indicating to the marker that an outgoing sender is not required on this type of call. The operation of the NSO relay also indicates to the marker that only a connecting path between the calling subscriber line and a special service trunk is required. This is similar to an outgoing call in which the marker establishes the connecting path between the calling subscriber line and the outgoing trunk circuit.

The operation of the subscriber service call route R-relay, with the RCY, LR, RTST and GS-1/5 relays non-operated, will extend ground to the associated "OS" cross-connection terminal which will be cross-connected to the "NSO" cross-connection terminal of figure 33 thereby operating the NSO relay.

The operation of the NSO relay will operate the subscriber outgoing SOG-1/3 relays to direct the marker to perform functions required in assisting a subscriber service call. The marker functions required for a subscriber service call are somewhat similar to the functions required for a subscriber outgoing call except that an outgoing sender is not required.

The windings of the SOG-3 relay, the SOG-2 relay and the SOG-1 relay are in series with each other and the operating path will be extended through the operated OR relay contacts, through the operated NSO relay contacts, through the non-operated RTST and LR relay contacts, through the non-operated TR2E relay contacts, over the "TRK" lead to the originating register marker connector circuit where the "TRK" lead will be grounded when the originating register marker connector is operated.

The operation of the SOG-2 relay with the RV-1/2 relays released will operate CB relay when the DIS-2 relay is non-operated. The operation of the CB relay will operate the CB-1/5, CB-7, CBD, CBD-1 and CBF relays.

18.4 Special Service Trunk Selection

The special service trunk selection will be initiated by the marker when the marker route relay associated with this subscriber service call is operated.

The method of selecting an idle special service trunk circuit for completion of the call is similar to the method of selecting an idle originating register circuit for completion of a dial tone connection, as described in paragraphs 7.32, 7.33, 7.34, 7.35, 7.36 and 7.37. However, since the special service trunk is associated with either the "A" or "B" appearance on the trunk link frame the FA- or FB-relay will be operated in the trunk link and connector circuit.

18.5 Selection of the Connecting Path

The selection of the connecting path will be initiated when the trunk link frame is seized by the marker. However, the marker will be unable to test and select an idle connecting path until the line link frame associated with the calling line is seized and the special service trunk has been selected and seized.

The marker operations required for the selection of the connecting path between the calling line and the selected special service trunk circuit is similar to the selection of the connecting path between the calling line and the selected non-reverting intra-office trunk circuit, as described in paragraph 8.11.

18.6 Setting Up the Selected Connecting Path

After the connecting path to the calling line has been selected, the select and hold magnets on the line link frame and trunk link frame are operated, tests are made on the calling line and the connecting path supervision is transferred to the selected special service trunk.

18.61 Select Magnet Operation

The operation of the select magnets is similar to the select magnet operation for a dial tone connection, as described in paragraph 7.51.

18.62 Hold Magnet Operation

The operation of the hold magnet is similar to the hold magnet operation for a dial tone connection, as described in paragraph 7.52.

18.63 False Cross, Continuity and Double Connection Tests

To determine if the connecting path is in a proper condition for service a false cross and ground test, a continuity test and a double connection test will be made on the selected connecting path.

18.631 False Cross and Ground Test

The false cross and ground test on the connecting path to the calling subscriber for a subscriber service call is similar to the false cross and ground test for a dial tone connection, as described in paragraph 7.531.

During the assistance of connecting the outgoing trunk to the calling subscriber the false cross and ground test will be cancelled if a "heavy traffic" condition exists or if the calling subscriber is associated with a PBX line that has dial selected trunks. To indicate that the false cross and ground test will be cancelled when the calling subscriber is associated with a PBX line that has dial selected trunks, the HTR relay will be operated. The "HTG" cross-connection terminal of figure J will be cross-connected to the "SC-" cross-connection terminal of figure 61 associated with the class of service of the PBX subscriber that has dial selected trunks. Also the "HTR" cross-connection terminal of figure 30 will be cross-connected to the "S-" cross-connection terminal of figure 61 associated with the class of service of the calling subscriber. For a PBX subscriber that has dial selected trunks, the operation of the TK and SOG-2 relays will extend ground to the "HTG" and "SC-" cross-connection terminals and with the associated S relay operated ground will be extended to the "S-" and "HTR" cross-connection terminal thereby operating the HTR relay.

18.632 Continuity Test

The continuity test on the connecting path to the calling subscriber line is similar to the continuity test for a dial tone connection, as described in paragraph 7.532. However, if the calling subscriber is a tip party subscriber the RCTB relay will be operated, as described in paragraph 7.5322, before continuity test is made. The operation of the marker tip party TP relay will indicate that the calling subscriber is a tip party subscriber. The operation of the TP and SOG-3 relays will operate the RCTB relay which will release the RCTA relay which in turn will release the RCT relay. The release of the RCT relay, as described in paragraph 7.5322, will change the continuity test from the ring to the tip side of the subscriber line for such a condition.

18.633 Double Connection Test

The double connection test on the connecting path to the calling subscriber is similar to the double connection test for a dial tone connection, as described in paragraph 7.533.

18.64 Transfer of the Connecting Path Supervision to the Special Service Trunk

The transfer of the connecting path supervision to the special service trunk is similar to the transfer of the connecting path supervision to the originating register for a dial tone connection, as described in paragraph 7.54.

18.7 Release of the Marker and Associated Circuits

After the marker circuit has completely performed the subscriber service call functions, the marker will be released from this subscriber service call and will be recycled to the idle condition so as to be available for assistance to other calls or connections.

Since the operating path for holding operated the various marker relays may be opened at serveral different points almost simultaneously, this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

18.71 Recycle of the Marker Release Control

The recycle of the marker release control is similar to the recycle of the marker release control for a subscriber outgoing call, as described in paragraph 11.81. However, there is no sender circuit to perform trunk test therefore the TG and TGT relays will remain unoperated and will not enter into the circuit operations.

18.72 Release of the Registration of Information From the Originating Register Functions

The release of the registration of information from the originating register functions is similar to the release of the registration of information from the originating register functions for a subscriber outgoing call, as described in paragraph 11.82. However, the BC-0/7 and CC-0/7 relays have not been operated and therefore will not be released at this point.

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18.73 Release of the Identification of the Call Functions

18.731 Release of the TC-5/7, R-, OPS-0/3, OPR, NSO, and SOG-1/3 Relays

The release of the originating register marker connector will release the operated TC-5/7 relay. The OPS-0/3 relay if operated will be released when the CKG-1 relay releases. The release of the OPS-0/3 relay will in turn release the OPR relay. The OPS-0/3 relay if required, in releasing will release the R- relay. However, if the operation of the OPS-0/3 relay is not required for this call, the R- relay will then be released upon the release of the CKG-1. The release of the R- relay will in turn release the NSO relay which in turn will release the SOG-1/3 relays.

18.732 Release of the CB, CB-1/5, CB-7, CBD, CBD-1 and CBF Relays

The operation of the DIS-2 relay will release the CB relay which will release the CB-1/5, CB-7, CBD, CBD-1 and CBF relays.

18.74 Release of the Special Service Trunk Selection Functions

The release of the special service trunk selection functions is similar to the release of the outgoing trunk selection functions for a subscriber outgoing call, as described in paragraph 11.85.

18.75 Release of the Selection of the Connecting Path Functions

The release of the selection of the connecting path functions is similar to the release of the selection of the connecting path functions for a subscriber outgoing call, as described in paragraph 11.86.

18.76 Release of the Setting Up the Selected Connecting Path Functions

The release of the setting up the selected connecting path functions is similar to the release of the setting up the selected connecting path functions for a subscriber outgoing call, as described in paragraph 11.87.

19. MARKER OPERATIONS REQUIRED FOR MESSAGE CHARGING

In the No. 5 Crossbar System there are four methods of message charging for calls which are originated by subscribers. These four methods are:

a. Operator ticketing, in which a call which is to be charged on a message rate basis will be routed to an operator who will complete the call for the subscriber and will make a ticket to record the call so that the subscriber may be charged.

b. Coin collector charging, in which the subscriber must deposit the message charge in the coin collector before the call is completed.

c. Message register charging, in which a message register associated with the subscriber is operated to indicate the cumulative number of message charging units within the message charging billing period.

d. Automatic message accounting charging, in which the information pertaining to each message rate call is recorded by punching holes in a paper tape. This paper tape is later processed at an accounting center to provide the message charge for each message rate call.

19.1 Operator Ticketing

When the subscriber desires a connection to an office which requires that an operator ticket be made, the subscriber must dial the zero operator code or one of the special service codes instead of the called subscriber directory office and numerical code. The marker will translate this zero operator or special service code and will assist the connection of the subscriber to an operator, as previously described in paragraph 18.

After the subscriber is connected to an operator, the subscriber will inform the operator of the called subscriber directory office and numerical code. The operator will connect the calling subscriber to the required outgoing trunk and will either dial the called number or will pass on to an operator in the called office the called number.

The operator at the calling office will write a ticket giving the information necessary for charging the calling subscriber.

19.2 Coin Collector Charging

A subscriber using a coin telephone originates a call in the same manner as when using a noncoin telephone except that it is necessary to deposit a coin in the subset. There are two kinds of prepayment coin service: "coin first" which is used extensively, and "dial tone first" which is used only in a few areas.

Coin first operation requires that a coin be deposited before dial tone will be received. The test for the coin is made by either the originating register or by the line link and connector circuit and will depend upon the options which have been provided in each office. After dialing is completed, the talking connection is established to an intra-office trunk circuit arranged for coin operation as described in paragraph 8 or to an outgoing trunk circuit arranged for coin operation as described in paragraph 11. The trunk connects itself to the coin supervisory circuit through the coin supervisory link for collect or return of the coin, usually after the calling subscriber hangs up.

When dial tone first service is provided, the subscriber may start any call and complete a call to zero operator without depositing a coin. Dial tone is transmitted to the subscriber. Regardless of whether or not a coin has been deposited. If a coin is required to complete the call, the register will not engage or marker for establishing the talking connection unless a coin has been deposited. If a coin has been deposited, the talking connection is established to a trunk arranged for coin operation, and control of the coin is handled by the coin supervisory circuit in the same manner as for coin first operation.

19.21 Coin First Calls

On most types of coin calls the subscriber will be charged and the coin collected. However, on certain types of coin calls the initial coin will be returned.

19.211 Charge Calls

If the coin test is to be made by the originating register circuit, a subscriber originating a call from a coin station with coin first service is connected to an originating register in the normal manner, as described in paragraph 7, regardless of whether or not a coin has been deposited. However, if the office is arranged so that the line link and connector circuit will make the coin test then the line link and connector circuit will not seize a marker to set up a dial tone connection until after coin test has verified the presence of the coin. The marker determines that the call is from a coin subscriber by the class of service indication, and informs the register that a coin call is to be served.

When the dialing of the called subscriber number is completed, the originating register engages a marker and informs it that the call is of the coin class. The marker then establishes a connection between the calling subscriber and called subscriber for an intra-office call, as described in paragraph 8 or between the calling subscriber and an outgoing trunk for an outgoing call, as described in paragraph 11. However the connection must be associated with a trunk which is arranged for coin operation. Such a trunk may be arranged to serve calls of only the coin class, or it may be a "universal" trunk, which is arranged for flat rate, message rate and coin.

The answer of the called subscriber determines that the calling subscriber shall be charged for the call. The answer sets the charge condition in the trunk, but the collection of the coin is made when the calling subscriber disconnects at the end of the call. When the calling subscriber disconnects, the trunk associates itself with a coin supervisory circuit through the coin supervisory link. The coin supervisory circuit tests for the presence of the coin and collects it. If the called subscriber has not answered when the calling subscriber disconnects, the coin supervisory circuit returns the coin.

19.212 Coin Return Calls

For zero operator or for X11 code calls certain offices may have options provided so that the zero operator or X11 trunk circuits will initiate the coin return. However, in other offices options may be provided so that the originating register will initiate coin return. In this case the register recognizes such calls and makes coin return before engaging a marker to establish the talking connection.

The originating register also returns the initial coin in cases of certain irregular operations such as calls abandoned during dialing, permanent signals and trouble conditions for which the marker does not release the register within an allotted time interval. In such cases, the register returns the coin before it either releases or engages a marker to dispose of the call.

The register may also return the coin when directed to do so by the marker. Such a case is a call to a free code whose trunks are not arranged for coin operation (other than X11 and zero operator calls). Since the register does not recognize the need for coin return from the office code, it engages a marker in the normal manner. The marker determines from the office code that the subscriber should not be charged, requests the register to make coin return, and releases. The register makes coin return and re-engages a marker for the completion of the call.

19.2121 Marker Operations for Free Code Coin Calls

In offices having loop start coin lines when a coin subscriber makes a call that is associated with a free code (zero operator, X11, or official PBX calls) the code point associated with this code will be grounded. Trunks associated with free codes will not be arranged for coin operation and grounding the code point will operate the register return relay instead of the route R-relay. The ground on the code point will be extended thru the winding of the route R- relay to the "R-" cross-connection terminal. The "R-" cross-connection terminal will be cross-connected to the "CC" cross-connection terminal thereby extending ground to the RR relay with the non-coin return, non-stuck coin check SCK relay operated thereby operating the RR relay. The R- relay is not operated because of the high resistance of the winding of the RR relay. The SCK relay is operated to indicate the presence of the coin.

The non-operation of the route R-relay will prevent the marker from proceeding with the connection of the calling subscriber to a trunk circuit. The operation of the RR relay will extend ground from the "CNR" lead to the originating register circuit to indicate that coin return should be made by the register.

The operation of the RR relay will also operate the RRK relay which in turn will operate the RRC relay which will operate the RLG relay. The operation of the RR, RLG, RRC and RRK relays will extend ground to operate the marker disconnect DIS-1/2 relays thereby releasing the marker from this connection. The RRK will be locked operated by ground returned to the marker from the originating register on the "CNR" lead upon the operation of its register relay representing that coin return is required.

After the register has returned the coin it will again seize a marker for the completion of the call.

In offices having ground start coin lines when a coin subscriber calls a free code, for example, zero operator, X11, or official PBX, the code point associated with this code will be grounded. Grounding the code point will operate the route series relays used for trunks class signals in series with the route relay if the marker has not been cross-connected in such a manner to request that the originating register return the coin. The route series relays used for trunk class signals will be cross-connected in a manner similar to the description in section 26, in order to provide the proper information to the trunk circuit. The marker will proceed with the connection of the calling subscriber to the trunk circuit. For this type of call, the supervision in the trunk circuit will return the coin. If the marker has been cross-connected in such a manner as to request the originating register to return the coin the method of operation will be similar to the description in the preceding paragraphs.

Outgoing calls will be treated in a similar manner whether loop start coin lines or ground start coin lines and charging will be determined by charge supervision in the trunk.

Where coin junctor or outgoing trunks are used to serve coin class traffic only, the trunks do not require a coin class mark from the marker.

If the primary route is served by a universal coin and non-coin trunk group, a coin class mark will be required for all calls associated with coin subscribers. Under these conditions, the coin only alternate route must also be arranged to function with a coin class mark in order to satisfy the marker route series circuit for the original route. Where this alternate route is also used to serve other primary coin routes, it is necessary that the primary routes be arranged to provide the coin class mark.

19.2122 Marker Operations for Free Number Coin Calls

Marker operations for coin subscribers originating an intra-office call will be the same whether associated with loop start coin lines or ground start coin lines. Grounding the code point associated with the office code of the called subscriber directory number will operate the route series relay used for trunk class signals in series with the route relay. The route series relays used for trunk class signals will be cross-connected in a manner similar to the description in Section 26, in order to provide the proper information to the trunk circuit. When the number is processed in the number group, the number group will indicate to the marker that a call associated with a free number has been received, by grounding either the "FNA" or "FNB" leads, in offices that are equipped with four wire ringing switches only. Ground on the "FNA" or "FNB" lead will operate the associated FNA or FNB relay which will in turn operate the FN relay. The operation of the FN relay will cancel the TC class mark to the trunk link and connector circuit. For this type of call, the charging supervision in the trunk will return the coin. In offices that are equipped with six wire ringing switches, or four and six wire ringing switches, the FNB relay will be operated similar to the description previously mentioned, however, the FNA relay will be operated when either the RCT-8 or RCT-9 relay operates. The operation of the RCT-8 or RCT-9 relay will extend ground to the winding of the FNA relay. The operation of the FNA or FNB relay will operate the FN relay. During the period the four wire ringing switches are being converted to six wire switches, the SN option is required. The SN option should be removed after the conversion. Option SN permits the operation of the FNA relay when ground is extended to the "FNA" lead or the RCT-8 or RCT-9 relay operates. The FNB relay will be operated when the "FNB" lead is grounded.

19.22 Dial Tone First Calls

Calls from dial tone first coin lines proceed in the same manner as non-coin calls until dialing has been completed. At this point, instead of engaging a marker, a coin test is made by the originating register. If a coin is deposited the register engages a marker and the call is completed in the same manner as a coin first call.

On calls from dial tone first coin lines to zero operator a coin need not be deposited, therefore, no coin test is made on this type of call.

19.3 Message Register Charging

In the crossbar system No. 5 message registers can only be used in connection with individual and two-party message rate classes of service for recording message units on originating traffic that requires the use of either intraoffice trunks or outgoing trunks for calls to points within the one message unit charge area. Outgoing traffic to points beyond the one-message-unit charge area is routed to an operator for ticketing.

A subscriber with a message rate class of service originates calls in the same manner as a subscriber with a flat rate class of service. When message register charging is employed, each message rate subscriber has a message register in the central office associated with his line. The message resister is operated on local calls for which the subscriber should be charged. The number of operations of the register over a period of time can therefore be used to determine how much the subscriber is to be charged for the telephone service.

Two message registers are provided for fully assigned two party message rate lines. The calls by the one subscriber are recorded on one register and calls by the other subscriber are recorded on the second register. The two subscribers are termed "tip party" or "ring party" according to which side of the line their subset ringers are connected.

On a call from a message rate line, the call proceeds in the same manner as a call from a flat rate line until the originating register is connected, as described in Paragraph 7. However, if the class of service indication which the marker receives during the dial tone connection indicates that a two-party line is involved the originating register will be informed to perform the two-party test functions. By performing the two-party test the originating register will identify which party is making the call.

After dialing has been completed the originating register engages a marker for establishing the talking connection. The originating register informs the marker that an individual or two-party message rate call is to be assisted by operating the associated class of service CTA-0/2 and CU-0/7 relays in the marker. If the call is from a two-party line the originating register also informs the marker if the tip party or ring party subscriber is to be charged by operating the TP or RP relay in the marker. The marker will then proceed to establish a connection between the calling subscriber and the called subscriber and associated with an intraoffice trunk arranged for message rate operation, as described in Paragraph 8 or between the calling subscriber and an outgoing trunk arranged for message rate operation, as described in Paragraph 11. The marker will inform the trunk circuit to set up the message charge condition by placing ground on the "TC" lead and will also inform the trunk circuit which party is to be charged by placing ground on either the "TP" or "RP" leads.

After the called subscriber has answered the message register is operated to indicate that the call is a charge call.

19.4 Automatic Message Accounting Charging

With the use of automatic message accounting, which will be designated as AMA, a new method of recording the charges for telephone service has been introduced. This method provides a flexible arrangement for charging for customer-dialed local and toll service on individual and two party lines without the use of message registers. It permits charging for overtime on local message rate calls and billing for local and toll messages on either a "bulk billed" or "detailed billed" basis. Bulk billing refers to the practice of rating certain calls in number of message units and showing the total of such message units on the subscriber's bill. In detail billing the details of the calls, including the charges, appear on the bill. Since no method of identifying the parties on a four-party line is available, AMA features cannot be applied to subscribers on more than two-party lines.

The AMA method records the details of messages as a series of punched holes on a continuous paper tape. Three entries are normally made on each charge call, the initial entry containing information as to the customer to be charged and the charging plan, and two time entries showing the time of answer and disconnect. Since the recording equipment is common to a large group of lines and the details of the call are recorded chronologically as they become available, individual entries are ordinarily interspaced with the entries of other calls. Each entry, however, carries an identifying number which permits the assembling of the parts of the information. The paper tape is removed periodically and processed at a central point called the "Accounting Center".

Calls involving the AMA method of charging may be:

a. Subscriber outgoing calls for which either bulk billed or detailed billed charging is required.

b. Intra-office calls for which bulk billed charging is required.

19.41 Subscriber Outgoing Call Requiring AMA Charging

The marker operations in assisting a subscriber outgoing call requiring AMA charging is similar to the marker operations required in assisting a subscriber outgoing call which does not require AMA charging as described in paragraph 11. In addition to the information which the marker transmits to the outgoing sender when assisting a subscriber outgoing call which does not require AMA charging, the marker will transmit information to the outgoing sender which is necessary for charging purposes. The outgoing sender will then transmit all of the information necessary for charging the calling subscriber to the transverter circuit which will initiate the punching of the AMA tape.

19.411 Seizure of the Marker by the Originating Register

The seizure of the marker for a subscriber outgoing call requiring AMA charging is similar to the seizure of the marker by the originating register for a subscriber outgoing call which does not require AMA charging, as described in paragraph 11.1.

19.412 Registration of Information from the Originating Register

The registration of information from the originating register is similar to the registration of information for a subscriber outgoing call as described in paragraph 11.2.

19.413 Identification of the Basic Call or Connection

The identification of the basic call is similar to the identification of the basic call for a subscriber outgoing call as described in paragraph 11.3. However, the "R-" cross-connection terminal associated with the winding of the outgoing route R- relay will be cross-connected to one of the "MBS-0/9" cross-connection terminals of figure 56. Therefore one of the message billing series MBS-0/9 relays will be operated. The MBS-0/9 relays will be operated only when an AMA record is required.

The operation of one of the MBS-1/9 relays with the free number FN relay, the operator OPR relay, the busy line BL relay, the vacant code-partial dial VP relay, and the catchall auxiliary CAA relay non-operated will operate the AMA relay. The operation of the MBS-0 relay, where it is desired will make an entry on the AMA tape on a non-charge call for service observing purposes. The operation of the AMA relay with the DIS-2 relay non-operated will operate the AMA-3, AMA-4, and AMA-5 relays. The operation of the AMA-4 relay will operate the AMA-1, AMA-2 and GTU relays.

The operation of the route R- relay and the AMA-1/5 relays will direct the marker to perform the functions required in assisting a subscriber outgoing call requiring AMA charging.

19.414 Selection and Connection of an Outgoing Sender

For assisting a subscriber outgoing call requiring AMA charging it is necessary to associate an outgoing sender with the subscriber outgoing call. If the subscriber outgoing call does not require an outgoing sender for outpulsing then it is necessary to associate an outgoing sender with the call when AMA charging is required. The outgoing sender is required since the AMA recorder circuit will receive the information necessary for charging the calling subscriber from the outgoing sender.

19.4141 Outgoing Sender Subgroup Selection

The outgoing sender subgroup selection is similar to the outgoing sender subgroup selection for a subscriber outgoing call, as described in paragraph 11.41.

19.4142 Outgoing Sender Selection

The outgoing sender selection is similar to the outgoing sender selection for a subscriber outgoing call, as described in paragraph 11.42.

19.4143 Marker Connection to the Selected Outgoing Sender

The marker connection to the selected outgoing sender is similar to the marker connection to the selected outgoing sender for a subscriber outgoing call, as described in paragraph 11.43. However, the additional outgoing sender connector cut-in relays required for an AMA call will be operated, to extend a group of leads, which are needed for AMA charging, from the marker to the selected outgoing sender.

19.4144 Transfer of Information from Marker to Outgoing Sender

The transfer of information from marker to outgoing sender is similar to the transfer of information from marker to outgoing sender for a subscriber outgoing call, as described in paragraph 11.44. However, in addition to transmitting the information as described in paragraph 11.44, the marker will transmit to the outgoing sender the following information:

a. Information to indicate that an AMA charge record is required.

b. Information to indicate the location of the calling line.

c. Identification of the calling subscriber as to tip or ring party.

d. Information to indicate the message billing index for the call.

e. Information as to the office and numerical code pattern of the called office.

f. Information as to the AMA recorder circuit associated with the selected outgoing trunk.

g. Information as to whether or not the outgoing sender should transmit the called subscriber number to the called office. If the outgoing sender is required only for AMA charging purposes the outgoing sender will not transmit the called subscriber number.

19.41441 Information to Indicate That an AMA Record is Required

The operation of the AMA-3 relay, as described in paragraph 19.413, and the operation of the TGS-2 relay, as described in paragraph 11.412, will extend ground potential over the "AMA" lead to the outgoing sender connector and then to the outgoing sender to operate the AMA relay in the outgoing sender to indicate that an AMA record is required.

19.41442 Information to Indicate the Location of the Calling Line

With the GTU, GTL-3/4 and AMA-1/2 relays operated the calling line information, which has been extended from the originating register to the marker over the "FT-0/3", "FU-0/7", "VG-0/10", "HG-0/7" and "VF-0/4" leads as described in paragraph 8.023, will be further extended over the "FT-0/3", "FU-0/7", "VG-0/10", "HG-0/7" and "VF-0/4" leads to the outgoing sender connector and then to the outgoing sender circuit. In the outgoing sender the associated FT-0/3, FU-0/7, VG-0/10, HG-0/7 and VF-0/4 relays will be operated to indicate the location of the calling line.

19.41443 Identification of the Calling Subscriber as to Tip or Ring Party

The originating register circuit will test and will determine if a tip or ring party is involved and will place ground on the "TP" lead to the marker to operate in the marker the tip party TP relay or will place ground on the "RP" lead to operate the ring party RP relay.

The operaion of the TP, AMA, and CLG relays with the PBY, BL, OPR, PNC, and PPX relays non-operated will place ground potential on the "TP" lead which is extended thru the outgoing sender connector to the outgoing sender to operate the TP relay in the outgoing sender.

The operation of the RP, AMA and CLG relays will place ground potential on the "RP" lead which is extended thru the outgoing sender connector to the outgoing sender to operate the RP relay in the outgoing sender.

19.41444 Information Indicate The Message Billing Index

The operation of one of the message billing series MBS-0/9 relays with the AMA relay operated and the FN relay non-operated will operate one of the message billing MB-0/4 relays and either the message billing primary MBP or the message billing secondary MBS relay.

The operation of the transmitting ground supply TGS-2 relay with the MB-0/4 and the MBP or MBS relays operated will place ground potential on the "MB-0/7" leads as follows:

Relays Operated	"MB-0/7" Leads Grounded
MB-0 and MBP	"MB-7 and MB-4"
MB-1 " "	"MB-1 " MB-0"
MB-2 " "	"MB-2 " MB-0"
MB-3 " "	"MB-2 " MB-1"
MB-4 " "	"MB-4 " MB-0"
MB-0 and MBS	"MB-1 " MB-4"
MB-1 " "	"MB-2 " MB-4"
MB-2 " "	"MB-7 " MB-0"
MB-3 " "	"MB-7 " MB-1"
MB-4 " "	"MB-7 " MB-2"

The "MB-0/7" leads are extended to the outgoing sender connector and then to the outgoing sender, thereby operating in the outgoing sender the associated MB-0/7 relays. The operation of the TGS-2 relay will also operate the message billing check MBK-1/2 relays.

19.41445 Information as to the Office and Numerical Code Pattern of the Called Office and the Number of Digits to be Outpulsed by the Outgoing Sender

To indicate the information as to the office and numerical code pattern of the called office the marker will transmit information over the "CP-0/7", "4DG", "5DG", "LST" and "L5D" leads to the selected outgoing sender.

The following information is transmitted to the outgoing sender over the "CP-0/7", "4DG", "5DG", "LST" and "L5D" leads:

Transmitting Lead	Information Transmitted to Outgoing Sender
"CP-0/7"	Transmits information to indicate the code pattern of the called office and the number of digits in the called office code together with the area, extended or local.
"4DG"	Transmits information to indicate that the call is to an office having no numericals of more than four digits.
"5DG"	Transmits information to indicate that the call is to an office having some five digit numericals but not lettered stations. The "5DG" office may also have numbers of less than four digits.
"LST"	Transmits information to indicate that the call is to an office having four digit numericals, some of which have lettered stations.
"L5D"	Transmits information to indicate that the call is to an office having three, four or five digit numericals and some four digit numericals with lettered stations.

The "CP" cross-connection terminal of figure 51 associated with this outgoing call route will be cross-connected to one of the "CPS-0/4" or "CPP-0/4" cross-connection terminals of figure 67. If the "CP" cross-connection terminal is cross-connected to one of the "CPS-0/4" cross-connection terminals the associated CP-0/4 and CPS relays, which are in series, in the marker will be operated when the route R-relay is operated. If the "CP" cross-connection terminal is cross-connected to one of the "CPP-0/4" cross-connection terminals the associated CP-0/4 and CPP relays, which are in series, will be operated when the route R- relay is operated. The operation of the transmitting ground supply TGS-2 relay with one of the CP-0/4 and either the CPS or CPP relay operated will place ground potential on the "CP-0/7" leads as follows:

Relays Operated	"CP-0/7" Leads Grounded
CP-0 and CPP	"CP-7 and CP-4"
CP-1 " "	"CP-1 " CP-0"
CP-2 " "	"CP-2 " CP-0"
CP-3 " "	"CP-2 " CP-1"
CP-4 " "	"CP-4 " CP-0"
CP-0 " CPS	"CP-1 " CP-4"
CP-1 " "	"CP-2 " CP-4"

Relays Operated	"CP-0/7" Leads Grounded
CP-2 and CPS	"CP-7 and CP-0"
CP-3 " CPS	"CP-7 " CP-0"
CP-4 " CPS	"CP-7 " CP-2"

The "CP-0/7" leads are extended to the outgoing sender connector and then to the outgoing sender, thereby operating in the outgoing sender the CP-0/7 relays which are associated with the grounded "CP-0/7" leads.

The "DL" cross-connection terminal of figure 51 associated with this outgoing call route will be cross-connected to one of the "DLP-0/13" or "DLS-0/13" cross-connection terminals of figure 67 thereby operating one of the DL-0/13 relays and either the DLS or DLP relay in the marker when the route R-relay associated with this outgoing call is operated. The operation of the transmitting ground supply TGS-1 relay with one of the DL-0/13 relays and either the DLS or DLP relay operated will place ground potential on the "4DG", "5DG", "LST" and "L5D" leads as follows:

Relays Operated	Leads Grounded
DL-0/6 and DLP	"4DG"
DL-0/6 and DLS	"5DG"
DL-7/13 and DLP	"L5D"
DL-7/13 and DLS	"LST"

The "4DG", "5DG", "L5D" and "LST" leads are extended to the outgoing sender connector and then to the outgoing sender, thereby operating in the outgoing sender the 4DG, 5DG, L5D or LST relay.

To determine the information which is to be deleted the operation of the DL-0/13 relay with the TGS-1 relay operated will place ground potential on one of the "DL-1/6" leads as follows:

Relay Operated	Lead Grounded	Digits to be Deleted from Outpulsing
DL-0 or DL-7	None	None
DL-1 or DL-8	"DL-1"	"A"
DL-2 or DL-9	"DL-2"	"A" and "B"
DL-3 or DL-10	"DL-3"	"A, B and C"
DL-4 or DL-11	"DL-4"	"A,B,C and D"
DL-5 or DL-12	"DL-5"	"A,B,C,D and E"
DL-6 or DL-13	"DL-6"	"A,B,C,D,E and F"

The "DL-1/6" leads are extended to the outgoing sender connector and then to the outgoing sender thereby operating in the outgoing sender the DL-1/6 relay.

19.41446 Information as to the AMA Recorder Associated with the Selected Outgoing Trunk

When the FA- or FB- relay in the trunk link frame operates, ground potential is extended to either the "RN" or "KT" cross-connection terminals in the trunk link and connector circuit. Each "RN" or "KT" cross-connection terminal is cross-connected to the "ONN", "1TB", "2MB", "3FB", "4TT", "5MT", "6FT", "7TP","8MP" or "9FP" cross-connection terminal to indicate the AMA recorder number with which the outgoing trunk is associated. The first number of each designation identifies the recorder number. For example "ONN" is associated with AMA recorder "0". Therefore the operation of the FA- or FB- relay associated with this outgoing trunk will extend ground to the marker over one of the "ONN", "1TB", "2MB", "3FB", "4TT", "5MT", "6FT", "7TP", "8MP" or "9FB" leads to operate the associated marker ONN, 1TB, 2MB, 3FB, 4TT, 5 MT, 6FT, 7TP, 8MP or 9FB relay to indicate the AMA recorder number.

The operation of one of the marker ONN, 1TB, 2MB, 3FB, 4TT, 5MT, 6FT, 7TP, 8MP or 9FB relays with the RN relay operated will operate in the marker two of the recorder number RN-0/7 relays and will also place ground potential on two of the "RN-0/7" leads which are extended to the outgoing sender connector and then to the outgoing sender to operate the associated RN-0/7 relays. The RNT-1, RNT, and RNT-2 relays will be operated in a manner similar to the description for the pulse conversion connection paragraph 17.58. To check that two and only two of the RN-0/7 relays have operated the RNK-1/2 relays will be operated. The operation of the RNK-1/2 relays is similar to the description in paragraph 17.59.

19.41447 Indication for Sender not to Transmit to Called Office

To indicate that the outgoing sender should not transmit to the called office the no digit ND-1 relay will be operated in the marker. The "DL" cross-connection terminal of figure 51 associated with this outgoing call will be cross-connected to the "ND-1" cross-connection terminal of figure 33 thereby operating the ND-1 relay when the marker route R-relay is operated.

The operation of the ND-1 and TGS-1 relay will extend ground potential over the "ND" lead to the outgoing sender connector and then to the outgoing sender to operate the no digit pulsing class relay in outgoing sender.

19.4145 Checking the Information Transferred to the Outgoing Sender

The checking information transferred to the outgoing sender is similar to the checking information transferred to the outgoing sender for a subscriber outgoing call, as described in paragraph 11.445. However in addition to checking the information as described in paragraph 11.445, the marker will also check some of the information which has been described in paragraph 19.4144 which has been transferred to the outgoing sender.

19.41451 Checking the Information that an AMA Record is Required

The release of the TGS-2 relay will remove the operating path for the marker MBK-3 relay and the outgoing sender AMA relay. If the AMA relay in the outgoing sender has been operated the MBK-3 relay will be held operated by the locking ground potential on the "AMA" lead from the outgoing sender. Therefore, the marker before releasing the outgoing sender connector common channel will check that the MBK-3 relay is operated and will then reoperate the GTL-2/4 relays which in turn will operate the release sender connector RSC relay.

19.41452 Checking Information to Indicate the Location of the Calling Line

The operation of the OST-2 relay will release the GTL relay which in turn will release the GTL-2, GTL-3 and GTL-4 relays. The release of the GTL-2, GTL-3 and GTL-4 relays will remove the operating path for the marker and the outgoing sender register FT-0/3, FU-0/7, VG-0/10, HG-0/7 and VF-0/4 relays. If the location of the calling line information has been transferred to the outgoing sender and if the required register relays have been operated in the sender, the operated register relays in the marker will be held operated by the locking ground potential from the outgoing sender.

As an indication that the required register relays in the marker have remained operated the RK-1 and RK-2 relays will be held operated. Therefore, the marker before releasing the outgoing sender connector common channel will check that the RK-1 and RK-2 relays are operated and will the reoperate the GTL-2/4 relays. For this call, the GTL-2/4 relays will be operated in a similar manner to the operation of the RSC relay as described in paragraph 11.461. The RSC relay will be operated when the GTL-2/4 relays reoperate, with the OGC, CLK, OST-2, and AMA-4 relays operated.

19.41453 Checking the Information as to Tip Party or Ring Party Calling Subscriber

The release of the TGS-1 relay will in turn release the CLG relay which will remove the operating path for the marker TPK or RPK relay and the outgoing sender TP or RP relay which have been operated when the "TP" or "RP" lead to the outgoing sender has been grounded. If the TP or RP relay in the outgoing sender has been operated the TPK or RPK relay will be held operated by the locking ground potential on the "TP" or "RP" lead from the outgoing sender. Therefore, the marker before releasing the outgoing sender connector common channel will check that the CLK relay is held operated. The CLK relay will only be held operated if the TPK or RPK relay is held operated. If the CLK relay is held operated the release sender connector RSC relay will be operated.

19.41454 Checking the Information to Indicate the Message Billing Index

The release of the TGS-2 relay will remove the operating path for the marker MBK-1 and MBK-2 relays and the outgoing sender, MB-0/7 relays. If the required MB-0/7 relays in the outgoing sender have been operated the MBK-1 and MBK-2 relays will be held operated by the locking ground potential on the "MB-0/7" leads from the outgoing sender. Therefore, the marker before releasing the outgoing sender connector common channel will check that the MBK-1 and MBK-2 relays are operated and with all other checking relays operated will reoperate the GTL-2/4 relays. The reoperation of the GTL-2/4 relays will initiate the operation of the RSC relay.

19.41455 Checking Information as to the Office and Numerical Code Pattern of the Called Office and the Number of Digits to be Outpulsed by the Outgoing Sender

The release of the TGS-2 relay will remove the operating path for the marker CPK-1 and CPK-2 relays and the outgoing sender CP-0/7 relays. If the required CP-0/7 relays in the outgoing senders have been operated the CPK-1 and CPK-2 relays will be held operated by the locking ground potential extended from the outgoing sender to the marker on two of the "CP-0/7" leads.

The release of the TGS-1 relay will remove the operating path for the marker DLK-2 relay and the outgoing sender 4DG, 5DG, LST and L5D relays. If the 4DG, 5DG, LST or L5D relay in the outgoing sender has been operated the DLK-2 relay will be held operated by the locking ground potential on the "4DG", "5DG", "LST" or "L5D" lead extended from the outgoing sender to the marker.

The release of the TGS-1 relay will remove the operating path for the marker DLK-1 relay and the outgoing sender DL-1/6 relays. If the number of digits to be outpulsed information has been transferred to the outgoing sender and if the DL-1/6 relay has been operated in the outgoing sender the DLK-1 relay will be held operated by the locking ground potential from the outgoing sender.

The marker before releasing the outgoing sender connector common channel will check that the CPK-1, CPK-2, DLK-2 and DLK-1 relays are operated and will then reoperate the GTL-2/4 relays which in turn will operate the release sender connector RSC relay.

19.41456 Checking the Information as to the AMA Recorder Number

The information as to the AMA recorder number is extended from the marker over the "RN-0/7" leads, thru the contacts of the operated AMA relay in the outgoing sender circuit to the outgoing sender circuit. The outgoing sender connector AMA relay is not released when the outgoing sender connector common channel is released but is held until the individual channel between the marker and the outgoing sender is released by releasing the S relay in the outgoing sender connector. Therefore, the marker will not check the information as to the AMA recorder number before releasing the common channel by operating the RSC relay. However, the marker will check the information as to the AMA recorder number before releasing the individual channel between this marker and the selected outgoing sender.

Before the marker releases the individual channel to the outgoing sender the marker will release the RN relay in the marker. The release of the RN relay will remove the operating path for the marker and the outgoing sender RN-0/7 relays. If the AMA recorder number information has been transferred to the outgoing sender and if the required RN-0/7 relays have been operated in the outgoing sender, the operated RN-0/7 relays in the marker will be held operated by the locking ground potential from the outgoing sender.

As an indication that the required RN-0/7 relays in the marker have remained operated the RNK-1 and RNK-2 relays will be operated. Therefore, the marker before sending an advance indication to the outgoing sender and operating the outgoing sender AV relay will check that the RNK-1 and RNK-2 relays are operated.

19.41457 Checking the Indication for the Sender not to Transmit to Called Office

The release of the TGS-1 relay will remove the ground potential which the marker placed on the "ND" lead and will remove the operating path for the marker NDK relay and the no digit pulsing class relay in the outgoing sender. If the no digit pulsing class relay in the outgoing sender has been operated the NDK relay in the marker will be held operated by the locking ground potential extended from the outgoing sender to the marker on the "ND" lead. The marker will check that the NDK relay in addition to the other checking relays have remained operated before releasing the outgoing sender common channel. The marker before releasing the outgoing sender connector common channel will check that the NDK relay is operated and will then reoperate the GTL-2/4 relays which in turn will operate the release sender connector RSC relay.

19.4146 Outgoing Sender Connection to Outgoing Trunk

The outgoing sender connection to the outgoing trunk is similar to the outgoing sender connection to the outgoing trunk for a subscriber outgoing call, as described in paragraph 11.45.

19.4147 Release of the Outgoing Sender Connector

The release of the outgoing sender connector is similar to the release of the outgoing sender connector for a subscriber outgoing call, as described in paragraph 11.46. However, the release of the outgoing sender timing OST relay will not operate the release sender connector RSC relay but instead will operate the OTL-2/4 relays which in turn will operate the RSC relay.

19.415 Outgoing Trunk Selection

The outgoing trunk selection is similar to the outgoing trunk selection for a subscriber outgoing call, as described in paragraph 11.5.

19.416 Selection of the Connecting Path

The selection of the connecting path is similar to the selection of the connecting path for a subscriber outgoing call, as described in paragraph 11.6.

19.417 Setting Up the Selected Connecting Path

The setting up of the selected connecting path is similar to the setting up the selected connecting path for a subscriber outgoing call, as described in paragraph 11.7.

19.418 Release of the Marker and Associated Circuits

The release of the marker is similar to the release of the marker for a subscriber outgoing call, as described in paragraph 11.8.

19.42 Intra-Office Call Requiring AMA Charging

The marker operations in assisting a non-reverting intra-office call requiring AMA charging is similar to the marker operations required in assisting a non-reverting intra-office call which does not require AMA charging as described in paragraph 8. However, for assisting an intra-office call requiring AMA charging it is necessary to associate an outgoing sender with the intra-office call. The outgoing sender is required since the transverter circuit will receive the information necessary for charging the calling subscriber from the outgoing sender. This outgoing sender will be associated with the marker when the marker is establishing the connection between the selected intra-office trunk and the calling subscriber line.

19.4201 Seizure of the Marker by the Originating Register

The seizure of the marker for an intra-office call requiring AMA charging is similar to the seizure of the marker by the originating register for an intra-office call which does not require AMA charging, as described in paragraph 8.01.

19.4202 Registration of Information from the Originating Register

The registration of information from the originating register is similar to the registration of information for an intra-office call as described in paragraph 8.02.

19.4203 Identification of the Basic Call or Connection

The identification of the basic call is similar to the identification of the basic call for an intra-office call as described in paragraph 8.03. However, the "R-" cross-connection terminal associated with the winding of the intra-office R- relay will be cross-connected to one of the "MBS-0/9" cross-connection terminals of figure 56. Therefore one of the message billing series MBS-0/9 relays will be operated. The MBS-0/9 relays will be operated only when an AMA record is required.

The operation of one of the MBS-1/9 relays with the free number FN relay, the operator OPR relay, the busy line BL relay, the vacant code - partial dial VP relay and the catchall auxiliary CAA relay non-operated will operate the AMA relay. The operation of the MBS-0 relay, where it is desired will make an entry on the AMA tape on a non-charge call for service observing purposes. The operation of the AMA relay with the DIS-2 relay non-operated will operate the AMA-3, AMA-4 and AMA-5 relays. The operation of the AMA-4 relay will operate the AMA-1, AMA-2 and GTU relays.

The operation of the route R- relay and the AMA-1/5 relays will direct the marker to perform the functions required in assisting an intra-office call requiring AMA charging.

19.4204 Identification of the Location of the Called Line

The identification of the location of the called line is similar to the identification of the location of the called line for an intra-office call as described in paragraph 8.04.

19.4205 Intra-Office, Non-Reverting Trunk Selection

The intra-office trunk selection is similar to the intra-office trunk selection for an intra-office call as described in paragraph 8.05.

19.4206 Called Line Busy Test

The called line busy test is similar to the called line busy test for an intra-office call as described in paragraph 8.06.

19.4207 Selection of the Connecting Path to the Called Line

The selection of the connecting path to the called line is similar to the selection of the connecting path to the called line for an intra-office call as described in paragraph 8.07.

19.4208 Setting Up the Selected Connecting Path to the Called Line

The setting up the selected connecting path to the called line is similar to the setting up the selected connecting path to the called line for an intra-office call as described in paragraph 8.08.

19.4209 Setting Up the Selected Ringing Code

The setting up the selected ringing code is similar to the setting up the selected ringing code for an intra-office call as described in paragraph 8.09.

19.4210 Releasing the Called Line Connecting Path Functions and Initiating the Calling Line Connecting Path Functions

The releasing the called line connecting path functions and the initiating the calling line connecting path functions are similar to the description for an intra-office call as described in paragraph 8.10.

19.4211 Selection and Connection of an Outgoing Sender

For assisting an intra-office call requiring AMA charging it is necessary to associate an outgoing sender with the intra-office call. The outgoing sender is required since the AMA recorder circuit will receive the information necessary for charging the calling subscriber from the outgoing sender. The selection and connection of an outgoing sender is similar to the selection and connection of an outgoing sender for a subscriber outgoing call, as described in paragraph 11.4.

19.42111 Outgoing Sender Subgroup Selection

The outgoing sender subgroup selection is similar to the outgoing sender subgroup selection for an outgoing call, as described in paragraph 11.41. However, the SOG-1/3 relays will not be operated. The NSI relay will be operated when ground potential is extended to the NSI relay winding with the R- and FSA relays operated, with the RTST, LR, RCY and GS- relay non-operated, and with the "OS" cross-connection terminal of figure 51 cross-connected to the "NSI" cross-connection terminal of figure 33. The OSA-0/4 and OSG-0/4 relays will be operated when ground potential is extended to the relay windings with the NSI, SCB, and AMA-4 relays operated and with the "AMA" cross-connection terminal of figure 89 cross-connected to the "OSC" cross-connection terminal of figure 70. The operation of the SCB relay in this call will be similar to the description for the intra-office call, paragraph 8.1021.

19.42112 Outgoing Sender Selection

The outgoing sender selection is similar to the outgoing sender selection for a subscriber outgoing call, as described in paragraph 11.42.

19.42113 Marker Connection to the Selected Outgoing Sender

The marker connection to the selected outgoing sender is similar to the marker connection to the selected outgoing sender for a subscriber outgoing call, as described in paragraph 11.43. However, the additional outgoing sender cut-in relays required for an AMA call will be operated, to extend a group of leads, which are needed for AMA charging, from the marker to the selected outgoing sender.

19.42114 Transfer of Information from Marker to Outgoing Sender

The transfer of information from marker to the outgoing sender is similar to the transfer of information from marker to outgoing sender for a subscriber outgoing call, as described in paragraph 11.44. However, in addition to transmitting and checking the information as described in paragraph 11.44, the marker will also transmit to the outgoing sender the information described in paragraph 19.4144 and will then check that the outgoing sender has received this information, as described in paragraph 19.4145.

19.42115 Outgoing Sender Connection to Intra-Office Trunk

The outgoing sender connection to the intra-office trunk is similar to the outgoing sender connection to the outgoing trunk for a subscriber outgoing call, as described in paragraph 11.45

19.42116 Release of the Outgoing Sender Connector

The release of the outgoing sender connector is similar to the release of the outgoing sender connector for a subscriber outgoing call, as described in paragraph 11.46. However, the release of the outgoing sender timing OST relay will not operate the release sender connector RSC relay but instead will operate the GTL-2/4 relays which in turn will operate the RSC relay.

19.4212 Selection of the Connecting Path to the Calling Line

The selection of the connecting path to the calling line is similar to the selection of the connecting path to the calling line for an intra-office call, as described in paragraph 8.11.

19.4213 Setting Up the Selected Connecting Path to the Calling Line

The setting up the selected connecting path to the calling line is similar to the setting up the selected connecting path to the calling line for an intra-office call, as described in paragraph 8.12. However, since an outgoing sender is associated with this intra-office an advance indication signal will be transmitted to the outgoing sender before the completion of the setting up the selected connected path to the calling line. The operation of the DCT relay, as described in paragraph 8.1233 for the intra-office call, will initiate the advance indication to the outgoing sender as described in paragraph 11.74. After the advance indication has been transmitted to the outgoing sender and checked in the marker by the operation of the outgoing sender AV relay and the operation of the marker AVK and AVK-1 relays, the DCT-2 relay will be operated and the marker operations will proceed, as described in paragraph 8.12.

19.4214 Release of the Marker and Associated Circuits

The release of the marker is similar to the release of the marker for an intra-office call, as described in paragraph 8.13.

20. MARKER RECYCLES AND ROUTE ADVANCES

When a marker is assisting a call or connection is unable to complete this call or connection the marker will usually "recycle" or "route advance." When the condition which prevents the marker from completing the call or connection is of such a nature that by releasing the equipment which has been selected, other than the selected marker, and by selecting different equipment it is possible to complete the connection the marker will be "recycled." On a "recycle" the trunk link frame, the line link frame, and the trunk circuit are released and the trunk link frame, the trunk circuit and the junctor subgroup preferences are advanced. Then the marker will attempt to complete the same call or connection without advancing to a different route.

When the condition which prevents the marker from completing the call or connection is of such a nature that it is not possible to complete the connection by a marker "recycle" the marker will be "route advanced." When the marker is "route advanced" the marker will not attempt to set up a connection to the original route but will instead complete a connection to another route which may result in the call being completed, or as is most probable, a connection being made or action taken to inform the calling subscriber that the call cannot be completed.

20.1 Called Line Busy

The action of the marker when a called line busy condition is encountered will be subdivided under four major divisions as follows:

a) Called line busy for intra-office call with non-PBX line.

b) Called line busy for intra-office call with PBX line.

c) Called line busy for terminating call with non-PBX line.

d) Called line busy for terminating call with PBX line.

When the called line is associated with an intra-office call a tone trunk will be connected to the calling subscriber to transmit the line busy tone signal. When the called line is associated with a terminating call the marker will signal the incoming trunk to provide the line busy tone signal. When the called line is associated with an outgoing call the office associated with the called line will provide the line busy tone signal.

To provide an outline of the marker route advance or recycles under various called line busy conditions the following tables are provided.

Marker Operations with Intra-Office Call for Non-PBX Called Line

Marker Route Advances From	To	Conditions
Intra-Office Call	Tone Trunk Connection	When Called Line Is Busy
Tone Trunk Connection	Common Overflow Trunk Connection	When Called Line Is Busy and All Tone Trunks Are Busy for Non-Coin Calling Line
Tone Trunk Connection	"BT" Signal to Orig. Reg. Ckt. Which Will Provide Overflow Tone	When Called Line Is Busy and All Tone Trunks Are Busy for Coin Calling Line
Common Overflow Trunk Connection	"BT" Signal to Orig. Reg. Ckt. Which Will Provide Overflow Tone	When Called Line Is Busy, All Tone Trunks Busy and All Common Overflow Trunks Busy for Non-Coin Calling Line

Marker Operations with Intra-Office Call for PBX Called Line

Marker Recycles or Route Advances From	To	Conditions
Recycles to Release Selected PBX Line	Recycles to Select a Second PBX Line within PBX Group	When Selected PBX Line Is Found Busy by the Called Line Busy Test
Route Advance from Intra-Office Call	Route Advance to Tone Trunk Connection	When Marker Recycles to Select a Second PBX Line and Then Finds by the Called Line Busy Test That This Second Selected PBX Line Is Busy or; When Marker Determines That All PBX Lines within the PBX Group Are Busy
Route Advance from Tone Trunk Connection	Route Advance to Common Overflow Trunk Connection	When Marker Initiates a Tone Trunk Connection but All Tone Trunks Are Busy for Non-Coin Calling Line
Route Advance from Tone Trunk Connection	"BT" Signal to Orig. Reg. Ckt. Which Will Provide Overflow Tone	When Marker Initiates a Tone Trunk Connection but All Tone Trunks Are Busy for Coin Calling Line
Route Advance from Common Overflow Trunk Connection	"BT" Signal to Orig. Reg. Ckt. Which Will Provide Overflow Tone	When Marker Initiates a Common Overflow Trunk Connection but All Common Overflow Trunks Are Busy for Non-Coin Calling Line

Marker Operations with Terminating Call for Non-PBX or PBX Called Line

Marker Recycles or Route Advances From	To	Conditions
Recycles to Release Selected PBX Line	Recycles to Select a Second PBX Line within PBX Group	When Selected PBX Line Is Found Busy by the Called Line Busy Test
Provides for Initiating Busy Tone Ringing from Ringing Selection Switch		When Marker Recycles to Select a Second PBX Line and then Finds by the Called Line Busy Test that this Second Selected PBX Line Is Busy or; When Marker Determines that All PBX Lines within the PBX Group Are Busy or; When Non-PBX Called Line Is Found Busy by the Called Line Busy Test

20.11 Called Line Busy for Intra-Office Call with Non-PBX Called Line

When the marker is assisting an intra-office call associated with a non- PBX called line and determines that the called line is busy the marker will "route advance" by releasing the intra-office call functions and then will initiate a conn ection from the calling subscriber to a tone trunk. After the tone trunk connection has been established the tone trunk will transmit the line busy tone signal to the calling subscriber.

If all tone trunks are busy the marker will be unable to establish a connection from the calling subscriber, to a tone trunk. Therefore, the marker will again "route advance" by releasing the tone trunk connection functions and then will initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line. After the common overflow trunk connection has been established the common overflow trunk will transmit the overflow tone signal to the non-coin calling subscriber. The overflow tone is similar to the line busy tone although not identical.

If all tone trunks are busy the marker will be unable to establish a connection from the coin calling subscriber to a tone trunk or if all common overflow trunks are busy the marker will be unable to establish a connection from the non-coin calling subscriber to a common overflow trunk. Therefore, in these cases, the marker will again initiate a "route advance." However, in this case there is no new route to which the marker can "route advance" to establish a connection. Therefore, the marker will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone. The marker will then be released and the calling subscriber will receive the overflow signal from the originating register circuit.

20.111 Route Advance to Tone Trunk Connection from Intra-Office Call. Connection

The marker will proceed with the intra-office call functions, as described in paragraphs 8.01, 8.02, 8.03, 8.04, 8.05 and 8.06, until the marker determines, as described in paragraph 8.06, that the called line is busy. When the marker determines that the called line is busy by the operation of the line busy test LBT relay, as described in paragraph 8.062, the marker will initiate a "route advance" in order to establish a connection from the calling subscriber to a tone trunk. This tone trunk has a termination associated with a trunk link frame. In order to "route advance" the marker will first release the intra-office call functions and then will initiate the tone trunk connection functions.

20.1111 Line Busy Indication and Operation of the LBT and LB Relays

The line busy test LBT relay will be operated as described in paragraph 8.062. The operation of the LBT relay will operate the line busy LB relay with the LLC2 relay operated and the SPL-1, RCY2 and CKR relays non-operated.

20.1112 Release of the Marker Intra-Office Call Functions

The marker will first release those intra-office call functions which are not required for a tone trunk connection.

20.11121 Operation of the RAV-1/2, RA-1/5 and GS-1/5 Relays

The operation of the LB relay, with the ITR-1 relay operated, will extend ground to operate the route advance RAV-1/2 relays in series. The RAV-1/2 relays will be held operated with the RAV-1 and SNK relays operated.

The one route advance RA-1/5 relay associated with the ground supply group associated with the intra-office trunk route will be operated when the RAV-1 relay is operated. The winding of this RA-1/5 relay will be extended through the non-operated GS-1/5 relay contacts, through the operated intra-office route R-relay contacts, over the "RAL" lead and through the operated RAV-1 relay contacts and over the "G4" lead and through the operated CKG-2 relay contacts to ground, thereby operating the RA-1/5 relay. After operating the RA-1/5 relay will be held operated with the RAV-1 and CKG-2 relays operated.

The operation of one RA-1/5 relay with the CKG-3 relay operated will operate the associated ground supply group GS-1/5 relay. The operated GS-1/5 relay will be held operated with the CKG-3 relay operated.

20.11122 Release of the TLC-1/3, LLC-1/2, ONW, CKG-4, NSI, ITR-1/3, FLG and FLG-1 Relays

The operation of the RAV-1 relay will release the TLC-1/3 relays. The operation of the RAV-2 relay will release the CKG-4 relay which in turn will release the LLC-1/2 and ONW relays.

The operation of the GS-1/5 relay will release the NSI relay which will release the ITR-1/3 relays which in turn will release the FLG and FLG-1 relays.

20.11123 Release of the Identification of the Location of the Called Line Functions

The release of the FLG-1 relay will release the LLI relay which in turn will release the FTL, FUL and RCL relays. The release of the FLG relay will release the VGL-1/2, HGL-1, and VFL-1 relays. The release of the FTL, FUL, RCL, VGL-1/2, HGL-1 and VFL-1 relays will release the operated FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4 and RCT-1/15 relays which in turn will release the VTK-1, HTK-1 and FTK-1 relays.

The release of the LLI relay will release the operated PN, TN or PTN relay.

20.11124 Release of the Intra-Office Trunk Selection Functions

The operation of the GS-1/5 relay will release the operated AL-0/3 relay which will in turn release the FC- and FCA- relays if the AL-0/3 relays are required for intra-office trunk selection. If the AL-0/3 relays are not required for intra-office trunk selection the operation of the GS-1/5 relay will release the FC- and FCA- relays. The release of the FC- and FCA- relays will release the FCK and FCKA relays which in turn will release the FS- relays.

All FTC- relays which are operated will be released when the FC- and FCA- relays are released. The release of the FTC- relays will release the FTCK relay.

The release of the TLC-1 relay will release the trunk link and connector MP, MCA, MCB, MCC and MCD relays. The release of the MP relay will release the trunk link frame MC relay.

The release of the trunk link and connector MP relay will release the TFK-1 and TFK-2 relays. The release of the trunk link and connector MCA relay will release the MAK-1 relay and the release of the trunk link and connector MCD relay will release the MDK relay.

The operation of the GS-1/5 relay will release the operated TB-0/5 relay and the operated TG-0/19 relay. The release of the TLC-2 relay will release the operated TS-0/19 relay.

The release of the trunk link frame MCA relay will release the trunk circuit F relay which in turn will release the trunk link frame FB- relays which in turn will release the LV-2/9 relays. The release of the trunk link and connector circuit MCB relay will release the operated LC-0/9 relay.

The release of the trunk link frame MCB relay will release the associated TB-0/5 relay in the trunk link and connector circuit.

The release of the trunk link frame MCB and MCD relays will release the TBK and LCK relays.

The release of the TLC-2 relay will release the FMK relay. The release of the TFK-1 relay will release the FML relay.

20.11125 Release of the Intra-Office Selection of the Connecting Path Functions

The release of the LLC-1 relay will release the line link and connector MP, MCA, MCB, HG-0/9 and LG-0/11 relays. The release of the line link frame MCA relay will release the VGB-0/11 relay.

The release of the TLC-3 relay will release the STF or PR relay and the operated 2TLF/10TLF relay. The release of the STF or PR relay will release the 20F or 40F relay and the release of the operated 2TLF/10TLF relay will release the 7Q or RQ relay, if operated.

The release of the ONW and LLC-1 relays will release the STP-1 or STP-2 relay which will release the PNR, PA, PB or PC relay. The release of the operated PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the trunk link frame MCC relay will release the operated P-0/9 relay which will in turn release the 2G or 3G relay, if operated.

The release of the LLC-2 relay will release the JG-0/4 relay. The release of the trunk link frame MCB relay will release the JCK-0/1 relays.

The release of the trunk link and connector MCC relay will release the trunk link and connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER relays.

The release of the line link frame HG-0/9 relay will release the TLL-0/9 relays. The release of the trunk link frame MCB relay will release the TJ-0/9 relays. The release of the trunk link frame LC-0/9 relay will release the TTL-0/9 relays.

20.1113 Initiating the Tone Trunk Connection Functions

After the marker has released the intra-office call functions the marker will initiate the tone trunk connection functions.

20.11131 Release of the SNK, RAV-1/2 and RA-1/5 Relays

The release of the TFK-1, FCK, FCKA, FTCK, FML and FMP relays will release the selections normal check SNK relay as a check of the release of these relays and as a check that the intra-office call functions have been released.

The release of the SNK relay will release the RAV-1/2 relays which in turn will release the operated RA-1/5 relay.

20.11132 Operation of the Route R- Relay Associated with the Tone Trunk Connection

In order for the marker to proceed to select a tone trunk and a connecting channel between the calling subscriber and the tone trunk the marker must determine the route and type of equipment which can provide the proper service for this tone trunk connection.

For a typical office the cross-connections for operating the route R- relay are as follows:

The operated CKG-3 relay contacts will extend ground over the "RA" lead, through the released RA-1/5 relays and the operated GS-1/5 relay, and through the operated intra-office route R- relay which will extend the ground to the route advance "RA" cross-connection terminal. The "RA" cross-connection terminal of Figure 51 will be cross connected to the "LR" cross-connection terminal of Figure 53. Therefore ground is extended to the "LR" cross-connection terminal of Figure 53 and further extended with the RV relay non-operated and the LB relay operated through the winding of the BL relay to place ground on the "OV" cross-connection terminal of Figure 53. The "OV" cross-connection terminal of Figure 53 will be cross connected to associated "SC-" cross-connection terminals of Figure 61. The operation of a particular class of service S-00/44 or S-100/144 relay associated with the class of service of the calling subscriber will extend the ground on the "OV" cross-connection terminal to one particular "S-" cross-connection terminal of Figure 61. The "S-" cross-connection terminal will be cross connected to an "RC" cross-connection terminal of Figure 51 associated with the tone trunk route thereby extending ground to operate the route R- relay associated with a tone trunk connection and with the class of service of the calling subscriber.

The "R-" cross-connection terminal associated with the winding of the tone trunk route R- relay may be cross connected to the "RB" cross-connection terminal of Figure 53.

20.11133 Operation of the NSO, SOG-1/3, CB, CB-1/5, CB7, CBF, CBD-1 and CBD Relays

The operation of the route relay on a tone trunk connection results in the operation of the no sender outgoing NSO relay. The non-operated LR, RTST, RCY and GS-1/5 relay and the operation of the tone trunk route R- relay will extend ground to the associated "OS" cross-connection terminal of Figure 51 which will be cross connected to the "NSO" cross-connection terminal of Figure F thereby operating the NSO relay.

The operation of the NSO relay will operate the subscriber outgoing SOG-1/3 relays to direct the marker to perform functions required in assisting a tone trunk connection. The marker functions required for a tone trunk connection are somewhat similar to the functions required for a subscriber outgoing call.

The windings of the SOG-3, SOG-2 and SOG-1 relays are in series with each other and the operating path will be extended through the operated OR relay contacts, through the operated NSO relay contacts, through the non-operated RTST and LR relay contacts, through the non-operated TR2E relay contacts and over the "TRK" lead to the originating register marker connector circuit where the "TRK" lead will be grounded when the originating register marker connector MC relay is operated and the TR-1 relay is non-operated.

The operation of the SOG-2 relay with the RV-1/2 relays released will operate the CB relay when the DIS-2 relay is non-operated. The operation of the CB relay will operate the CB-1/5, CB-7, CBD, CBD-1 and CBF relays.

20.11134 Operation of the TLC-1/3, LLC-1/2, ONW and CKG-4 Relays

The release of the RAV-1/2 relays will reoperate the TLC-1/3 and CKG-4 relays. The operation of the CKG-4 relay will reoperate the LLC-1/2 and ONW relays.

20.11135 Tone Trunk Selection

The tone trunk selection will be initiated by the marker when the marker route relay associated with the tone trunk connection is operated.

The method of selecting an idle tone trunk circuit is similar to the method of selecting an idle originating register, as described in paragraphs 7.32, 7.33, 7.34, 7.35, 7.36 and 7.37.

20.11136 Selection of the Connecting Path

The selection of the connecting path to the calling line will be initiated as soon as the relays associated with the intra-office call functions have been released and the call back relays have been operated to indicate that the marker should set up a call back connection from the selected tone trunk to the calling line.

The marker operations required for the selection of the connecting path between the calling line and the selected tone trunk is similar to the selection of the connecting path between the calling line and the selected intra-office trunk, as described in paragraph 8.11.

20.11137 Setting Up the Selected Connecting Path

The marker operations required for setting up the selected connecting path is similar to setting up the selected connecting path for a dial tone connection, as described in paragraphs 7.51, 7.52, 7.53 and 7.54.

20.11138 Release of the Marker and Associated Circuits

The release of the marker will be similar to the release of the marker for a reverting intra-office call, as described in paragraph 9.11.

20.112 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

If all tone trunks are busy the marker will be unable to establish a connection from the calling subscriber to a tone trunk. Under this condition the marker will again route advance and if the calling subscriber is associated with a non-coin line the marker will assist a connection from the calling subscriber to the common overflow trunk.

The marker will proceed with route advancing from the intra-office call

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connection to the tone trunk connection, as described in paragraphs 20.111. However, when the marker initiates the tone trunk selection, as described in paragraph 20.11135, the marker will determine that all tone trunks are busy. If the class of service indication of the calling line indicates a non-coin line the marker will assist a connection from the calling subscriber to the common overflow trunk.

However, if the class of service indication of the calling line indicates a coin line the marker will initiate the action as described in paragraph 20.113.

20.1121 Release of the Marker Tone Trunk Connection Functions

When the marker which is initiating a tone trunk connection determines by the operation of the trunk busy timing TBT and TBTA relays that all tone trunks within a trunk subgroup are busy and that there are no other tone trunk subgroups the marker will route advance from a tone trunk connection to a common overflow trunk connection if the subscriber line is a non-coin line.

20.11211 Operation of the TBT, TBTB, TBTA, RAV-1/2, RA-1/5, and GS-1/5 Relays

When the marker is initiating a tone trunk selection the FC- and FCA- relays will be operated to extend leads from the marker to the trunk link frames to determine which trunk link frames are associated with idle tone trunks. If a trunk link frame is associated with one or more idle tone trunks the associated marker FTC-0/19 relay will be operated. To indicate that the FC- and FCA- relays have operated the FCK and FCKA relays will be operated and to indicate that one or more FTC-0/19 relays have operated the FTCK and FTCK-1 relays will be operated.

The operation of the FCK and FCKA relays with the FTCK-1, FTCK and TBTB relays non-operated will extend ground potential to the secondary winding of the TBT relay to operate the TBT relay to the non-operate position. The primary winding is energized through the TFT resistance to tend to operate the TBT relay to the operate position. However, since the secondary winding action predominates, the TBT relay will operate to the non-operate position.

The operation of the FCK and FCKA relays with the FTCK-1, FTCK and TBT relays non-operated will operate the TBTB relay.

The operation of the TBTB relay will remove the ground potential on the secondary winding of the TBT relay which is holding the TBT relay in the non-operate position. However, the TBT relay will not operate immediately since the charge from the TBT condenser will hold the TBT relay in the non-operate position for a short interval of time.

If an idle tone trunk is available the FTCK and FTCK-1 relays will operate and will in turn release the operated TBTB relay before the timing TBT relay will operate. Therefore, in this case, when the TBT relay is operated the TBTB relay will be released which will prevent the operation of the TBTA relay.

However, if an idle tone trunk is not available the FTCK and FTCK-1 relays will not operate and will not release the operated TBTB relay before the timing TBT relay will operate. Therefore, in this case, when the TBT relay is operated the TBTA relay will be operated to indicate that all tone trunks are busy.

Assuming that the tone trunk group consists of only one subgroup of trunks, the operation of the TBTA relay, with the MT-1 and GP-1 relays non-operated, will operate the RAV-1/2 relays in series.

The one route advance RA-1/5 relay associated with the ground supply group associated with the tone trunk route will be operated when the RAV-1 relay is operated. The winding of this RA-1/5 relay will be extended through the non-operated GS-1/5 relay contacts, through the operated tone trunk route R-relay contacts, through the operated RAV-1 relay contacts, through the operated CKG-2 relay contacts to ground, thereby operating the RA-1/5 relay. After operating the RA-1/5 relay will be held operated with the RAV-1 and SNK relays operated.

The operation of one RA-1/5 relay with the CKG-3 relay operated will operate the associated ground supply group GS-1/5 relay. The operated GS-1/5 relay will be held operated with the CKG-3 relay operated.

20.11212 Release of the TLC-1/3, LLC-1/2, ONW, CKG-4, NSO, SOG-1/3, CB, CB-1/5, CB-7, CBF, CBD and CBD-1 Relays

The operation of the RAV-1 relay will release the TLC-1/3 relays. The operation of the RAV-2 relay will release the CKG-4 relay which in turn will release the LLC-1/2 and ONW relays.

The operation of the GS-1/5 relay will release the NSO relay which will release the SOG-1/3 relays which in turn will release the CB, CB-1/5, CB-7, CBF, CBD and CBD-1 relays.

20.11213 Release of the FC-, FCA-, FCK, and FCKA Relays

The operation of the GS-1/5 relay will release the FC- and FCA- relays which will release the FCK and FCKA relays

20.1122 Initiating the Common Overflow Trunk Connection Functions

After the marker has released the tone trunk connection functions the marker will initiate the common overflow trunk connection functions.

20.11221 Release of the TBTA, TBTB, SNK, RAV-1/2 and RA-1/5 Relays

The release of the FCK and FCKA relays will release the TBTA and TBTB relays which in turn will release the SNK relay.

The release of the SNK relay will release the RAV-1/2 relays which in turn will release the operated RA-1/2 relay.

20.11222 Operation of the Route R- Relay Associated with the Common Overflow Trunk Connection

For a typical office the cross-connections for operating the route R- relay are as follows:

The operated CKG-3 relay contacts will extend ground over the "RA" lead, through the released RA-1/5 relays and the operated GS-1/5 relay, and through the operated tone trunk route R- relay which will extend ground to the route advance "RA" cross-connection terminal. The "RA" cross-connection terminal of Figure 51 will be cross connected to an "RC" cross-connection terminal of Figure 51 associated with the common overflow trunk route thereby extending ground to operate the route R- relay associated with a common overflow trunk connection. The "R" cross-connection terminal associated with the winding of the common overflow trunk route R- relay may be cross connected to the "CA" cross connection of Figure 53 thereby operating the CAA relay in series with the route R- relay.

20.11223 Operation of the NSO, SOG-1/3, CB, CB-1/5, CB-7, CBF, CBD-1 and CBD Relays

The operation of these relays are similar to the operation described in paragraph 20.11133.

20.11224 Operation of the TLC-1/3, LLC-1/2, ONW and CKG-4 Relays

The operation of these relays are similar to the operation described in paragraph 20.11134.

20.11225 Common Overflow Trunk Selection

The common overflow trunk selection will be initiated by the marker when the marker route relay associated with the common overflow trunk connection is operated.

The method of selecting an idle common overflow trunk circuit is similar to the method of selecting an idle originating register, as described in paragraphs 7.32, 7.33, 7.34, 7.35, 7.36 and 7.37.

20.11226 Selection of the Connecting Path

The selection of the connecting path to the calling line will be initiated as soon as the relays associated with the tone trunk connection functions have been released and the call back relays have been operated to indicate that the marker should set up a call back connection from the selected common overflow trunk to the calling line.

The marker operations required for the selection of the connecting path between the calling line and the selected common overflow trunk is similar to the selection of the connecting path between the calling line and the selected intra-office trunk, as described in paragraph 8.11.

20.11227 Setting Up the Selected Connecting Path

The marker operations required for setting up the selected connecting path is similar to setting up the selected connecting path for a dial tone connection, as described in paragraphs 7.51, 7.52, 7.53 and 7.54.

20.11228 Release of the Marker and Associated Circuits

The release of the marker will be similar to the release of the marker for a reverting intra-office call, as described in paragraph 9.11

20.113 Route Advance to Provide Overflow Tone from the Originating Register

If all tone trunks are busy the marker will be unable to establish a connection from the coin calling subscriber to a tone trunk or if all common overflow trunks are busy the marker will be unable to establish a connection from the non-coin calling subscriber to a common overflow trunk. Therefore, in these cases, the marker will again initiate a route advance. However, in both of these cases there will be no new route to which the marker can "route advance" to establish a connection to provide an overflow tone signal. Therefore, the marker will place ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone. The marker will not be required to set up any connection and will therefore immediately release without releasing the originating register from the connection to the calling subscriber.

20.1131 Operation of the TBT, TBTB, TBTA, RAV-1/2, RA-6, RBT, TRL and TRLA Relays

When the marker is initiating the tone trunk selection or the common overflow trunk selection the FC- and FCA- relays will be operated to extend leads from the marker to the trunk link frames to determine which trunk link frames are associated with idle trunks of the required type. If a trunk link frame is associated with one or more idle trunks of the required type the associated marker FTC-0/19 relay will be operated. To indicate that the FC- and FCA- relays have operated the FCK and FCKA relays will be operated and to indicate that one or more FTC-0/19 relays have operated the FTCK and FTCK-1 relays will be operated.

The operation of the FCK and FCKA relays with the FTCK-1, FTCK and TBTB relays non-operated will extend ground potential to the secondary winding of the TBT relay to operate the TBT relay to the non-operate position. The primary winding is energized through the TFT resistance to tend to operate the TBT relay to operate position. However, since the secondary winding action predominates, the TBT relay will operate to the non-operate position.

The operation of the FCK and FCKA relays with the FTCK-1, FTCK and TBT relays non-operated will operate the TBTB relay.

The operation of the TBTB relay will remove the ground potential on the secondary winding of the TBT relay which is holding the TBT relay in the non-operate position. However, the TBT relay will not operate immediately since the charge from the TBT condenser will hold the TBT relay in the non-operate position for a short interval of time.

If an idle trunk of the required type is available the FTCK and FTCK-1 relays will operate and will in turn release the operated TBTB relay before the timing TBT relay will operate. Therefore, in this case, when the TBT relay is operated the TBTB relay will be released which will prevent the operation of the TBTA relay.

However, if an idle trunk of the required type is not available the FTCK and FTCK-1 relays will not operate and will not release the operated TBTB relay before the timing TBT relay will operate. Therefore, in this case, when the TBT relay is operated the TBTA relay will be operated to indicate that all trunks of the required type are busy.

Assuming that the required trunks are associated with only one subgroup of trunks, the operation of the TBTA relay, with the MT-1 and GP-1 relays non-operated, will operate the RAV-1/2 relays in series.

The route advance RA-6 relay will be operated when the RAV-1 relay is operated. The winding of the RA-6 relay will be extended through the operated coin tone trunk route R- relay contacts or through the operated common overflow route R- relay contacts, through the operated RAV-1 relay contacts, through the operated CKG-2 relay contacts to ground, thereby operating the RA-6 relay. The operation of the RA-6 relay will indicate to the marker that no other routes exist to which the marker may route advance to provide the busy line tone.

The operation of the RA-6 relay, with the SOG-1 relay operated and the MF-13 relay non-operated will operate the register busy return RBT relay which will operate the trouble release disconnect (without taking a trouble record) TRL relay which in turn will operate the TRLA relay.

20.1132 Operation of the Originating Register BT relay

The operation of the TRL and TRLA relays, with the MRL-1, TR2, LR and TST relays non-operated and the RBT relay operated, will extend ground over the "BT" lead from the marker to the originating register to operate the BT relay in the originating register. The operation of the BT relay in the originating register will initiate overflow tone to be transmitted to the calling subscriber.

20.1133 Release of the Marker and Associated Circuits

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

20.11331 Release of the TLC-1/3, LLC-1/2, ONW, CKG-1/7 and CB Relays

The operation of the RAV-1 relay will release the TLC-1/3 relays. The operation of the RAV-2 relay will release the CKG-4 relay which in turn will release the LLC-1/2 and ONW relays.

The operation of the TRLA relay will release the CKG-1/3 relays. The release of the CKG-3 relay will release the CKG-5/7 relays and the operated route R- relays. The release of the SOG-2 relay will release the CB relay.

20.11332 Release of the Register Marker Connector RS, RA, RB, RC, RD, MS, MA,MB, MC and MD Relays

The operation of the originating register BT relay will release the originating register marker connector from the marker and originating register circuit but will not release the originating register from the dial tone connecting path to the calling subscriber.

The operation of the BT relay in the originating register circuit will release the RS and MS relays in the originating register marker connector. The release of the RS relay will release the RA, RB, RC and RD relays in the originating register marker connector. The release of the MS relay will release the MA and MC relays which in turn will release the MB and MD relays in the originating register marker connector circuit.

20.11333 Release of the MCB-1/6 Relays and the Marker Connector CB Relays

The release of the route R- relays will release the FC- and FCA- relays which in turn will release the FCK and FCKA relays. The release of the FCK and FCKA relays will release the TBTA and TBTB relays which in turn will release the SNK relay. The release of the SNK relay, with the TRL relay released, will release the MCB-1/6 relays which in turn will release the CB relays associated with this marker circuit in all marker connectors. The release of the CB relays associated with this marker circuit in all marker connectors will indicate to all marker connectors that this marker has been released and is now idle and available and that any marker connector circuit may select and seize this marker for service.

20.11334 Release of the CTA-0/2, CU-0/7, S-, OR, FT-0/3, FU-0/7, VG-0/10, HG-0/7, VF-0/4, AC-0/7, BC-0/7 and CC-0/7 Relays

The release of the originating register marker connector RA and RB relays will release the CTA-0/2 and CU-0/7 relays. The release of the originating register marker connector RA relay will release the OR relay and the AC-0/7, BC-0/7 and CC-0/7 relays. The release of the originating register marker connector RC and RD relays will release the FT-0/3, FU-0/7, VG-0/10, HG-0/7, and VF-0/4 relays. The release of the CKG-1 relay will release the S- relay.

20.11335 Release of the TC-5/7, AT-2/9, BT-20/99, LPA, LPB, LTA, LTB, NSO and SOG-1/3 Relays

The release of the originating register marker connector MA relay will release the operated TC-5/7 relay. The release of the CKG-1 relay will release the operated AT-2/9, BT-20/99, LPA, LPB, LTA and LTB relays. The release of the route R- relays will release the NSO relay which in turn will release the SOG-1/3 relays.

20.11336 Release of the CB-1/5, CB-7, CBD, CBF, CBD-1, FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, VTK-1, HTK-1 and FTK-1 Relays

The release of the CB relay will release the CB-1/5, CB-7, CBF, CBD and CBD-1 relays which will release the FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9 and VFT-0/4 relays which in turn will release VTK-1, HTK-1 and FTK-1 relays.

20.12 Called Line Busy for Intra-Office Call with PBX Called Line

When the marker is assisting an intra-office call and when the marker is identifying the location of the terminal hunting line, as described in paragraph 8.04, the marker will select one of the idle lines within the PBX group for completing the call. Also, the marker will be informed through the number group when all lines within the PBX line group are busy. If all lines within the PBX group are busy the marker will not proceed with the usual intra-office call functions and will "route advance" by releasing the intra-office call functions and then will initiate a connection from the calling subscriber to a tone trunk. If all tone trunks are busy the marker will again "route advance" by releasing the tone trunk connection functions and then will initiate a connection from the calling subscriber line to a common overflow trunk. If all common overflow trunks are busy the marker will again initiate a "route advance" and will place ground on the "BT" lead to the originating register circuit to indicate that the originating register circuit should provide the overflow tone.

Under certain conditions the marker when associated with the number group will select one of the idle PBX lines to complete the call but will later determine that this line is busy when making the called line busy test. When the marker has proceeded to the called line busy test, as described in paragraph 8.062, the called line will be tested and if the selected line has been seized for the completion of another call in the interval of time from the number group line busy test to the marker called line busy test the marker will receive a line busy indication when performing the line busy test. Since, under these conditions, only one of the lines within the PBX line group has been tested and found busy the marker will not initiate the transmitting of busy tone to the calling subscriber. Instead the marker will initiate a PBX recycle which will release the information associated with the selected called PBX line and will re-establish a connection to the number group circuit in order to select an idle line within the same PBX line group. However, if the same action occurs with the second selected PBX line the marker will not attempt a second PBX recycle but will then initiate a "route advance" in order to route advance to a tone trunk connection.

20.121 Called Line Busy Indication from Number Group.

20.1211 Route Advance to Tone Trunk Connection from Intra-Office Call Connection

The marker will proceed with the intra-office call functions, as described in paragraphs 8.01, 8.02, and 8.03, until the marker when identifying the location of a terminal hunting line, as described in paragraph 8.04, will determine that all lines with the PBX line group are busy. When the marker determines that all lines with the desired PBX line group are busy the marker will initiate a route advance in order to establish a connection from the calling subscriber to a tone trunk.

20.12111 Operation of the EG, GB, and LB Relays

The operation of the end of group EG relay, as described in paragraph 8.04324, will inform the marker that terminal hunting has been extended through all of the tens blocks associated with the desired PBX lines. The operation of the group busy GB relay, as described in paragraph 8.04322, with the EG relay operated will inform the marker that all lines within the desired PBX line group have been tested and all have been found to be busy.

The operation of the GB relay, with the EG and NGC relays operated and the NC relay non-operated, will operate the LB relay.

20.12112 Release of the Number Group

When the marker has determined that all lines within the desired PBX line group are busy the marker will release the number group circuit.

20.121121 Operation of the RNG and NR Relays and Release of the PBX-1/2 Relays

The operation of the LB relay, with the OFK relay non-operated, will operate the release number group RNG relay which in turn will operate the number release NR relay and will release the PBX-1/2 relays.

20.121122 Release of the N-1/4, N-1A/4A, TH-0/7, HN-0/7, TN-0/7, U-0/7 and the OAN or OBN Relays

The operation of the NR relay will release the operated N-1/4 and N-1A/4A relays which in turn will release the operated TH-0/7, HN-0/7, TN-0/7 and U-0/7 relays. The operation of the NR relay will also release the operated OAN or OBN relay.

20.121123 Release of the MP and MCA Relays in the Number Group and the Release of the NGK Relay in the Marker

The release of the PBX1 relay will release the number group MP relay. The release of the number group MP relay will release the number group MCA relay which in turn will release the marker NGK relay.

20.121124 Release of the HB-0/9, TB-00/99 and SC- Relays in the Number Group

The operation of the GB relay will release the HB-0/9 relay in the number group by removing the battery potential on the "LHB" lead which has been extended to the number group circuit to hold the HB-0/9 relay operated. The release of the PBX-1 relay will release the TB-00/99 and SC- relays in the number group by removing the battery potential on the "SCK" lead which has been extended to the number group circuit to hold the TB-00/99 and SC- relays operated.

20.12113 Release of the Marker Intra-Office Call Functions

The release of the marker intra-office call functions is similar to the description in paragraph 20.1112. However, since all lines associcated with the desired PBX line group were busy the marker did not operate the relays associated with identification of the called line, the marker did not seize the line link frame or operate the relays associated with the line link frame seizure and the marker did not select a connecting path.

20.12114 Initiating the Tone Trunk Connection Functions

The initiating the tone trunk connection functions is similar to the description in paragraph 20.1113.

20.1212 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

20.1213 Route Advance to Provide Busy Tone from the Originating Register

The route advance to provide busy tone from the originating register is similar to the description in paragraph 20.113.

20.122 Called Line Busy Indication from Called Line Busy Test on First Selected PBX Line and Initiation of Marker PBX Recycle

The marker will proceed with the intra-office call functions, as described in paragraphs 8.01, 8.02, 8.03, 8.04, 8.05 and 8.06, until the marker determines, as described in paragraph 8.06, that the selected PBX line is busy. When the marker was associated with the number group the selected PBX line was tested and was found to be idle and was therefore selected for service. However, in the interval of time from the selection of the idle PBX line to the initiation of the line busy test, as described in paragraph 8.06, it is possible for another marker to seize and to make busy this PBX line for service on another call. Under these conditions this marker will initiate a PBX recycle in order to release the selection of this selected PBX line and to reselect some other idle PBX line within the PBX line group.

If after a PBX recycle has been completed and a second PBX line selected for service, this second PBX line is tested and a called line busy test indication is received the marker will not initiate a second PBX recycle but will initiate a "route advance", as described in paragraph 20.123 in order to route advance to a tone trunk connection.

20.1221 Line Busy Indication and Operation of the LBT, RCY-2 and RCY-3 Relays

The line busy test LBT relay will be operated as described in paragraph 8.062. The operation of the LBT relay with the LLC-2, CKR and FLG relays operated and the RCY-4 relay non-operated will operate the RCY-2 relay which in turn will operate the RCY-3 relay. The operated CKR relay indicates that the called line is a PBX line and therefore a PBX recycle is required. The operation of the RCY-2 and RCY-3 relays will initiate the PBX recycle.

20.1222 Release of the Functions Associated with the Called PBX Line

The marker will first release those intra-office call functions which are associated with the called PBX line so that the marker may reselect some other PBX line within the PBX line group which is idle.

20.12221 Release of the LLC-1/2, ONW, and FLG-1 Relays

The operation of the RCY-2 relay will release the LLC-1/2 and ONW relays. The operation of the RCY-3 relay will release the FLG-1 relay.

20.12222 Release of the Identification of the Location of the Called Line Functions

The release of the FLG-1 relay will release the LLI relay which in turn will release the FTL, FUL, RCL, VGL, HGL and VFL relays. The release of the FTL, FUL, RCL, VGL, HGL and VFL relays will release the operated FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4 and RCT-10 relays which in turn will release the VTK-1, HTK-1 and FTK-1 relays.

The release of the LLI relay will release the operated PN, TN or PTN relay. The release of the FLG-1 relay will release the CKR and SLCK-1 relays.

20.12223 Release of the Selection of the Connecting Path Functions

The release of the LLC-1 relay will release the line link and connector MP, MCA, MCB, HG-0/9 and LG-0/11 relays. The release of the line link frame MCA relay will release the VGB-0/11 relay.

The release of the ONW and LLC-1 relays will release the STP-1 or STP-2 relay which will release the PNR, PA, PB or PC relay. The release of the operated PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the FUT-0/3 relay will release the operated P-0/9 relay which in turn will release the 2G or 3G relay, if operated.

The release of the LLC-2 relay will release the JG-0/4 relay which in turn will release the trunk link and connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER relays. The release of the trunk link and connector JC-0/19 relay will release the JCK-0/1 relays.

The release of the LLC-1 relay will release the CH-0/9 and CHA relays.

20.1223 Initiating the Reselection of Some Other PBX Line within the PBX Line Group

After the marker has released the functions associated with the called PBX line the marker will initiate the reselection of some other PBX line within the PBX line group.

20.12231 Operation of the RCY-4, LLC-1/2, ONW and FLG-1 Relays

The RCY-4 relay will be operated to check that the functions associated with the called PBX line have been released or recycled. The winding of the RCY-4 relay will be extended with the RCY-3, and HMT-1 relays operated and the SLCK-1, CKR, SL, GLH-1, GT-2, CON-1, TK, RK, LK, TCHK, HGK, and JCK-0/1 relays non-operated to ground potential which will operate the RCY-4 relay. The operation of the RCY-4 relay will reoperate the LLC-1/2, ONW and FLG-1 relays.

20.12232 Identification of the Location of the Called Line

The reoperation of the FLG-1 relay will reoperate the NGC relay which will initiate the seizure of the number group. The number group will be reseized and some other PBX line within the PBX line group which is idle will be selected for completing the connection. The identification of the location of the called line is similar to the description in paragraph 8.04.

20.12233 Called Line Busy Test

The called line busy test is initiated to test the new PBX line which has been selected. The called line busy test is similar to the description in paragraph 8.06.

20.12234 Selection of the Connecting Path to the Called Line

The selection of the connecting path to the called line is similar to the description in paragraph 8.07.

20.12235 Setting Up the Selected Connecting Path to the Called Line and Setting Up the Selected Ringing Code

The setting up the selected connecting path to the called line is similar to the description in paragraph 8.08.

The setting up the selected ringing code is similar to the description in paragraph 8.09.

20.12236 Releasing the Called Line Connecting Path Functions and Initiating the Calling Line Connecting Path Functions

The releasing the called line connecting path functions and initiating the calling line connecting path functions is similar to the description in paragraph 8.10.

20.12237 Selection of the Connecting Path to the Calling Line

The selection of the connecting path to the calling line is similar to the description in paragraph 8.11.

20.12238 Setting Up the Selected Connecting Path to the Calling Line

The setting up the selected connecting path to the calling line is similar to the description in paragraph 8.12.

20.12239 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 8.13.

20.123 Called Line Busy Indication from Called Line Busy Test on Second Selected PBX Line and Initiation of Marker Route Advance

The marker will proceed with the intra-office call functions, as described in paragraphs 8.01, 8.02, 8.03, 8.04, 8.05 and 8.06, until the marker determines, as described in paragraph 8.06, that the selected PBX line is busy. The marker will then initiate a PBX recycle and will select a second PBX line within the PBX group for service, as described in paragraphs 20.1221, 20.1222 and 20.1223. The marker will proceed until the marker determines, as described in paragraph 20.12233, that the second selected PBX line is busy. The marker will then initiate a "route advance."

20.1231 Route Advance to Tone Trunk Connection from Intra-Office Call Connection

The marker in route advancing will initiate a connection from the calling subscriber to a tone trunk in a manner similar to the description of paragraph 20.111.

20.1232 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

If all tone trunks are busy the marker will be unable to establish a connection from the calling subscriber to a tone trunk. Under this condition the marker will again route advance and will assist a connection from the calling subscriber to a common overflow trunk in a manner similar to the description of paragraph 20.112.

20.1233 Route Advance to Provide Busy Tone from the Originating Register

If all common overflow trunks are busy the marker will be unable to establish a connection from the calling subscriber to a common overflow trunk. Therefore, the marker will again initiate a route advance to provide overflow tone from the originating register in a manner similar to the description of paragraph 20.113.

20.13 Called Line Busy for Terminating Call with Non-PBX Called Line

When the marker is assisting a terminating call associated with a non-PBX called line and determines that the called line is busy the marker will not proceed with the usual terminating call functions and will set up the busy tone ringing condition on the ringing selection switch so that the incoming trunk can provide the busy tone to the calling subscriber. After setting up the busy tone ringing condition on the ringing selection switch the marker will release from the connection.

The marker will proceed with the terminating call functions, as described in paragraphs 12.1, 12.2, 12.3, and 12.4, until the marker determines, as described in paragraph 12.5, that the called line is busy. When the marker determines that the called line is busy by the operation of the line busy test LBT relay, as described in paragraph 12.5, the marker will not proceed with the terminating call functions but will set up the busy tone condition on the ringing selection switch and will inform the incoming trunk that the incoming trunk should provide the busy tone to the calling subscriber.

20.131 Operation of the LBT, LB and BY Relays

The line busy test LBT relay will be operated as described in paragraph 8.062. The operation of the LBT relay will operate the line busy LB relay with the LLC2 relay operated and the SPL-1, RCY2 and CKR relays non-operated.

The operation of the LB relay will operate the busy line BY relay with the TER-1 relay operated and the BNB, RIB and TBIB relays non-operated.

20.132 Release of the RS-0/9, RSK and SRK Marker Relays and the Ringing Switch Select Magnets

When the marker received the ringing information of the called line from the number group the marker operated the associated RS-0/9, RSK and SRK relays in the marker and also the associated ringing switch select magnets. These marker relays and the ringing switch select magnets associated with the ringing combination of the called line must be released before reoperating the marker relays and the ringing switch select magnets associated with the ringing combination of the busy tone.

The operation of the BY relay will release the operated RS-0/9 marker relay which will release the operated ringing switch select magnets which in turn will

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release the RSK relay. The release of the RSK relay will release the SRK relay.

20.133 Setting Up the Busy Tone Ringing Code

The setting up the busy tone ringing code is somewhat similar to setting up the selected ringing code for an intra-office call.

20.1331 Operation of the Marker OFH, RS-0/9 and RSK Relays and the Ringing Selection Switch Select Magnets -0/9

The release of the SRK relay, with the RSK and RCK-2 relays non-operated and the BY relay operated, will operate the overflow hold magnet (ringing switch) OFH relay.

The operation of the OFH relay, with the BY relay operated and the OV relay non-operated, will operate the RS-1 and RS-9 relays.

The operation of the RS-1 and RS-9 relays with the FLG and ONX relays operated will extend battery potential over the associated "RS-1" and "RS-9" leads to the trunk link frame where the operated MCA and LV- relays will extend the "RS-1" and "RS-9" leads to the ringing selection switch thereby operating the associated ringing selection switch select magnets -1 and -9.

The operation of one of the ringing selection switch select magnets will place ground on the "RSK" lead, which will be extended through the trunk link frame with the LV- and MCA relays operated to the marker circuit thereby operating the ringing selection check RSK relay in the marker.

20.1332 Operation of the Marker SRK and LI Relays and the Incoming Trunk RC Relay

The operation of the RSK relay will operate the start ringing check SRK relay. The operation of the SRK relay with the CKG-7 and OFH relays operated will operate the LI relay.

The operation of the marker LI relay will extend resistance ground potential to the "RC" lead which will be extended through the trunk link frame with the MCB and LV- relays operated to the incoming trunk circuit to operate the ringing control RC relay in the incoming trunk circuit. Resistance ground potential is placed on the "RC" lead in the marker by extending the "RC" lead from the trunk link frame through the contacts of the non-operated OC, TOG-3, RV-3 and SOG-3 relays to the primary winding of the RCK-1 relay, through the contacts of the operated CKG-6 and LI relays, through the RCK-1 resistance, through the contacts of the operated FLG-1 relay and through the contacts of the non-operated MXT, XRS-1 and XRS-2 relays to ground potential.

20.1333 Operation of the Ringing Selection Switch Hold Magnet and the Marker RCK-1 and RCK-2 Relays

The operation of the RC relay in the incoming trunk will extend ground over the "H" lead to operate the associated ringing selection switch hold magnet.

The RCK-1 relay in the marker will be operated to check that the ringing selection switch crosspoints have been operated. With the operation of the CKG-6 relay, battery potential through the RCK-2 resistance has been extended to one side of the primary winding of the RCK-1 relay. The other side of the primary winding of the RCK-1 relay is extended to the "RC" lead and to the winding of the RC relay in the incoming trunk circuit. The other side of the winding of the RC relay in the incoming trunk is connected to battery potential, therefore the primary winding of the RCK-1 relay is not energized in the operate polarity. It is to be noted that the ground potential which was extended through the primary winding of the RCK-1 relay energizes the primary winding in the non-operate polarity. When the ringing selection switch crosspoints are operated a holding ground is supplied to the RC relay in the incoming trunk. This holding ground on the winding of the RC relay is extended over the "RC" lead to the marker and to the primary winding of the RCK-1 relay and energizes the primary winding in the operate polarity. Therefore, the RCK-1 relay operates as a check that the ringing selection switch crosspoints have operated. The operation of the RCK-1 relay, with the SRK and LI relay operated, will operate the RCK-2 relay.

20.134 Release of the Marker and Associated Circuits

After the marker has checked by the operation of the RCK-1 and RCK-2 relays that the ringing switch hold magnet has operated the marker will be released.

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously, this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

20.1341 Operation of the Marker OFH1 Relay, Release of the Trunk F Relay and Release of the Marker RCK-1 and RCK-2 Relays

The operation of the RCK-2 relay, with the BY relay operated, will operate the OFH-1 relay.

The operation of the OFH-1 relay will remove the battery potential on the "F" lead which has been extended to the incoming register marker connector and then to the incoming trunk circuit to operate the F relay in the incoming trunk circuit. Therefore the F relay in the incoming trunk circuit will be released.

The release of the F relay in the incoming register will remove the ground potential which has been extended over the "RC" lead to the incoming register marker connector and then to the marker to operate the RCK-1 relay. Therefore the RCK-1 relay will be released which in turn will release the RCK-2 relay.

20.1342 Release of the LLC-1/2, ONW, TLC-1/3 and CKG-1/7 Relays and the Operation of the DIS-1/2 Relays

The operation of the BY relay will release the LLC-1/2 and ONW relays. The release of the RCK-2 relay will operate the DIS-1/2 relays. The operating path for the DIS-1/2 relays in series is extended from the winding of the DIS-1 relay, through the contacts of the non-operated MT-1, MON-1, TRL-1, TRR and TR1 relay, through the contacts of either the HTR relay non-operated or the contacts of the TG relay non-operated and the HTR relay operated, through the contacts of the non-operated RRK, RRC, PSR, TRS and LR relays, through the contacts of the operated OFH-1 relay, through the contacts of the non-operated RCK-2 relay and through the contacts of the operated BY relay to ground potential which will operate the DIS-1 and DIS-2 relays.

The operation of the DIS-1/2 relays will release the TLC-1/3, CKG-1/3 and CKG-6/7 relays. The release of the CKG-3 relay will release the CKG-4/5 relays.

20.1343 Operation of the Incoming Register MRL Relay and the Release of the Register Marker Connector RS, RA, RB, RC, RD, MS, MA, MB, MC and MD Relays

The operation of the DIS-1/2 relays with the marker MRL-1 relay non-operated will extend ground over the "MRL" lead to the incoming register marker connector circuit and then to the incoming register circuit to operate the MRL relay in the incoming register circuit. The operation of the MRL relay will release the incoming register from the terminating call and will also release the incoming register marker connector circuit.

The operation of the MRL relay in the incoming register circuit will release the RS and MS relays in the incoming register marker connector. The release of the RS relay will release the RA, RB, RC and RD relays in the incoming register marker connector. The release of the MS relay will release the MA and MC relays which in turn will release the MB and MD relays in the incoming register marker connector circuit.

20.1344 Release of the DIS-1/2 and MCB-1/6 Relays in the Marker and the CB Relays in the Marker Connector

The release of the incoming register marker connector MA relay will release the DIS-1/2 relays.

The release of the DIS-2 relay will release the MCB-1/6 relays which in turn will release the CB relays associated with this marker in all marker connector circuits.

20.1345 Release of the Registration of Information from the Incoming Register Functions

20.13451 Release of the OA, OB and AC-0/7 Relays

The release of the incoming register marker connector RA relay will release the OA, OB and AC-0/7 relays.

20.13452 Release of the TF-0/7 and FG-0/1 Relays

The release of the incoming register marker connector MC relay will release the TF-0/7 and FG-0/1 relays.

20.1346 Release of the Identification of the Call Functions

20.13461 Release of the INC, TC-5, LPA, LPB, LTA and LTB Relays

The release of the incoming register marker connector MA relay will release the operated TC-5 relay and the INC relay. The release of the CKG-1 relay will release the operated LPA, LPB, LTA or LTB relay.

20.13462 Release of the TER-1/4 Relays

The release of the incoming register marker connector MC relay will release the TER-1/3 relays which in turn will release the TER-4 relay.

20.1347 Release of the Identification of the Location of the Called Line Functions

20.13471 Release of the FLG and FLG-1 Relays

The release of the CKG-3 relay will release the FLG and FLG-1 relays.

20.13472 Release of the FTL, FUL, VGL-1/2, HGL-1, VFL-1, RCL, FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, RCT-1/15, VTK-1, HTK-1 and FTK-1 Relays

The release of the FLG-1 relay will release the LLI relay which in turn will release the FTL, FUL and RCL relays. The release of the FLG relay will release the VGL-1/2, HGL-1 and VFL-1 relays. The release of the FTL, FUL, RCL, VGL-1/2, HGL-1 and VFL-1 relays will release the operated FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4 and RCT-1/15 relays which in turn will release the VTK-1, HTK-1 and FTK-1 relays.

20.13473 Release of the PN, TN, or PTN Relays

The release of the LLI relay will release the operated PN, TN or PTN relay.

20.1348 Release of the Line Link Frame

20.13481 Release of the Line Link and Connector MP, MCA and MCB Relays and the Marker LFK Relay

The release of the LLC-1 relay will release the line link and connector MP, MCA and MCB relays. The release of the MCA relay will release the LFK relay in the marker.

20.13482 Release of the Line Link and Connector VGB-0/11, HG-0/9 and LG-0/11 Relays

The release of the line link and connector MCA relay will release the line link frame VGB-0/11 relay. The release of the LLC-1 relay will release the operated HG-0/9 and LG-0/11 relays in the line link frame.

20.1349 Release of the Selection of the Connecting Path Functions

20.13491 Release of the Trunk Link and Connector MP, MC, MCA, MCB, MCC and MCD Relays

The release of the TLC-1 relay will release the trunk link and connector MP, MCA, MCB, MCC and MCD relays. The release of the MP relay will release the trunk link frame MC relay.

20.13492 Release of the TFK-3, MAK-1 and MDK Relays

The release of the trunk link and connector MP relay will release the TFK-3 relay. The release of the trunk link and connector MCA relay will release the MAK-1 relay and the release of the trunk link and connector MCD relay will release the MDK relay.

20.13493 Release of the Trunk Link and Connector FB-, LV-2/9 and LC-0/9 Relays and the Release of the Marker LCK Relay

The release of the incoming trunk F relay will release the trunk link frame FB- relay which in turn will release the LV-2/9 and LC-0/9 relays. The release of the LC-0/9 relay in the trunk link and connector circuit will release the marker LCK relay.

20.13494 Release of the STF, PR, 2TLF/10TLF, 20F, 40F, 7Q, RQ, PNR, PA, PB, PC, P-0/9, 2G, 3G, TCH-0/9, TCHK, JG-0/4 and JCK-0/1 Relays

The release of the TLC-3 relay will release the STF or PR relay and the operated 2TLF/10TLF relay. The release of the STF or PR relay will release the 20F or 40F relay and the release of the operated 2TLF/10TLF relay will release the 7Q or RQ relay, if operated.

The release of the ONW or LLC-1 relay will release the STP-1 or STP-2 relay which will release the PNR, PA, PB or PC relay. The release of the operated PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the trunk link frame MCC relay will release the operated P-0/9 relay which will in turn release the 2G or 3G relay, if operated.

The release of the LLC-2 relay will release the JG-0/4 relay. The release of the trunk link frame MCB relay will release the JCK-0/1 relays.

20.13495 Release of the Trunk Link and Connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER Relays

The release of the marker JG-0/4 relay will release the G-0/4, RF, EF, JC-0/19, L, R, EL and ER relays.

20.13496 Release of the TLL-0/9, TJ-0/9, TTL-0/9, TK, CHT, CH-0/9 and CHA Relays

The release of the line link frame HG-0/9 relay will release the TLL-0/9 relays. The release of the trunk link frame MCB relay will release the TJ-0/9 relays. The release of the trunk link frame LC-0/9 relay will release the TTL-0/9 relays.

The release of the LLC-1 relay will release the CH-0/9 and CHA relays. The release of the LCK relay will release the TK which will release the CHT relay.

20.13497 Release of the Line Link and Trunk Link Frame Select Magnets

The operation of the OFH-1 relay will release the ONX relay which in turn will release the operated select magnets on the line link frame line and junctor switches and on the trunk link frame junctor and trunk switches.

20.14 Called Line Busy for Terminating Call with PBX Called Line

When the marker is assisting a terminating call and when the marker is identifying the location of a terminal hunting line, as described in paragraph 12.4, the marker will select one of the idle lines within the PBX group for completing the call. Also, the marker will be informed through the number group when all lines within the PBX line group are busy. If all lines within the PBX group are busy the marker will not proceed with the usual terminating call functions and will set up the busy tone ringing condition on the ringing selection switch so that the incoming trunk can provide the busy tone to the calling subscriber. After setting up the busy tone ringing condition on the ringing selection switch the marker will release from the connection.

Under certain conditions the marker when associated with the number group will select one of the idle PBX lines to complete the call but will later determine that this line is busy when making the called line busy test. When the marker has proceeded to the called line busy test, as described in paragraph 12.5, the called line will be tested and if the selected line has been seized for the completion of another call in the interval of time from the number group line busy test to the marker called line busy test the marker will receive a line busy indication when performing the line busy test. Since, under these conditions, only one of the lines within the PBX line group has been tested and found busy the marker will not initiate the transmitting of busy tone to the calling subscriber. Instead the marker will initiate a PBX recycle which will release the information associated with the selected called PBX line and will reestablish a connection to the number group circuit in order to select an idle line within the PBX line group.

20.141 Called Line Busy Indication from Number Group

The marker will proceed with the terminating call functions, as described in paragraphs 12.1, 12.2 and 12.3, until the marker when identifying the location of a terminal hunting line, as described in paragraph 12.4, will determine that all lines within the PBX line group are busy. The marker will not proceed with the terminating call functions but will set up the busy tone condition on the ringing selection switch and will inform the incoming trunk that the incoming trunk should provide the busy tone to the calling subscriber.

20.1411 Operation of the EG, GB, LB and BY Relays

The operation of the end of group EG relay, as described in paragraph 8.04324, will inform the marker that terminal hunting has been extended through all of the tens blocks associated with the desired PBX lines. The operation of the group busy GB relay, as described in paragraph 8.04322, with the EG relay operated will inform the marker that all lines within the desired PBX line group have been tested and all have been found to be busy.

The operation of the GB relay, with the EG and NGC relays operated and the NC relay non-operated, will operate the LB

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relay. The operation of the LB relay will operate the busy line BY relay with the TER-1 relay operated and the BNB, RIB and TBIB relays non-operated.

20.1412 Release of the Number Group

When the marker has determined that all lines within the desired PBX line group are busy the marker will release the number group circuit.

20.14121 Operation of the RNG and NR Relays and Release of the PBX-1/2 Relays

The operation of the LB relay, with the OFK relay non-operated, will operate the release number group RNG relay which in turn will operate the number release NR relay and will release the PBX-1/2 relays.

20.14122 Release of the N-1/4, N-1A/4A, TH-0/7, HN-0/7, T-0/7, V-0/7 and the OAN or OBN Relays

The operation of the NR relay will release the operated N-1/4 and N-1A/4A relays which in turn will release the operated TH-0/7, HN-0/7, T-0/7 and U-0/7 relays. The operation of the NR relay will also release the operated OAN or OBN relay.

20.14123 Release of the MP and MCA Relays in the Number Group and the Release of the NGK Relay in the Marker

The release of the PBX-1 relay will release the number group MP relay. The release of the number group MP relay will release the number group MCA relay which in turn will release the marker NGK relay.

20.14124 Release of the HG-0/9, TB-00/99 and SC- Relays in the Number Group

The operation of the GB relay will release the HB-0/9 relay in the number group by removing the battery potential on the "LHB" lead which has been extended to the number group circuit to hold the HB-0/9 relay operated.

The release of the PBX-1 relay will release the TB-00/99 and SC- relays in the number group by removing the battery potential on the "SCK" lead which has been extended to the number group circuit to hold the TB-00/99 and SC- relays operated.

20.1413 Setting Up the Busy Tone Ringing Code

The setting up the busy tone ringing code is similar to the description in paragraph 20.133. However, since the RS-0/9, RSK and SRK relays have not been previously operated, the operation of the BY relay will operate the OFH relay.

20.1414 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 20.134. However, since all lines associated with the desired PBX line group were busy the marker did not operate the relays associated with identification of the called line, the marker did not seize the line link frame or operate the relays associated with the line link frame seizure, and the marker did not select a connecting path.

20.142 Called Line Busy Indication from Called Line Busy Test on First Selected PBX Line and Initiation of Marker PBX Recycle

The marker will proceed with the terminating call functions, as described in paragraphs 12.1, 12.2, 12.3 and 12.4, until the marker determines, as described in paragraph 12.5, that the selected PBX line is busy. Under these conditions this marker will initiate a PBX recycle in order to release the selection of this selected PBX line and to reselect some other idle PBX line within the PBX line group.

If after a PBX recycle has been completed and a second PBX line selected for service, this second PBX line is tested and a called line busy test indication is received the marker will not initiate a second PBX recycle but will set up the busy tone ringing condition on the ringing selection switch, as described in paragraph 22.0143, so that the incoming trunk can provide the busy tone to the calling subscriber.

20.1421 Line Busy Indication and Operation of the LBT, RCY-2 and RCY-3 Relays

The operation of the LBT, RCY-2 and RCY-3 relays is similar to the description in paragraph 20.1221.

20.1422 Release of the Functions Associated with the Called PBX Line

The release of the functions associated with the called PBX line is similar to the description in paragraph 20.1222.

20.1423 Initiating the Reselection of Some Other PBX Line within the PBX Line Group

20.14231 Operation of the RCY-4, LLC-1/2, ONW and FLG-1 Relays

The operation of the RCY-4, LLC-1/2, ONW and FLG-1 relays is similar to the description in paragraph 20.12231.

20.14232 Identification of the Location of the Called Line

The reoperation of the FLG-1 relay will reoperate the NGC relay which will initiate the seizure of the number group. The number group will be reseized and some other PBX line within the PBX line group which is idle will be selected for completing the connection. The identification of the location of the called line is similar to the description in paragraph 12.4.

20.14233 Called Line Busy Test

The called line busy test is similar to the descripion in paragraph 12.5.

20.14234 Selection of the Connecting Path to the Called Line

The selection of the connecting path to the called line is similar to the description in paragraph 12.6.

20.14235 Setting Up the Selected Connecting Path

The setting up the selected connecting path is similar to the description in paragraph 12.7.

20.14236 Setting Up the Selected Ringing Code

The setting up the selected ringing code is similar to the description in paragraph 12.8.

20.14237 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 12.9.

20.143 Called Line Busy Indication from Called Line Busy Test on Second Selected PBX Line

The marker will proceed with the terminating call functions, as described in paragraphs 12.1, 12.2, 12.3, 12.4 and 12.5, until the marker determines as described in paragraph 12.5, that the selected PBX line is busy. The marker will then initiate a PBX recycle and will select a second PBX line within the PBX group for service, as described in paragraphs 20.1421, 20.1422 and 20.1423. The marker will proceed until the marker determines, as described in paragraph 20.14233, that the second selected PBX line is busy. The marker will then set up the busy tone ringing condition on the ringing selection switch so that the incoming trunk can provide the busy tone to the calling subscriber in a manner similar to the description in paragraph 20.13.

20.2 Line Link Frame Busy

When a marker in the process of assisting a call or connection encounters a busy line link frame this line link frame busy condition may be the result of either another marker being associated with the line link frame or the line link frame may be "plugged-busy" by the use of the make-busy plug.

When a marker in assisting any call or connection encounters a busy line link frame which is the result of another marker being associated with the line link frame, the marker will wait until the line link frame is idle and will then proceed with the call or connection in the usual manner. Therefore, the marker actions under this condition are not altered and only a delay is encountered in the seizure of the line link frame.

When a marker encounters a busy line link frame which is the result of the line link frame being plugged-busy, the marker action will vary depending upon the basic type of call or connection which the marker is assisting as follows:

a. For a dial tone connection the marker will complete dial tone connections and will disregard the fact that the line link frame has been "plugged-busy".

b. For an intra-office call in which the line link frame associated with the called line has been "plugged-busy" the marker will route advance and will connect a tone trunk to the calling line. When the calling line has been connected to the tone trunk, the tone trunk will provide an overflow tone to the calling subscriber.

c. For an intra-office call in which the line link frame associated with the calling line has been "plugged-busy" the marker will give a "BT" signal to the originating register which will then provide an overflow tone to the calling subscriber.

d. For an outgoing call in which the line link frame has been "plugged-busy" the marker will give a "BT" signal to the originating register which will provide an overflow tone to the calling subscriber.

e. For a terminating call in which the line link frame has been "plugged-busy" the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber.

f. For a tandem call with non-local completion in which the line link frame associated with the incoming tandem trunk appearance has been "plugged-busy" the marker will route advance and assuming no alternate routes the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming tandem trunk can provide the overflow tone to the calling subscriber.

g. For a intertoll call with non-local completion in which the selected line link frame has been "plugged-busy" the marker will initiate a number group recycle which will release the information associated with the selected line link frame and will reestablish a connection to a number group circuit in order to select the other line link frame which is associated with this incoming intertoll trunk. However, if the same action occurs with the second selected line link frame the marker will not attempt a second number group recycle but will then initiate a route advance and assuming no alternate routes the marker will set the overflow ringing condition on the ringing selection switch so that the incoming intertoll trunk can provide the overflow tone to the calling subscriber.

To provide an outline of the marker route advances or recycles under various line link frame busy conditions the following table is provided.

Marker Operations for Line Link Frame Plugged Busy

Type of Call	Marker Recycles or Route Advances From	To	Condition
Dial Tone			Completes dial tone connection without regard to line link frame "plugged-busy" condition.
Intra-Office (Terminating Stage)	Route Advance from Intra-Office Call	Route Advance to Tone Trunk Connection	When line link frame associated with called line has been "plugged-busy".
Intra-Office (Originating Stage)	"BT" Signal to Orig. Reg. Ckt. without Route Advancing	-	When line link frame associated with calling line has been "plugged-busy".
Outgoing	"BT" Signal to Orig. Reg. Ckt. without Route Advancing	-	When line link frame associated with calling line has been "plugged-busy".
Terminating	Provides for Initiating Overflow Tone Ringing from Ringing Selection Switch		When line link frame associated with called line has been "plugged-busy".

Type of Call	Marker Recycles or Route Advances From	To	Condition
Tandem for Non-Local Completion	Route Advance from Tandem Call Route	a. Provides for Initiating Overflow Tone Ringing from Ringing Selection Switch When Alternate Route is Not Available;or b. Route Advance to Tandem Call Alternate Routes and then Route Advance to Provide Overflow Tone Ringing from Ringing Selection Switch	When line link frame associated with the incoming tandem trunk has been "plugged-busy".
Inter-Toll, Non-Local Completion (First Selected Line Link Frame)	Recycles to Release the First Line Link Frame Selection	Recycles to Select the Second Line Link Frame Associated with Other Appearance of Incoming Intertoll Trunk	When line link frame associated with the first selected line link frame associated with the incoming intertoll trunk has been "plugged-busy".
Intertoll, Non-Local Completion (Second Selected Line Link Frame)	Route Advance from Intertoll Call Route	a. Provides for Initiating Overflow Tone Ringing from Ringing Selection Switch When Alternate Route Is Not Available; or b. Route Advance to Intertoll Call Alternate Routes and Then Route Advance to Provide Overflow Tone Ringing from Ringing Selection Switch	When line link frame associated with the second selected line link frame associated with the incoming intertoll trunk has been "plugged-busy".

20.21 Intra-Office Call, Line Link Frame Associated with Called Line Plugged-Busy

When a line link frame is plugged-busy the MB- relay in the line link frame will be operated by the make-busy plug. A marker in the process of seizing this line link frame will extend battery over the "ST-" lead to the line link frame which with the MB- relay operated will extend this battery potential over the "TMB" lead to the marker thereby operating the marker line link frame busy LLB relay as an indication that the line link frame has been plugged-busy.

When the marker is assisting an intra-office call and determines that the line link frame associated with the called line has been plugged-busy the marker will route advance by releasing the intra-office call functions and then will initiate a connection from the calling subscriber to a tone trunk. After the tone trunk connection has been established the tone trunk will transmit the overflow tone signal to the calling subscriber.

If all tone trunks are busy the marker will be unable to establish a connection from the calling subscriber to a tone trunk. Therefore, the marker will again route advance by releasing the tone trunk connection functions and then will initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line. After the common overflow trunk connection has been established the common overflow trunk will transmit the overflow tone signal to the non-coin calling subscriber.

If all tone trunks are busy the marker will be unable to establish a connection from the coin calling subscriber to a tone trunk or if all common overflow trunks are busy the marker will be unable to establish a connection from the non-coin calling subscriber to a common overflow trunk. Therefore, in these cases, the marker will again initiate a route advance. However, in this case there is no route to which the marker can route advance to establish a connection. Therefore, the marker will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone. The marker will then be released and the calling subscriber will receive the overflow signal from the originating register circuit.

20.211 Route Advance to Tone Trunk Connection from Intra-Office Call Connection

The marker will proceed with the intra-office call functions, as described in paragraphs 8.01, 8.02, 8.03, 8.04, 8.05 and 8.06, until the marker attempts to seize the line link frame associated with the called line, as described in paragraph 8.061. When the marker attempts to seize this line link frame, which has been plugged-busy, the line link frame will extend battery potential over the "TMB" lead to operate the line link frame busy LLB relay in the marker. The operation of the LLB relay will initiate a route advance which will release the intra-office call functions and then will initiate the tone trunk connection functions.

20.2111 Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB Relay

When the marker attempts to seize the line link frame, as described in paragraph 8.061, battery potential will be extended over the "ST-00/39" lead associated with the line link frame associated with the called line. With the MB- relay in the line link frame operated, the battery potential on the "ST-00/39" lead will be further extended to the "TMB" lead and to the marker circuit to operate the LLB relay. The MB- relay in the line link frame was operated when the line link frame was plugged-busy.

20.2112 Release of the Marker Intra-Office Call Functions

The marker will release those intra-office call functions which are not required for a tone trunk connection.

The release of the marker intra-office call functions will be initiated by the operation of the LLB relay and will be similar to the description in paragraph 20.1112. However, since the line link frame was not seized, the relays associated with the line link frame seizure were not operated and therefore need not be released.

20.2113 Initiating the Tone Trunk Connection Functions

After the marker has released the intra-office call functions the marker will initiate the tone trunk connection functions.

The initiating of the tone trunk connection functions are similar to the description in paragraph 20.1113.

20.212 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

20.213 Route Advance to Provide Overflow Tone from the Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

20.22 Intra-Office Call, Line Link Frame Associated with Calling Line Plugged-Busy

When the marker is assisting an intra-office call and determines that the line link frame associated with the calling line has been plugged-busy the marker will place ground potential on the "BT" lead to the originating register circuit to indicate that the originating register circuit should provide the overflow tone. The marker will not be required to set up any connection and will therefore immediately release without releasing the originating register from the connection to the calling subscriber.

The marker will proceed with the intra-office call functions, as described in paragraphs 8.01, 8.02, 8.03, 8.04, 8.05, 8.06, 8.07, 8.08, 8.09, 8.10 and 8.11, until the marker attempts to seize the line link frame associated with the calling line, as described in paragraph 8.11. When the marker attempts to seize this line link frame, which has been plugged-busy, the line link frame will extend battery potential over the "TMB" lead to operate the line link frame busy LLB relay in the marker. The operation of the LLB relay will initiate the actions required for the originating register to provide the overflow tone to the calling subscriber.

20.221 Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB, RBT, TRL and TRLA Relays

When the marker attempts to seize the line link frame, as described in paragraph 8.11, battery potential will be extended over the "ST-00/39" lead associated with the line link frame associated with the calling line. With the MB- relay in the line link frame operated, the battery potential on the "ST-00/39" lead will be further extended to the "TMB" lead and to the marker circuit to operate the LLB relay. The MB- relay in the line link frame was operated when the line link frame was plugged-busy.

The operation of the LLB relay, with the ITR-1 and SCB-1 relays operated and the MT-13 relay non-operated, will operate the register busy return RBT relay which will operate the trouble release disconnect (without taking a trouble record TRL relay which in turn will operate the TRLA relay).

20.222 Operation of the Originating Register BT Relay

The operation of the TRL and TRLA relays with the MRL-1, TR2, LR and TST relays non-operated and the RBT relay operated, will extend ground over the "BT" lead from the marker to the originating register to operate the BT relay in the originating register. The operation of the BT relay in the originating register will initiate overflow tone to be transmitted to the calling subscriber.

20.223 Release of the Marker and Associated Circuits

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

20.2231 Release of the TLC-1/3, LLC-1/2, ONW, CKG-1/7 and CB Relays

The operation of the TRLA relay will release the TLC-1/3, LLC-1/2, ONW and CKG-1/3 relays. The release of the CKG-3 relay will release the CKG-4/7 relays and the operated route R- relay. The release of the SCB-1 relay will release the CB relay.

20.2232 Release of the Register Marker Connector RS, RA, RB, RC, RD, MS, MA, MB, MC and MD Relays

The operation of the originating register BT relay will release the originating register marker connector from the marker and originating register circuit but will not release the originating register from the dial tone connecting path to the calling subscriber.

The operation of the BT relay in the originating register circuit will release the RS and MS relays in the originating register marker connector. The release of the RS relay will release the RA, RB, RC and RD relays in the originating register marker connector. The release of the MS relay will release the MA and MC relays which in turn will release the MB and MD relays in the originating register marker connector circuit.

20.2233 Release of the MCB-1/6 Relays and the Marker Connector CB Relays

The release of the route R- relay will release the FC- and FCA- relays which in turn will release the FCK and FCKA relays. The release of the FCK and FCKA relays will release the SNK relay. The release of the SNK relay, with the TRL relay released, will release the MCB-1/6 relays which in turn will release the CB relays associated with this marker circuit in all marker connectors. The release of the CB relays associated with this marker circuit in all marker connectors will indicate to all marker connectors that this marker has been released and is now idle and available and that any marker connector circuit may select this marker for service.

20.2234 Release of the Registration of Information from Originating Register Functions

The release of registration of information from the originating register functions are similar to the description in paragraph 8.132. However, the FT-0/3, FU-0/7, VG-0/10, HG-0/7 and VG-0/4 relays will be released when the originating register marker connector RC and RD relays are released.

20.2235 Release of the Identification of the Call Functions

The release of the identification of the call functions are similar to the description in paragraph 8.133.

20.2236 Release of the Intra-Office Trunk Selection Functions

The release of the intra-office trunk selection functions are similar to the description in paragraph 8.134.

20.2237 Release of the Selection of the Connecting Path to the Calling Line Functions

The release of the selection of the connecting path to the calling line functions are similar to the description in paragraph 8.135. However, since the line link frame was not seized and a connecting path was not selected the relays associated with these functions will not be released.

20.2238 Release of the Hold Magnets Associated with the Connecting Path to the Called Line

The release of the ITR-2 relay will remove the ground potential on the "BST" lead which has been extended to the sleeve conductor of the called line connecting path to hold operated the associated hold magnets.

20.23 Outgoing Call, Line Link Frame Associated with Calling Line Plugged-Busy

When the marker is assisting an outgoing call and determines that the line link frame associated with the calling line has been plugged-busy the marker will place ground potential on the "BT" lead to the originating register circuit to indicate that the originating register circuit should provide the overflow tone. The marker will not be required to set up any connection and will therefore immediately release without releasing the originating register from the connection to the calling subscriber.

The marker will proceed, as described in paragraphs 11.1, 11.2, 11.3, 11.4, 11.5 and 11.6, until the marker attempts to seize the line link frame, as described in paragraph 11.6. When the marker attempts to seize this line link frame, which has been plugged-busy, the line link frame will extend battery potential over the "TMB" lead to operate the line link frame busy LLB relay in the marker. The operation of the LLB relay will initiate the actions required for the originating register to provide the overflow tone to the calling subscriber.

20.231 Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB, RBT, TRL and TRLA Relays

The line link frame plugged-busy indication and operation of the marker LLB, RBT, TRL and TRLA relays are similar to the description in paragraph 20.221.

20.232 Operation of the Originating Register BT Relay

The operation of the originating register BT relay is similar to the description in paragraph 20.222.

20.233 Release of the Marker and Associated Circuits

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

20.2331 Release of the TLC-1/3, LLC-1/2, ONW, CKG-1/7 and CB

The operation of the TRLA relay will release the TLC-1/3, LLC-1/2, ONW and CKG-1/3 relays. The release of the CKG-3 relay will release the CKG-4/7 relays and the operated route R- relay. The release of the SOG-2 relay will release the CB relay.

20.2332 Release of the Register Marker Connector RS, RA, RB, RC, RD, MS, MA, MB, MC and MD Relays

The operation of the originating register BT relay will release the originating register marker connector from the marker and originating register circuit but will not release the originating register from the dial tone connecting path to the calling subscriber.

The operation of the BT relay in the originating register circuit will release the RS and MS relays in the originating register marker connector. The release of the RS relay will release the RA, RB, RC and RD relays in the originating register marker connector. The release of the MS relay will release the MA and MC relays which in turn will release the MB and MD relays in the originating register marker connector circuit.

20.2333 Release of the MCB-1/6 Relays and the Marker Connector CB Relays

The release of the route R- relay will release the FC- and FCA- relays which in turn will release the FCK and FCKA relays. The release of the FCK and FCKA relays will release the SNK relay. The release of the SNK relay, with the TRL relay released, will release the MCB-1/6 relays which in turn will release the CB relays associated with this marker circuit in all marker connectors.

20.2334 Release of the Registration of Information from Originating Register Functions

The release of registration of information from the originating register functions are similar to the description in paragraph 11.82. However, the FT-0/3, FU-0/7, VG-0/10, HG-0/7 and VF-0/4 relays will be released when the originating register marker connector RC and RD relays are released.

20.2335 Release of the Identification of the Call Functions

The release of the identification of the call functions are similar to the description in paragraph 11.83.

20.2336 Release of the Selection and Connection of an Outgoing Sender Functions

The release of the selection and connection of an outgoing sender functions are similar to the description in paragraph 11.84

20.2337 Release of the Outgoing Trunk Selection Functions

The release of the outgoing trunk selection functions are similar to the description in paragraph 11.85.

20.2338 Release of the Selection of the Connecting Path Functions

The release of the selection of the connecting path functions are similar to the description in paragraph 11.86. However, since the line link frame was not seized and a connecting path was not selected the relays associated with these functions will not be released.

20.24 Terminating Call, Line Link Frame Associated with Called Line Plugged-Busy

When the marker is assisting a terminating call and determines that the line link frame associated with the called line has been plugged-busy the marker will not proceed with the usual terminating call functions and will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber. After setting up the overflow tone ringing condition on the ringing selection switch the marker will release from the connection.

The marker will proceed with the terminating call functions, as described in paragraphs 12.1, 12.2, 12.3, 12.4 and 12.5, until the marker attempts to seize the line link frame, as described in paragraph 12.5. When the marker attempts to seize this line link frame, which has been plugged-busy, the line link frame will extend battery potential over the "TMB" lead to operate the line link frame busy LLB relay in the marker. The operation of the LLB relay will initiate the actions required to set up the overflow tone condition on the ringing selection switch and will inform the incoming trunk that the incoming trunk should provide the overflow tone to the calling subscriber.

20.241 Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB, PMO and OV Relays

When the marker attempts to seize the line link frame battery potential will be extended over the "ST-00/39" lead associated with the line link frame. With the MB- relay in the line link frame operated, the battery potential on the "ST-00/39" lead will be further extended to the "TMB" lead and to the marker circuit to operate the LLB relay. The MB- relay in the line link frame was operated when the line link frame was plugged-busy.

The operation of the LLB relay, with the TER-1 relay operated, will operate the permanent overflow PMO relay which in turn will operate the overflow OV relay.

20.242 Release of the RS-0/9, RSK and SRK Marker Relays and the Ringing Switch Select Magnets

When the marker received the ringing information of the called line from the number group the marker operated the associated RS-0/9, RSK and SRK relays in the marker and also the associated ringing switch select magnets. These marker relays and ringing switch select magnets associated with the ringing combination of the called line must be released before reoperating the marker relays and the ringing switch select magnets associated with the ringing combination of the overflow tone.

The operation of the OV relay will release the operated RS-0/9 marker relay which will release the operated ringing switch select magnets which in turn will release the RSK relay. The release of the RSK relay will release the SRK relay.

20.243 Setting Up the Overflow Tone Ringing Code

The setting up the overflow tone ringing code is similar to the setting up the busy tone ringing code as described in paragraph 20.133. However, instead of the RS-1 and RS-9 relays in the marker being operated through the operated BY relay contacts the RS-0 and RS-9 relays will be operated through the contacts of the operated OV relay. Therefore battery potential will be extended over the "RS-0" and "RS-9" leads to the trunk link frame and then to the ringing selection switch thereby operating the associated ringing selection switch select magnets.

20.244 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 20.134. However, those release functions which were initiated by the operation of the BY relay will in this case be initiated by the operation of the OV relay. Also, since those functions associated with line link frame seizure, connecting path selection and line link frame and trunk link frame select magnet operation were not completed, certain relays associated with these functions were not operated and therefore are not released.

20.25 **Tandem Call, Line Link Frame Associated with Tandem Trunk Appearance Plugged-Busy**

When the marker is assisting a tandem call with non-local completion and determines that the line link frame associated with the incoming tandem trunk appearance has been plugged-busy the marker will route advance.

If no alternate route for this tandem call is available the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming tandem trunk can provide the overflow tone to the calling subscriber. After setting up the overflow tone ringing condition on the ringing selection switch the marker will release from the connection.

However, if an alternate route for this tandem call is available the marker will route advance to the alternate route and will in the process of completing the tandem call to the alternate route again determine that the line link frame is plugged-busy. The marker will then route advance and will set up the overflow tone ringing condition on the ringing selection switch so that the incoming tandem trunk can provide the overflow tone to the calling subscriber. It is to be noted that in this case the marker route advances to the alternate route even though the line link frame plugged-busy condition will also prevent its completion.

20.251 Tandem Call without Alternate Route, Line Link Frame Plugged-Busy

The marker will proceed with the tandem call functions, as described in paragraphs 14.1, 14.2, 14.3, 14.4, 14.5, 14.6 and 14.7, until the marker attempts to seize the line link frame associated with the incoming tandem trunk, as described in paragraph 14.7. When the marker attempts to seize this line link frame, which has been plugged-busy, the line link frame will extend battery potential over the "TMB" lead to operate the line link frame busy LLB relay in the marker. The operation of the LLB relay will initiate a route advance which will set up the overflow tone ringing condition on the ringing selection switch so that the incoming tandem trunk can provide the overflow tone to the calling subscriber.

20.2511 Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB Relay

When the marker attempts to seize the line link frame, as described in paragraph 14.7, battery potential will be extended over the "ST-00/39" lead associated with the line link frame associated with the incoming tandem trunk. With the MB-relay in the line link frame operated, the battery potential on the "ST-00/39" lead will be further extended to the "TMB" lead and to the marker circuit to operate the LLB relay.

20.2512 Release of the Marker Tandem Call Functions

The marker will first release those tandem call functions which are not required.

20.25121 Operation of the RAV-1/2, RA-1/5 and GS-1/5 Relays

The operation of the LLB relay, with the TOG-1 and TAN relays operated, will operate the route advance RAV-1/2 relays in series. The RAV-1/2 relays will be held operated with the RAV-1 and SNK relays operated.

The one route advance RA-1/5 relay associated with the ground supply group associated with the tandem call route will be operated when the RAV-1 relay is operated. The winding of this RA-1/5 relay will be extended through the non-operated GS-1/5 relay contacts, through the operated tandem call route R- relay contacts, over the "RAL" lead and through the operated RAV-1 relay contacts and over the "G4" lead and through the operated CKG-2 relay contacts to ground, thereby operating the RA-1/5 relay. After operating the RA-1/5 relay will be held operated with the RAV-1 and CKG-2 relays operated.

The operation of one RA-1/5 relay with the CKG-3 relay operated will operate the associated ground supply group GS-1/5 relay. The operated GS-1/5 relay will be held operated with the CKG-3 relay operated.

20.25122 Release of the TLC-1/3, LLC-1/2, ONW, CKG-4 and OSG-0/4 Relays

The operation of the RAV-1 relay will release the TLC-1/3 relays. The operation of the RAV-2 relay will release the CKG-4 relay which will in turn release the LLC-1/2 and ONW relays.

The operation of the GS-1/5 relay will release the OSG-0/4 relays.

20.25123 Release of the Selection and Connection of an Outgoing Sender Functions

The release of the OSG-0/4 relay will release the SON and OGC relays which in turn will release the OS-0/4 and OSK relays. The release of the OSK or OS-0/4 relays will release the S relay in the outgoing sender connector.

20.25124 Release of the Outgoing Trunk Selection Functions

The release of the outgoing trunk selection functions is similar to the description in paragraph 20.11124.

20.25125 Release of the Selection of the Connecting Path Functions

The release of the selection of the connecting path functions are similar to the description in paragraph 20.11125. However, since the line link frame was not seized, the relays associated with the line link frame seizure were not operated and therefore need not be released.

20.2513 Initiating the Terminating Call Functions and the Overflow Tone Functions

After the marker has released the tandem call functions the marker will initiate the overflow tone functions.

20.25131 Release of the SNK, RAV-1/2 and RA-1/5 Relays

The release of the TFK-1, FCK, FCKA, FTCK, FML, FMP and SON relays will release the selections normal check SNK relay as a check of the release of these relays and as a check that the tandem call functions have been released.

The release of the SNK relay will release the RAV-1/2 relays which in turn will release the operated RA-1/5 relay.

20.25132 Operation of the TOA, ROA, TER-1/3 and OV Relays

The release of the RA-1/5 relay will operate the TOA relay. The winding of the TOA relay is extended through the contacts of the operated TOG-1 relay and the contacts of the non-operated RAV-2 relay to the "LTA" cross-connection terminal. The

"LTA" cross-connection terminal will be cross connected to the route advance "RA" cross-connection terminal associated with this tandem call. The operated CKG-3 relay contacts will extend ground over the "RA" lead, through the released RA-1/5 relays and the operated GS-1/5 relay, over the "RA" lead to figure 51 where the operated route R relay associated with this tandem call will extend the ground to the "RA" cross-connection terminal, thereby operating the TOA relay.

The operation of the TOA relay, with the RAV-1 relay non-operated, will operate the ROA relay.

The operation of the ROA relay will operate the TER-1/3 relays. The windings of the TER-1/3 relays are in series with each other and the operating path will be extended, with the ROA relay operated and the RTST, LR and TR2E relays non-operated, to the "TRK" lead to the incoming register marker connector circuit where the "TRK" lead is grounded when the incoming register marker connector MC relay is operated and the TR-1 relay is non-operated.

The operation of the TER-1 relay, with the ROA relay operated and the LB relay non-operated, will operate the OV relay.

20.25133 Operation of the TLC-1/3, LLC-1/2, ONW and CKG-4 Relays

The release of the RAV-1/2 relays will operate the TLC-1/3 and CKG-4 relays. The operation of the CKG-4 relay will operate the LLC-1/2 and ONW relays.

20.25134 Seizure of the Trunk Link Frame and Connection to the Incoming Tandem Trunk Circuit

The seizure of the trunk link frame and connection to the incoming tandem trunk circuit is similar to the description in paragraph 12.61.

20.25135 Setting Up the Overflow Tone Ringing Code

The setting up the overflow tone ringing code is somewhat similar to setting up the selected ringing code for an intra-office call.

20.251351 Operation of the Marker OFH, RS-0/9 and RSK Relays and the Ringing Selection Switch Select Magnets -0/9

The operation of the OV relay, with the SRK, RSK and RCK-2 relays non-operated, will operate the overflow hold magnet (ringing switch) OFH relay.

The operation of the OFH relay, with the OV relay operated, will operate the RS-0 and RS-9 relays.

The operation of the RS-0 and RS-9 relays with the FLG and ONX relays operated will extend battery potential over the associated "RS-0" and "RS-9" leads to the trunk link frame where the operated MCA and LV- relays will extend the "RS-0" and "RS-9" leads to the ringing selection switch thereby operating the associated ringing selection switch select magnets -0 and -9.

The operation of one of the ringing selection switch select magnets will place ground on the "RSK" lead which will be extended through the trunk link frame with the LV- and MCA relays operated to the marker circuit thereby operating the ringing selection check RSK relay in the marker.

20.251352 Operation of the Marker SRK and LI Relays and the Incoming Tandem Trunk RC Relay

The operation of the RSK relay will operate the start ringing check SRK relay. The operation of the SRK relay with the CKG-7 and OFH relays operated will operate the LI relay.

The operation of the marker LI relay will extend resistance ground potential to the "RC" lead which will be extended through the trunk link frame with the MCB and LV- relays operated to the incoming trunk circuit to operate the ringing control RC relay in the incoming trunk circuit. Resistance ground potential is placed on the "RC" lead in the marker by extending the "RC" lead from the trunk link frame through the contacts of the non-operated OC, TOG-3, RV-3 and SOG-3 relays to the primary winding of the RCK-1 relay, through the contacts of the operated CKG-6 and LI relays, through the RCK-1 resistance, through the contacts of the operated FLG-1 relay and through the contacts of the non-operated MXT, XRS-1 and XRS-2 relays to ground potential.

20.251353 Operation of the Ringing Selection Switch Hold Magnet and the Marker RCK-1 and RCK-2 Relays

The operation of the RC relay in the incoming trunk circuit will extend ground over the "H" lead to operate the associated ringing selection switch hold magnet.

The RCK-1 relay in the marker will be operated to check that the ringing selection switch crosspoints have been operated. With the operation of the CKG-6 relay, battery potential has been extended to one side of the primary winding of the RCK-1 relay. The other side of the primary winding of the RCK-1 relay is extended to the "RC" lead and to the winding of the RC relay in the incoming trunk circuit. The other side of the winding of the RC relay in the incoming trunk is connected to battery potential, therefore the primary winding of the RCK-1 relay is not energized in the operate polarity. It is to be noted that the ground potential which was extended through the primary winding of the RCK-1 relay energizes the primary winding in the non-operate polarity. When the ringing selection switch crosspoints are operated a holding ground is supplied to the RC relay in the incoming trunk. This holding ground on the winding of the RC relay is extended over the "RC" lead to the marker and to the primary winding of the RCK-1 relay and energizes the primary winding in the operate polarity. Therefore the RCK-1 relay operates as a check that the ringing selection switch crosspoints have operated. The operation of the RCK-1 relay, with the SRK and LI relay operated, will operate the RCK-2 relay.

20.25136 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 20.134. However, those release functions which were initiated by the operation of the BY relay will in this case be initiated by the operation of the OV relay. Also, since those functions associated with line link frame seizure, connecting path selection and line link frame and trunk link frame select magnet operation were not completed certain relays associated with these functions were not operated and therefore are not released.

20.252 Tandem Call with Alternate Route, Line Link Frame Plugged-Busy

The marker will proceed with the tandem call functions, as described in paragraphs 14.1, 14.2, 14.3, 14.4, 14.5, 14.6 and 14.7, until the marker attempts to seize the line link frame associated with the incoming tandem trunk, as described in paragraph 14.7. When the marker attempts to seize this line link frame, which has been plugged-busy, the line link frame will extend battery potential over the "TMB" lead to operate the line link frame LLB relay in the marker. The operation of the LLB relay will initiate a route advance which will initiate a tandem call connection associated with the alternate tandem route.

20.2521 Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB Relay

The line link frame plugged-busy indication and operation of the marker LLB relay are similar to the description in paragraph 20.2511.

20.2522 Release of the Marker Tandem Call Functions Associated with Original Tandem Route

The release of the marker tandem call functions associated with the original tandem route are similar to the description in paragraph 20.2512.

20.2523 Initiating the Alternate Tandem Route Call Functions

After the marker has released the tandem call functions associated with the original tandem route the marker will initiate the tandem call functions associated with the alternate tandem route.

20.25231 Release of the SNK, RAV-1/2 and RA-1/5 Relays

The release of the SNK, RAV-1/2 and RA-1/5 relays is similar to the description in paragraph 20.25131.

20.25232 Operation of the Route R- Relay Associated with the Alternate Tandem Route

The release of the RA-1/5 relay will operate the route R- relay associated with the alternate tandem route. The operated CKG-3 relay contacts will extend ground over the "RA" lead, through the released RA-1/5 relays and the operated GS-1/5 relay, over the "RA" lead to Figure 51 where the operated original tandem route R- relay will extend the ground to the "RA" cross-connection terminal. The "RA" cross-connection terminal will be cross connected to an "RC" cross-connection terminal of Figure 51 associated with the alternate tandem route thereby extending ground to operate the route R- relay associated with this alternate tandem route.

20.25233 Operation of the TLC-1/3, LLC-1/2, ONW and CKG-4 Relays

The release of the RAV-1/2 relays will operate the TLC-1/3 and CKG-4 relays.

The operation of the CKG-4 relay will operate the LLC-1/2 and ONW relays.

20.25234 Selection and Connection of an Outgoing Sender

The selection and connection of an outgoing sender is similar to the description in paragraph 14.4.

20.25235 Outgoing Tandem Trunk Selection

The outgoing tandem trunk selection is similar to the description in paragraph 11.5.

20.25236 Selection of the Connecting Path

The marker will proceed with the selection of the connecting path, in a manner similar to the description in paragraph 14.7, until the marker attempts to seize the line link frame associated with the incoming tandem trunk. When the marker attempts to seize this line link frame, which has been plugged-busy, the line link frame will extend battery potential over the "LLB" lead to operate the line link frame busy LLB relay in the marker. The operation of the LLB relay will initiate a route advance which will set up the overflow tone ringing condition on the ringing selection switch so that the incoming tandem trunk can provide the overflow tone to the calling subscriber.

20.2524 Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB Relay

The line link frame plugged-busy indication and operation of the marker LLB relay are similar to the description in paragraph 20.2511.

20.2525 Release of the Marker Tandem Call Functions Associated with the Alternate Tandem Route

The release of the marker tandem call functions associated with the alternate tandem route are similar to the description in paragraph 20.2512.

20.2526 Initiating the Terminating Call Functions and the Overflow Tone Functions

The initiation of the terminating call functions and the overflow tone functions are similar to the description in paragraph 20.2513.

20.26 Intertoll Call, Line Link Frame Associated with Intertoll Trunk Appearance Plugged-Busy

An incoming intertoll trunk circuit has two line link frame appearances, each line link frame appearance being associated with a different line link frame. Therefore, when the marker is assisting an intertoll call with non-local completion and determines that the selected line link frame associated with one of the appearances of the incoming intertoll trunk has been plugged-busy the marker will not route advance. However, the marker will release the intertoll call functions in order to release the functions associated with the selected line link frame and will then proceed to reestablish the intertoll call functions and selecting a line link frame associated with the other line link frame appearance of the incoming intertoll trunk. The marker will then complete the intertoll call connection functions.

If the line link frame associated with the second line link frame appearance of the incoming intertoll trunk has also been "plugged-busy" the marker will route advance. If no alternate route for this intertoll call is available the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming intertoll trunk can provide the overflow tone to the calling subscriber. However, if an alternate route for this intertoll call is available the marker will route advance to the alternate route and will in the process of completing the intertoll call to the alternate again determine that the selected line link frame associated with one of the appearances of the incoming intertoll trunk has been plugged-busy. The marker will not attempt to select the line link frame associated with the other line link frame appearance but will immediately route advance and will set up the overflow tone ringing condition on the ringing selection switch. It is to be noted that in this case the marker route advances to the alternate route even though the line link frame plugged-busy conditions will also prevent its completion.

20.261 Intertoll Call, First Selected Line Link Frame Plugged-Busy

The marker will proceed with the intertoll call functions, as described in paragraphs 15.1, 15.2, 15.3, 15.4, 15.5, 15.6 and 15.7, until the marker attempts to seize the line link frame associated with the incoming intertoll trunk, as described in paragraph 15.7.

20.2611 Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB Relay

The line link frame plugged-busy indication and operation of the marker LLB relay are similar to the description in paragraph 20.2511.

20.2612 Release of the Marker Intertoll Call Functions Associated with the First Selected Line Link Frame

The marker will release the marker intertoll call functions in order to release the functions associated with the selected line link frame.

20.26121 Operation of the TNR Relay and Release of the FLG-1, LLI, FTL, FUL, VGL, HGL and VFL Relays

The operation of the LLB relay, with the TOG-1 and TOL relays operated, will operate the trunk number release TNR relay which in turn will release the FLG-1 relay. The TNR relay will be held operated by the operated ONW relay.

The release of the FLG-1 relay will release the LLI relay which in turn will release the FTL, FUL, VGL, HGL, VFL and PN, TN or PTN relays.

20.26122 Operation of the RCY, RCY-1, NGP and NGP-1 Relays and Release of the LLC-1/2, ONW, TLC-1/3 and OSG-0/4 Relays

The release of the FTL, FUL, VGL, HGL, VFL, PN, TN and PTN relays, with the RCT-10, RGT, RCL relays non-operated and the TOG-3 and TNR relays operated, will operate the recycle RCY and RCY-1 relays. The RCY and RCY-1 relays will be held operated by the operated SNK relay.

The operation of the RCY relay, with the TOG-1 relay operated, will operate the trunk number group preference NGP relay which in turn will operate the NGP-1 relay. The operation of the RCY relay will also release the OSG-0/4 relay.

The operation of the RCY-1 relay will release the LLC-1/2, ONW and TLC-1/3 relays.

20.26123 Release of the Selection and Connection of an Outgoing Sender Functions

The release of the OSG-0/4 relay will release the SON and OGC relays which in turn will release the OS-0/4 and OSK relays. The release of the OSK or OS-0/4 relays will release the S relay in the outgoing sender connector.

20.26124 Release of the Identification of the Incoming Intertoll Trunk Functions

The release of the FTL, FUL, VGL HGL and VFL relays will release the operated FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, and VFT-0/4 relays which in turn will release the VTK-1, HTK-1 and FTK-1 relays.

20.26125 Release of the Outgoing Trunk Selection Functions

The release of the outgoing trunk selection functions is similar to the description in paragraph 20.11124. However, the release of the outgoing trunk selection functions is initiated by the operation of the RCY relay rather than by the operation of the GS-1/5 relay.

20.26126 Release of the Selection of the Connecting Path Functions

The release of the selection of the connecting path functions is similar to the description in paragraph 20.11125. However, since the line link frame was not seized, the relays associated with the line link frame seizure were not operated and therefore need not be released.

20.2613 Initiating the Marker Intertoll Call Functions Associated with the Second Selected Line Link Frame

After the marker has released the marker intertoll call functions associated with the first selected line link frame the marker will initiate the marker intertoll functions associated with the second selected line link frame.

20.26131 Release of the TNR, RCY, RCY-1, and SNK Relays and Operation of the LLC-1/2, ONW and TLC-1/3 Relays

The release of the ONW relay will release the TNR relay which in turn will reoperate the FLG-1 relay.

The release of the TFK-1, FCK, FCKA, FTCK, FML, FMP and SON relays will release the selections normal check SNK relay as a check of the release of these relays and as a check that the intertoll call functions associated with the first selected line link frame have been released.

The release of the SNK and TNR relays will release the RCY and RCY-1 relays which in turn will reoperate the LLC-1/2, ONW and TLC-1/3 relays.

20.26132 Selection and Connection of an Outgoing Sender

The selection and connection of an outgoing sender is similar to the description in paragraph 14.4. However, the release of the RCY relay instead of the operation of the R- relay will initiate the selection and connection of an outgoing sender.

20.26133 Identification of the Location of the Incoming Intertoll Trunk on the Line Link Frame

The identification of the location of the incoming intertoll trunk on the line link frame is similar to the description in paragraph 14.5. However, since the NGP relay is operated the marker will now select the other number group associated with trunk numbers. This other number group circuit will translate the trunk number so as to direct the marker to the other line link frame associated with the intertoll trunk appearance.

20.26134 Outgoing Intertoll or Outgoing Toll Switching Trunk Selection

The outgoing intertoll or outgoing toll switching trunk selection is similar to the description in paragraph 11.5.

20.26135 Selection of the Connecting Path

The selection of the connecting path is similar to the description in paragraph 14.7.

20.26136 Setting Up the Selected Connecting Path

The setting up the selected connecting path is similar to the description in paragraph 14.8.

20.26137 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 14.9.

20.262 Intertoll Call without Alternate Route, First and Second Selected Line Link Frames Plugged-Busy

The marker will proceed with the intertoll call functions, as described in paragraphs 15.1, 15.2, 15.3, 15.4, 15.5, 15.6 and 15.7, until the marker attempts to seize the line link frame associated with the incoming intertoll trunk, as described in paragraph 15.7.

20.2621 First Selected Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB Relay

The first selected line link frame plugged-busy indication and operation of the marker LLB relay are similar to the description in paragraph 20.2511.

20.2622 Release of the Marker Intertoll Call Functions Associated with the First Selected Line Link Frame

The release of the marker intertoll call functions associated with the first selected line link frame is similar to the description in paragraph 20.2612.

20.2623 Initiating the Marker Intertoll Call Functions Associated with the Second Selected Line Link Frame

The marker will proceed with the intertoll call functions associated with the second selected line link frame, as described in paragraphs 20.26131, 20.26132, 20.26133, 20.26134 and 20.26135, until the marker attempts to seize the second selected line link frame associated with the incoming intertoll trunk.

20.2624 Second Selected Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB Relay

The second selected line link frame plugged-busy indication and operation of the marker LLB relay are similar to the description in paragraph 20.2511.

20.2625 Release of the Marker Intertoll Call Functions Associated with the Second Selected Line Link Frame

The release of the marker intertoll call functions associated with the second selected line link frame is similar to the description in paragraph 20.2512. The operation of the LLB relay, with the TOG-1, TOL and NGP-1 relays operated and the RCY relay released, will operate the RAV-1/2 relays.

20.2626 Initiating the Terminating Call Functions and the Overflow Tone Functions

The initiating the terminating call functions and the overflow tone functions is similar to the description in paragraph 20.2513.

20.263 Intertoll Call with Alternate Route, First and Second Selected Line Link Frames Plugged-Busy

The marker will proceed with the intertoll call functions, as described in paragraphs 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, until the marker attempts to seize the line link frame associated with the incoming intertoll trunk, as described in paragraph 15.7.

20.2631 First Selected Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB Relay

The first selected line link frame plugged-busy indication and operation of the marker LLB relay are similar to the description in paragraph 20.2511.

20.2632 Release of the Marker Intertoll Call Functions Associated with the First Selected Line Link Frame

The release of the marker intertoll call functions associated with the first selected line link frame and with the original intertoll route is similar to the description in paragraph 20.2612.

20.2633 Initiating the Marker Intertoll Call Functions Associated with the Second Selected Line Link Frame

The marker will proceed with the intertoll call functions associated with the second selected line link frame, as described in paragraphs 20.26131, 20.26132, 20.26133, 20.26134 and 20.26135, until the marker attempts to seize the second selected line link frame associated with the incoming intertoll trunk.

20.2634 Second Selected Line Link Frame - Busy Indication and Operation of the Marker LLB Relay

The second selected line link frame plugged-busy indication and operation of the marker LLB relay are similar to the description in paragraph 20.2511.

20.2635 Release of the Marker Intertoll Call Functions Associated with the Second Selected Line Link Frame

The release of the marker intertoll call functions associated with the second selected line link frame and with the original intertoll route is similar to the description in paragraph 20.2512. The operation of the LLB relay, with the TOG-1, TOL and NGP-1 relays operated and the RCY relay released, will operate the RAV-1/2 relays.

20.2636 Intiating the Alternate Intertoll Route Call Functions

The initiating the alternate intertoll route call functions are similar to the description in paragraph 20.2523.

20.2637 Second Selected Line Link Frame Plugged-Busy Indication and Operation of the Marker LLB Relay

The second selected line link frame plugged-busy indication and operation of the marker LLB relay is similar to the description in paragraph 20.2511.

20.2638 Release of the Marker Intertoll Call Functions Associated with the Alternate Intertoll Route

The release of the marker intertoll call functions associated with the alternate intertoll route is similar to the description in paragraph 20.2512. The operation of the LLB relay, with the TOG-1, TOL and NGP-1 relays operated and the RCY relay released, will operate the RAV-1/2 relays.

20.2639 Initiating the Terminating Call Functions and the Overflow Tone Functions

The initiating the terminating call functions and the overflow tone functions are similar to the description in paragraph 20.2513.

20.3 Trunk Link Frame Busy

When a marker in the process of assisting a call or connection encounters a busy trunk link frame this trunk link frame busy condition may be the result of either another marker being associated with the trunk link frame or the trunk link frame may be "plugged-busy" by the use of the make-busy plug.

When a marker in assisting a terminating call encounters a busy trunk link frame which is the result of another marker being associated with the trunk link frame, the marker will wait until the trunk link frame is idle and will then proceed with the terminating call in the usual manner. Therefore, the marker actions under this condition are not altered and only a delay is encountered in the seizure of the trunk link frame.

When a marker in assisting a terminating call encounters a trunk link frame which has been "plugged-busy", the marker will proceed in the usual manner and will disregard the fact that the trunk link frame has been "plugged-busy". In this case the marker will not encounter a delay in the seizure of the trunk link frame unless another marker is associated with this trunk link frame.

When a marker in assisting a dial tone connection, an intra-office call, a reverting call, a subscriber outgoing call or any other type of call or connection for which the marker must initiate trunk selection or originating register selection encounters a busy trunk link frame which is the result of either another marker being associated with the trunk link frame or the result of the trunk link frame being "plugged-busy", the marker circuit will not select a trunk or originating register circuit which is associated with this trunk link frame. Instead the marker will select a trunk or originating register circuit which is associated with a trunk link frame which is not associated with another marker and which is not "plugged-busy". As previously described in the selection of a trunk circuit or of an originating register circuit, the frame busy FB- relays in the marker which are associated with the trunk link frames which are associated with other markers will be operated to indicate that this marker should select trunks or originating registers associated with some other trunk link frame. In the same manner, when a trunk link frame is "plugged-busy" the associated frame busy FB- relay will be operated to indicate that this marker should select trunks or originating registers associated with some other trunk link frame.

20.4 All Originating Registers Busy

When the marker in assisting a dial tone connection determines that all originating registers of the type required are busy the marker will "route advance". Under these conditions when the marker "route advances", the marker will not proceed with the completion of the dial tone connection functions but will initiate the marker release functions.

After this marker is released the line link frame associated with the calling subscriber will initiate the reseizure of a marker in the same manner as the line link frame seized the first marker for completion of the dial tone connection. The process of releasing the marker when all originating registers of the type required are busy and reseizure of a marker by the line link frame will continue until the successful completion of the dial tone connection.

When the marker which is initiating a dial tone connection determines by the operation of the trunk busy timing TBT and TBTA relays that all originating registers of the required type are busy the marker will route advance. A route advance under these conditions will prevent the marker from proceeding with the dial tone connection function and will immediately initiate the release of the marker and the associated circuits.

20.41 Operation of the TBT, TBTB, TBTA, RAV-1/2 and RA-6 Relays

When the marker is initiating an originating register selection, as described in paragraph 7.3, the FC- and FCA- relays will be operated to extend leads from the marker to the trunk link frames to determine which trunk link frames are associated with idle originating registers of the required type. If a trunk link frame is associated with one or more idle originating registers of the required type the associated marker FTC-0/19 relay will be operated. To indicate that the FC- and FCA- relays have operated the FCK and FCKA relays will be operated and to indicate that one or more FTC-0/19 relays have operated the FTCK and FTCK-1 relays will be operated.

The operation of the FCK and FCKA relays with the FTCK-1, FTCK and TBTB relays non-operated will extend ground potential to the secondary winding of the TBT relay to operate the TBT relay to the non-operate position. The primary winding is energized through the TFT resistance to tend to operate the TBT relay to the operate position. However, since the secondary winding action predominates, the TBT relay will operate to the non-operate position.

The operation of the FCK and FCKA relays with the FTCK-1, FTCK and TBT relays non-operated will operate the TBTB relay.

The operation of the TBTB relay will remove the ground potential on the secondary winding of the TBT relay which is holding the TBT relay in the non-operate position. However, the TBT relay will not operate immediately since the charge from the TBT condenser will hold the TBT relay in the non-operate position for a short interval of time.

If an idle tone trunk is available the FTCK and FTCK-1 relays will operate and will in turn release the operated TBTB relay before the timing TBT relay will operate. Therefore, in this case, when the TBT relay is operated the TBTB relay will be released which will prevent the operation of the TBTA relay.

However, if an idle originating register of the required type is not available the FTCK and FTCK-1 relays will not operate and will not release the operated TBTB relay before the timing TBT relay will operate. Therefore, in this case, when the TBT relay is operated, the TBTA will be operated to indicate that all originating registers of the required type are busy.

The operation of the TBTA relay, with the MT-1 and GP-1 relays non-operated, will operate the RAV-1/2 relays in series.

The route advance RA-6 relay will be operated when the RAV-1 relay is operated. The winding of the RA-6 relay will be extended through the operated route R- relay contacts, over the "RAL" lead, through the operated RAV-1 relay contacts, over the "G4" lead and through the operated CKG-2 relay contacts to ground, thereby operating the RA-6 relay. The operation of the RA-6 relay will indicate to the marker that no other routes exist to which the marker may route advance. The operation of the RAV-1/2 and RA-6 relays will initiate the release of this marker.

20.42 Release of the Marker and Associated Circuits

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously, this circuit will describe only one point at which the operating circuit is opened to release the marker relays.

20.421 Release of the TLC-1/3, LLC-1/2, ONW, CKG-2/7, OC-1/2 and R- Relays and Operation of the DIS-1/2 Relays

The operation of the RAV-1 relay will release the TLC-1/3 relays. The operation of the RAV-2 relay will release the CKG-4 relay which in turn will release the LLC-1/2 and ONW relays.

The operation of the RA-6 relay will operate the DIS-1/2 relays. The operating path for the DIS-1/2 relays in series is extended from the winding of the DIS-1 relay over the "DIS" lead to the "DIS-1" lead with the MT-1, MON-1, TRL-1, TRR and TR1 relays non-operated, to the "DIS-1" lead or the "TG" lead with the TG relay non-operated, to the "DIS-1" lead if the HTR relay is either operated or non-operated, to the "DIS-1" lead with the RRK and RRC relays non-operated, to the "DIS-1" lead with the PSR relay non-operated, to the "ORB" lead with the TRS relay non-operated and the OC relay operated and to operating ground potential with the RA-6 relay operated. The DIS-1/2 relays will lock operated with the TRLA relay non-operated and the line link marker connector MA relay operated.

The operation of the DIS-1/2 relays will release the CKG-2/3, CKG-6/7, OC-1 or OC-2 and R- relays. The release of the CKG-3 relay will release the CKG-5 relay.

20.422 Release of the Line Link Marker Connector MS and MA Relays

The operation of the DIS-1 relay will release the line link marker connector MS relay which in turn will release the line link marker connector MA relay associated with the releasing marker circuit.

20.423 Release of the DIS-1/2 Relays

The release of the line link marker connector MA relay will release the DIS-1/2 relays.

20.424 Release of the MCB-1/6 Relays and the Line Link Marker Connector CB Relays

The release of the route R- relay will release the FC- and FCA- relays which in turn will release the FCK- and FCKA-

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relays. The release of the FCK- and FCKA- relays will release the TBTA and TBTB relays which in turn will release the SNK relay. The release of the SNK relay will release the MCB-1/6 relays which in turn will release the CB relays associated with this marker circuit in all marker connectors. The release of the CB relays associated with this marker circuit in all marker connectors will indicate to all marker connectors that this marker has been released and is now idle and available.

20.425 Release of the Identification of the Connection Functions

20.4251 Release of the D, MF or MLF Relay

The release of the line link marker connector MS relay will release the D, MF or MLF relay.

20.4252 Release of the DT-1, DT-2 and DT-3 Relays

The release of the D, MF or MLF relay will release the DT-1, DT-2 and DT-3 relays.

20.4253 Release of the Line Link Marker Connector MB Relay

The release of the line link marker connector MA relay will release the line link marker connector MB relay.

20.426 Release of the Identification of the Calling Line Functions

20.4261 Release of the FT-0/3, FTB-0/3, FU-0/7 and FUT-0/9 Relays

The operation of the DIS-2 relay will release the GTL-2 relay which in turn will release the FT-0/3 and FU-0/7 relays which in turn will release the FTB-0/3 and FUT-0/9 relays.

20.4262 Release of the VGT-0/11, HGT-0/9, VTK, HGK, VTK-1 and HTK-1 Relays

The release of the operated D, MF or MLF relay will release the operated VGT-0/11, HGT-0/9, VTK and HTK relays which in turn will release the VTK-1 and HTK-1 relays.

20.427 Release of the Originating Register Selection Functions

20.4271 Release of the FC, FCA-, FCC and FCKA Relays

The release of the operated route R- relay will release the FC- and FCA- relays which in turn will release the FCK and FCKA relays.

20.5 Number Group Busy

When a marker in the process of assisting a call or connection encounters a busy number group this number group busy condition may be the result of either another marker being associated with the number group or the number group may be "plugged-busy" by the use of the make-busy plug.

When a marker in assisting any call or connection encounters a busy number group which is the result of another marker being associated with the number group, the marker will wait until the number group is idle and will then proceed with the call or connection in the usual manner. Therefore, the marker actions under this condition are not altered and only a delay is encountered in the seizure of the number group.

When a marker encounters a busy number group which is the result of the number group being "plugged-busy", the marker action will vary depending upon the basic type of call or connection which the marker is assisting as follows:

a. For an intra-office call the marker will route advance and will connect a tone trunk to the calling line. When the calling line has been connected to the tone trunk, the tone trunk will provide an overflow tone to the calling subscriber.

b. For a terminating call the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber.

c. For a tandem call with non-local completion or for an intertoll call with non-local completion the marker will initiate the seizure of the other number group which is capable of translating trunk number information. Since both number groups associated with trunk number translation should never be plugged-busy at the same time, the marker should not encounter a plugged-busy number group when initiating the seizure of the second number group.

To provide an outline of the marker route advances or recycles under various number group busy conditions the following table is provided.

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Marker Operations for Number Group Made Busy

Type of Call	Marker Recycles or Route Advances From	To	Conditions
Intra-office	Route Advance from Intra-office call	Route Advance to Tone Trunk Connection	When number group associated with called line has been "plugged-busy".
Terminating	Provides for Initiating Overflow Tone Ringing from Ringing Selection Switch		When number group associated with called line has been "plugged-busy".
Tandem or Intertoll, Non-Local Completion	Recycles to Release the First Number Group Selection	Recycles to Select the Second Number Group Associated with Trunk Number Translation	When number group associated with the first selected number group has been "plugged-busy".

20.51 Intra-office Call, Number Group Associated with Called Line Plugged-Busy

When a number group circuit is plugged-busy the MB- relay in the number group circuit will be operated by the make-busy plug. A marker in the process of seizing this number group circuit will extend battery potential over the "ST-" lead to the number group circuit which with the MB- relay operated will extend this battery potential over the "TMB" lead to the marker thereby operating the marker number group busy NGB relay as an indication that the number group has been plugged-busy.

When the marker is assisting an intra-office call and determines that the number group associated with the called line has been plugged-busy the marker will route advance by releasing the intra-office call functions and then will initiate a connection from the calling subscriber to a tone trunk. After the tone trunk connection has been established the tone trunk will transmit the overflow tone signal to the calling subscriber.

If all tone trunks are busy the marker will be unable to establish a connection from the calling subscriber to a tone trunk. Therefore, the marker will again route advance by releasing the tone trunk connection functions and then will initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line. After the common overflow trunk connection has been established the common overflow trunk will transmit the overflow tone signal to the non-coin calling subscriber.

If all tone trunks are busy the marker will be unable to establish a connection from the coin calling subscriber to a tone trunk or if all common overflow trunks are busy the marker will be unable to establish a connection from the non-coin calling subscriber to a common overflow trunk. Therefore, in these cases, the marker will again initiate a route advance. However, in this case there is no route to which the marker can route advance to establish a connection. Therefore, the marker will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone.

20.511 Route Advance to Tone Trunk Connection from Intra-Office Call Connection

The marker will proceed with the intra-office call functions, as described in paragraphs 8.01, 8.02, 8.03 and 8.04, until the marker attempts to seize the number group associated with the called line, as described in paragraph 8.041. When the marker attempts to seize this number group circuit, which has been plugged-busy, the number group circuit will extend battery potential over the "TMB" lead to operate the number group busy NGB relay in the marker. The operation of the NGB relay will initiate a route advance which will release the intra-office call functions and then will initiate the tone trunk connection functions.

20.5111 Number Group Plugged-Busy Indication and Operation of the NGB Relay

When the marker attempts to seize the number group circuit as described in paragraph 8.041, battery potential will be extended over the "ST-" lead associated with the selected number group. With the MB- relay in the number group operated, the battery potential on the "ST-" lead will be further extended to the "TMB" lead and to the marker circuit to operate the NGB relay. The MB- relay in the number group circuit was operated when the number group was plugged-busy.

20.5112 Release of the Marker Intra-Office Call Functions

The release of the marker intra-office call functions will be initiated by the operation of the NGB relay and will be similar to the description in paragraph 20.112. However, the relays associated with the identification of the location of the called line functions and the line link frame seizure functions were not operated and therefore need not be released.

20.5113 Initiating the Tone Trunk Connection Functions

After the marker has released the intra-office call functions the marker will initiate the tone trunk connection functions.

The initiating of the tone trunk connection functions are similar to the description in paragraph 20.1113.

20.512 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

20.513 Route Advance to Provide Overflow Tone from Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

20.52 Terminating Call, Number Group Associated with Called Line Plugged-Busy

When the marker is assisting a terminating call and determines that the number group circuit associated with the called line has been plugged-busy the marker will not proceed with the usual terminating call functions and will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber. After setting up the overflow tone ringing condition on the ringing selection switch the marker will release from the connection.

The marker will proceed with the terminating call functions, as described in paragraphs 12.1, 12.2, 12.3, and 12.4, until the marker attempts to seize the number group circuit, as described in paragraph 12.4. When the marker attempts to seize this number group circuit, which has been plugged-busy, the number group circuit will extend battery potential over the "TMB" lead to operate the number group busy NGB relay in the marker. The operation of the NGB relay will initiate the actions required to set up the overflow tone condition on the ringing selection switch and will inform the incoming trunk that the incoming trunk should provide the overflow tone to the calling subscriber.

20.521 Number Group Plugged-Busy Indication and Operation of the Marker NGB, PMO and OV Relays

When the marker attempts to seize the number group circuit battery potential will be extended over the "ST-" lead associated with the selected number group circuit. With the MB- relay in the number group circuit operated, the battery potential on the "ST-" lead will be further extended to the "TMB" lead and to the marker circuit to operate the NGB relay.

The operation of the NGB relay with the TER-1 relay operated, will operate the permanent overflow PMO relay which in turn will operate the OV relay.

20.522 Setting Up the Overflow Tone Ringing Code

The setting up the overflow tone ringing code is similar to the description in paragraph 20.25135.

20.523 Release of the Marker and Associated Circuits

The release of the marker and associated circuit is similar to the description in paragraph 20.134. However, those release functions initiated by the operation of the BY relay will in this case be initiated by the operation of the OV relay. Also, since those functions associated with the identification of the location of the called line, with line link frame seizure, connecting path selection and line link frame and trunk link frame select magnet operation were not completed, certain relays associated with these functions were not operated and therefore are not released.

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20.53 Tandem Call or Intertoll Call Number Group Associated with Trunk Number Translation Plugged-Busy

The trunk number of an incoming tandem or intertoll trunk may be translated by either one of the two number groups which contain provisions for trunk number translation. Therefore, when the marker is assisting a tandem or intertoll call with non-local completion and determines that the first selected number group has been plugged-busy the marker will initiate the seizure of the second number group which has provision for number group translation. Since both number groups associated with trunk number translation should never be plugged-busy at the same time, the marker should not encounter a plugged-busy number group when initiating the seizure of the second number group.

If in error both number groups associated with trunk number translation are plugged-busy the marker will block in its operation, timeout and will initiate a trouble record.

20.531 Tandem or Intertoll Call, First Selected Number Group Associated with Trunk Number Translation Plugged-Busy

For a tandem call with non-local completion the marker will proceed with the tandem call functions, as described in paragraphs 14.1, 14.2, 14.3, 14.4 and 14.5, until the marker attempts to seize the first selected number group associated with trunk number translation, as described in paragraph 14.51. For an intertoll call with non-local completion the marker will proceed with the intertoll call functions, as described in paragraphs 15.1, 15.2, 15.3, 15.4 and 15.5, until the marker attempts to seize the first selected number group associated with trunk number translation, as described in paragraph 15.5. When the marker attempts to seize the number group circuit battery potential will be extended over the "ST-" lead associated with the selected number group. With the MB- relay in the number group operated, the battery potential on the "ST-" lead will be further extended to the "TMB" lead and to the marker circuit to operate the NGB relay which in turn will operate the number group preference NGP and NGP-1 relays.

The operation of the NGP relay will remove the battery potential on the "ST-" lead associated with the first selected number group circuit and will extend battery potential to the "ST-" lead associated with the other number group which can provide trunk number translation. This second number group will then be seized in the same manner as described in paragraph 14.51.

The marker will then complete the tandem call functions as described in paragraphs 14.5, 14.6, 14.7, 14.8 and 14.9 or will complete the intertoll call functions as described in paragraphs 15.5, 15.6, 15.7, 15.8 and 15.9.

20.532 Tandem or Intertoll Call, First and Second Selected Number Group Associated with Trunk Number Translation Plugged-Busy

For a tandem call with non-local completion the marker will proceed with tandem call functions, as described in paragraphs 14.1, 14.2, 14.3, 14.4 and 14.5, until the marker attempts to seize the first selected number group associated with trunk number translation, as described in paragraph 14.51. For an intertoll call with non-local completion the marker will proceed with the intertoll call functions, as described in paragraphs 15.1, 15.2, 15.3, 15.4 and 15.5, until the marker attempts to seize the first selected number group associated with trunk number translation, as described in paragraph 15.5. When the marker attempts to seize the number group circuit battery potential will be extended over the "ST-" lead associated with the selected number group. With the MB- relay in the number group operated, the battery potential on the "ST-" lead will be further extended to the "TMB" lead and to the marker circuit to operate the NGB relay which in turn will operate the number group preference NGP and NGP-1 relays.

The operation of the NGP relay will remove the battery potential on the "ST-" lead associated with the first selected number group circuit and will extend battery potential to the "ST-" lead associated with the other number group which can provide trunk number translation. However, since this second number group circuit has been plugged-busy, the battery potential on the associated "ST-" lead will not be extended to operate the second number group MP- relay to seize this second number. Instead the battery potential will be extended over the "ST-" lead, and with the MB- relay in the second selected number group operated, the battery potential on the "ST-" lead will be extended to the "TMB" lead and to the marker to hold operated the NGB relay. Being unable to seize the second selected number group circuit the marker work WT timer will timeout and the marker will initiate a trouble record, as described in paragraph 23.

After the trouble record has been perforated the marker will be released and the incoming register marker connector will initiate a second trial, as described in paragraph 24.

20.6 All Trunks Busy

When the marker encounters a condition in which all of the subgroup of trunks being tested are determined to be busy the marker will advance the two-step allotter circuit if a second subgroup of trunks associated with the same route are provided. After the two-step allotter has advanced the marker will test the second subgroup of trunks. If the marker again encounters all of the second subgroup of trunks busy or if there is only one subgroup of trunks the marker will route advance and for an intra-office call or for an outgoing call will establish a connection between the calling subscriber's line and a tone trunk to provide an overflow tone signal or for a non-local completing intertoll call or tandem call will signal the incoming trunk to provide the overflow tone signal.

20.61 All Trunks Busy for Intra-Office Call Associated With One Trunk Subgroup

When the marker in assisting an intra-office call associated with one subgroup of trunks determines that all trunks within the selected trunk subgroup are busy the marker will route advance by releasing the intra-office call functions and then will initiate a connection from the calling subscriber to a tone trunk. After the tone trunk connection has been established the tone trunk will transmit an overflow tone signal to the calling subscriber.

If all tone trunks are busy the marker will be unable to establish a connection from the calling subscriber to a tone trunk. Therefore, the marker will again route advance by releasing the tone trunk connection functions and then will initiate a connector from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line. After the common overflow trunk connection has been established the common overflow trunk will transmit the overflow tone signal to the non-coin calling subscriber.

If all tone trunks are busy the marker will be unable to establish a connection from the coin calling subscriber to a tone trunk or if all common overflow trunks are busy the marker will be unable to establish a connection from the non-coin calling subscriber to a common overflow trunk. Therefore, in these cases, the marker will again initiate a route advance. However, in this case there is no new route to which the marker can route advance to establish a connection. Therefore, the marker will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone. The marker will then be released and the calling subscriber will receive the overflow signal from the originating register circuit.

20.611 Route Advance to A Tone Trunk Connection From Intra-Office Call Connection

The marker will proceed with the intra-office call functions, as described in paragraphs 8.01, 8.02, 8.03 and 8.05, until the marker determines, as described in paragraph 20.6111, that an all trunks busy condition exists. The marker will then route advance and will establish a connection from the calling subscriber to a tone trunk.

20.6111 Release of the Marker Intra-Office Call Connection Functions

When a marker which is initiating an intra-office call connection determines by the operation of the trunk busy timing TBT and TBTA relays that all intra-office trunks within the trunk subgroup are busy and that there are no other intra-office trunk subgroups within the required trunk group the marker will route advance from an intra-office trunk connection to a tone trunk connection.

20.61111 Operation of the TBT, TBTB and TBTA Relays

When the marker is initiating an intra-office trunk selection the FC- and FCA- relays will be operated to extend leads from the marker to the trunk link frames to determine which trunk link frames are associated with idle intra-office trunks. If a trunk link frame is associated with one or more idle intra-office trunks the associated marker FTC-0/19 relay will be operated. To indicate that the FC- and FCA- relays have operated the FCK and FCKA relays will be operated and to indicate that one or more FTC-0/19 relays have operated the FTCK and FTCK-1 relays will be operated.

The operation of the FCK and FCKA relays, with the FTCK-1, FTCK and TBTB relays non-operated, will extend ground potential to the secondary winding of the TBT relay, to operate the TBT relay to the non-operate position. The primary winding is energized through the TFT resistance to tend to operate the TBT relay to the operate position. However, since the secondary winding action predominates, the TBT relay will operate to the non-operate position.

The operation of the FCK and FCKA relays, with the FTCK-1, FTCK and TBT relays non-operated, will operate the TBTB relay.

The operation of the TBTB relay will remove the ground potential on the secondary winding of the TBT relay which is holding the TBT relay in the non-operate position. However, the TBT relay will not operate immediately since the charge from the TBT condenser will hold the TBT relay in the non-operate position for a short interval of time.

If an idle intra-office trunk is available the FTCK and FTCK-1 relays will operate and will in turn release the operated TBTB relay before the timing TBT relay will operate. Therefore, in this case, when the TBT relay is operated the TBTB relay will be released which will prevent the operation of the TBTA relay.

However, if an idle intra-office trunk is not available the FTCK and FTCK-1 relays will not operate and will not release the operated TBTB relay before the timing TBT relay will operate. Therefore, in this case, when the TBT relay is operated the TBTA relay will be operated to indicate that all intra-office trunks in the selected subgroup are busy.

20.61112 Operation of the RAV-1/2, RA-1/5 and GS-1/5 Relays

Assuming that the intra-office trunk group consists of only one subgroup of trunks, the operation of the TBTA relay, with the MT-1 and GP-1 relays non-operated, will operate the RAV-1/2 relays in series.

The one route advance RA-1/5 relay associated with the ground supply group associated with the intra-office trunk route will be operated when the RAV-1 relay is operated. The winding of this RA-1/5 relay will be extended through the non-operated GS-1/5 relay contacts, through the operated intra-office route R- relay contacts, over the "RAL" lead and through the operated RAV-1 relay contacts and over the "G4" lead and through the operated CKG-2 relay contacts to ground, thereby operating the RA-1/5 relay. After operating the RA-1/5 relay will be held operated with the RAV-1 and CKG-2 relays operated.

The operation of one RA-1/5 relay with the CKG-3 relay operated will operate the associated ground supply group GS-1/5 relay. The operated GS-1/5 relay will be held operated with the CKG-3 relay operated.

20.61113 Release of the TLC-1/3, LLC-1/2, ONW, CKG-4, NSI, ITR-1/3, FLG and FLG-1 Relays

The operation of the RAV-1 relay will release the TLC-1/3 relays. The operation of the RAV-2 relay will release the CKG-4 relay which in turn will release the LLC-1/2 and ONW relays.

The operation of the GS-1/5 relay will release the NSI relay which will release the ITR-1/3 relays which in turn will release the FLG and FLG-1 relays.

20.61114 Release of the FC-, FCA-, FCK, FCKA, TBTA, and TBTB Relays

The operation of the GS-1/5 relay will release the FC- and FCA- relays which will release the FCK and FCKA relays. The release of the FCK and FCKA relays will release the TBTA and TBTB relays.

20.6112 Initiating the Tone Trunk Connection Functions

After the marker has released the intra-office call functions the marker will initiate the tone trunk connection functions which are similar to the description in paragraph 20.1113.

20.612 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

20.613 Route Advance to Provide Overflow Tone from the Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

20.62 All Trunks Busy for Intra-Office Call Associated with Two Trunk Subgroups

When the marker in assisting an intra-office call associated with two subgroups of trunks determines that all trunks within one of the trunk subgroups are busy the marker will advance the two-step allotter. After the two-step allotter has advanced the marker will test the other subgroup of trunks.

If all trunks within both trunk subgroups are busy the marker will route advance by releasing the intra-office call functions and then will initiate a connection from the calling subscriber to a tone trunk which will provide overflow tone to the calling subscriber.

If all tone trunks are busy the marker will again route advance by releasing the tone trunk connection functions and then will initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy for a coin calling subscriber or if all common overflow trunks are busy for a non-coin calling subscriber the marker will initiate a route advance. However, in this case there is no new route to which the marker can route advance to establish a connection. Therefore, the marker will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone. The marker will then be released and the calling subscriber will receive the overflow signal from the originating register circuit.

20.621 Allotter Advance to Second Subgroup of Intra-Office Trunks

The marker will proceed with the intra-office call functions, as described in paragraphs 8.01, 8.02, 8.03 and 8.05, until the marker determines, as described in paragraph 20.6211, that an all trunks busy condition exists within the selected subgroup of intra-office trunks. The marker will then advance the allotter circuit so that the marker may select an idle intra-office trunk from within the same trunk group but from the other subgroup of intra-office trunks. The marker will then establish an intra-office call connection in the usual manner.

20.6211 Release of the Selected Subgroup of Intra-Office Trunks

When a marker which is initiating an intra-office call connection determines by the operation of the trunk busy timing TBT and TBTA relays that all intra-office trunks within the selected trunk group are busy and that another subgroup of intra-office trunks is associated with the intra-office trunk group the marker will advance the allotter circuit so that the marker may test the other subgroup of intra-office trunks.

20.62111 Operation of the TBT, TBTB and TBTA Relays

The operation of the TBT, TBTB and TBTA relays are similar to the description in paragraph 20.61111.

20.62112 Operation of the GP-2 Relay and Release of the GPA or GPB Relay and the FC-, FCA-, FCK and FCKA Relays

When the marker is performing the intra-office call functions the marker will operate either the GPA relay to select subgroup "A" intra-office trunks or will operate the GPB relay to select subgroup "B" intra-office trunks as described in paragraph 8.0513. The operation of the TBTA relay, with the GT-1 relay operated and the MT-1 relay non-operated, will operate the GP-2 relay which in turn will release the operated GPA or GPB relay. The release of the GPA or GPB relay will release the FC- and FCA- relays which will release the FCK and FCKA relays.

20.6212 Initiating the Intra-Office Call Connection Associated with Other Subgroup of Trunks

After the marker has released the selected subgroup of intra-office trunks the marker will initiate an intra-office call connection associated with the other subgroup of intra-office trunks.

20.62121 Release of the TBTA, TBTB and SNK Relays

The release of the FCK and FCKA relays will release the TBTA and TBTA relays which in turn will release the SNK relay.

20.62122 Operation of the GP-3, GZ, GW and GPA or GPB Relays and the Release of the GP-1/3 Relays

The release of the SNK relay, with the GP-2 relays operated will operate the GP-3 relay. The operation of the GP-3 relay will operate the unoperated GZ or GW relay which in turn will release the GP-1 and GP-2 relays. The release of the GP-1 and GP-2 relays will release the GP-3 relay. The release of the GP-3 relay will release the GZ relay if this relay had been operated to select the first subgroup of intra-office trunks or the release of the GP-3 relay will operate the GZ relay if this relay had been released to

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select the first subgroup of intra-office trunks.

If the GPA relay had been operated to select subgroup "A" as the first subgroup of intra-office trunks to be tested for this intra-office call, then the GZ relay will be operated to operate the GPB relay to select subgroup "B" as the second group of intra-office trunks to be tested for this intra-office call. If the GPB relay had been operated to select subgroup "B" as the first subgroup of intra-office trunks to be tested for this intra-office call, then the GZ relay will be released to operate the GPA relay to select subgroup "A" as the second group of intra-office trunks to be tested for this intra-office call.

20.62123 Completing the Intra-Office Call Connection

After the GPA or GPB relay is operated, as described in paragraph 20.62122, the marker will test in the second subgroup of intra-office trunks and will proceed with the completion of the intra-office call connection as described in paragraphs 8.05, 8.06, 8.07, 8.08, 8.09, 8.10, 8.11, 8.12 and 8.13 if an idle intra-office trunk is available in the second trunk subgroup.

20.622 Route Advance To A Tone Trunk Connection from Intra-Office Call Connection

The marker will proceed with the intra-office call functions until the marker determines that all trunks within the first trunk subgroup are busy. The marker will then proceed as described in paragraph 20.621. However, when the marker is associated with the second trunk subgroup the marker will again determine that all trunks within the second trunk subgroup are busy. The marker will then proceed in a manner similar to the description in paragraphs 20.6111, 20.6112.

20.623 Route Advance To Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

20.624 Route Advance to Provide Overflow Tone from the Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

20.63 All Trunks Busy for Subscriber Outgoing Call Associated with One Trunk Subgroup

When the marker in assisting a subscriber outgoing call associated with one subgroup of trunks determines that all trunks are busy the marker will route advance by releasing the subscriber outgoing call functions and then will initiate a connection from the calling subscriber to a tone trunk which will provide overflow tone to the calling subscriber.

If all tone trunks are busy the marker will again route advance by releasing the tone trunk connection functions and then will initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy for a coin calling subscriber or if all common overflow trunks are busy for a non-coin calling subscriber the marker will initiate a route advance. However, in this case there is no new route to which the marker can route advance to establish a connection. Therefore, the marker will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone. The marker will then be released and the calling subscriber will receive the overflow signal from the originating register circuit.

20.631 Route Advance to A Tone Trunk Connection from Subscriber Outgoing Call Connection

The marker will proceed with the subscriber outgoing call functions, as described in paragraphs 11.1, 11.2, 11.3, 11.411, 11.412, 11.413, and 11.5, until the marker determines, as described in paragraph 20.6311, that an all trunks busy condition exists. The marker will then route advance and will establish a connection from the calling subscriber to a tone trunk.

20.6311 Release of the Marker Subscriber Outgoing Call Connection Functions

When a marker which is initiating a subscriber outgoing call connection determines by the operation of the trunk busy timing TBT and TBTA relays that all subscriber outgoing trunks of the desired trunk route are busy the marker will route advance from a subscriber outgoing trunk connection to a tone trunk connection.

20.63111 Operation of the TBT, TBTB and TBTA Relays

The operation of these relays is similar to the description in paragraph 20.61111.

20.63112 Operation of the RAV-1/2 RA-1/5 and GS-1/5 Relays

The operation of these relays is similar to the description in paragraph 20.61112.

20.63113 Release of the TLC-1/3, LLC-1/2, ONW, CKG-4, OSG-0/4, OSA-0/4, OGC, OSC, SON, SOG-1/3, CB, CB-1/5, CB-7, CBF, CBD and CBD-1 Relays

The operation of the RAV-1 relay will release the TLC-1/3 relays. The operation of the RAV-2 relay will release the CKG-4 relay which in turn will release the LLC-1/2 and ONW relays.

The operation of the GS-1/5 relay will release the OSG-0/4 and OSA-0/4 relays which will release the SOG-1/3, OGC, OSC and SON relays. The release of the SOG-1/3 relays will release the CB, CB-1/5, CB-7, CBF, CBD and CBD-1 relays.

20.63114 Release of the FC-, FCA-, FCK, FCKA, TBTA and TBTB Relays

The release of these relays is similar to the description in paragraph 20.6114.

20.6312 Initiating the Tone Trunk Connection Functions

After the marker has released the subscriber outgoing call functions the marker will initiate the tone trunk connection functions which are similar to the description in paragraph 20.1113.

However, for a typical office the cross-connections for operating the route R- relay are as follows:

The operated CKG-3 relay contacts will extend ground over the "RA" lead, through the released RA-1/5 relays and the operated GS-1/5 relay, and through the operated subscriber outgoing trunk route R-relay which will extend ground to the route advance "RA" cross-connection terminal. The "RA" cross-connection terminal of Figure 51 will be cross-connected to an "RC" cross-connection terminal of Figure 51 associated with the tone trunk route thereby extending ground to operate the route R-relay associated with a tone trunk connection.

20.632 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

20.633 Route Advance to Provide Overflow Tone from the Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

20.64 All Trunks Busy for Subscriber Outgoing Call Associated with Two Trunk Subgroups

When the marker in assisting a subscriber outgoing call associated with two subgroups of trunks determines that all trunks within one of the trunk subgroups are busy the marker will advance the two-step allotter. After the two-step allotter has advanced the marker will test the other subgroup of trunks.

If all trunks within both trunk subgroups are busy the marker will route advance by releasing the subscriber outgoing call functions and then will initiate a connection from the calling subscriber to a tone trunk which will provide overflow tone to the calling subscriber.

If all tone trunks are busy the marker will again route advance by releasing the tone trunk connection functions and then will initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy for a coin calling subscriber or if all common overflow trunks are busy for a non-coin calling subscriber the marker will initiate a route advance. However, in this case there is no new route to which the marker can route advance to establish a connection. Therefore, the marker will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone. The marker will then be released and the calling subscriber will receive the overflow signal from the originating register circuit.

20.641 Allotter Advance to Second Subgroup of Subscriber Outgoing Trunks

The marker will proceed with the subscriber outgoing call functions, as described in paragraphs 11.1, 11.2, 11.3, 11.411, 11.412, 11.413 and 11.5, until the marker determines, as described in paragraph 20.6411, that an all trunks busy condition exists within the selected subgroup of outgoing trunks. The marker will then advance the allotter circuit so that the marker may select an idle outgoing trunk from within the same trunk group but from the other subgroup of outgoing trunks. The marker will then establish a subscriber outgoing call connection in the usual manner.

20.6411 Release of the Selected Subgroup of Subscriber Outgoing Trunks

The release of the selected subgroup of subscriber outgoing trunks is similar to the description in paragraph 20.6211.

However, if the two-step allotter is also required for sender subgroup selection the release of the operated GPA or GPB relay will release the OSG-0/4 and OSA-0/4 relays which in turn will release the operated SOG-1/3, OGC, OSC and SON relays.

20.6412 Initiating the Subscriber Outgoing Call Connection Associated with Other Subgroup of Trunks

After the marker has released the selected subgroup of outgoing trunks the marker will initiate an outgoing call connection associated with the other subgroup of outgoing trunks.

20.64121 Release of the TBTA, TBTB and SNK Relays

The release of the TBTA, TBTB and SNK relays is similar to the description in paragraph 20.62121.

20.64122 Operation of the GP-3, GZ, GW and GPA or GPB Relays and the Release of the GP-1/3 Relays

The operation of the GP-3, GZ, GW and GPZ or GPB relays and the release of the GP-1/3 relays is similar to the description in paragraph 20.62122.

20.64123 Completing the Subscriber Outgoing Call Connection

After the GPA or GPB relay is operated the marker will test in the second subgroup of subscriber outgoing trunks and will proceed with the completion of the subscriber outgoing call connection as described in paragraphs 11.4, 11.5, 11.6, 11.7 and 11.8 if an idle outgoing trunk of the required route is available in the second trunk subgroup.

20.642 Route Advance to A Tone Trunk Connection from Outgoing Call Connection

The marker will proceed with the outgoing call function until the marker determines that all trunks within the first trunk subgroup are busy. The marker will then proceed as described in paragraph 20.641. However, when the marker is associated with the second trunk subgroup the marker will again determine that all trunks within the second trunk subgroup are busy. The marker will then proceed in a manner similar to the description in paragraphs 20.6311 and 20.6312.

20.643 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

20.644 Route Advance to Provide Overflow Tone from the Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

20.65 All Outgoing Trunks Busy for Non-Local Terminating Intertoll or Tandem Call with One Outgoing Trunk Subgroup and No Alternate Routes

When the marker in assisting a non-local terminating intertoll or tandem call associated with one subgroup of outgoing trunks and with no alternate routes determines that all outgoing trunks are busy the marker will route advance and will set up the reorder ringing condition on the ringing selection switch so that the incoming tandem or intertoll trunk can provide the reorder signal to the calling end. After setting up the reorder ringing condition on the ringing selection switch the marker will release from the connection.

The operation of the tandem outgoing auxiliary TOA relay and the reorder auxiliary ROA relay will initiate the setting up of the reorder ringing signal.

The marker will proceed with the tandem call functions, as described in paragraphs 14.1, 14.2, 14.3, 14.411, 14.412, 14.413, and 14.6, or the intertoll call functions as described in paragraphs 15.1, 15.2, 15.3, 15.4 and 15.6, until the marker determines, as described in paragraph 20.651, that an all outgoing trunks busy condition exists.

20.651 Release of the Marker Tandem or Intertoll Call Functions

When a marker which is initiating a tandem or a non-local completing intertoll call determines by the operation of the trunks busy timing TBT and TBTA relays that all of the required outgoing trunks within the trunk subgroup are busy, that there are no other trunk subgroups within the required outgoing trunk group and that there are no alternate routes the marker will route advance and will set up the reorder ringing condition on the ringing selection switch.

20.6511 Operation of the TBT, TBTB and TBTA Relays

The operation of the TBT, TBTB and TBTA relays is similar to the description in paragraph 20.61111.

20.6512 Operation of the RAV-1/2, RA-1/5 and GS-1/5 Relays

The operation of the RAV-1/2, RA-1/5 and GS-1/5 relays is similar to the description in paragraph 20.61112.

20.6513 Release of the TLC-1/3, LLC-1/2, ONW, CKG-4, OSG-0/4, OSGA-0/4, OGC, OSC and SON Relays

The release of the TLC-1/3, LLC-1/2, ONW, CKG-4, OSG-0/4, OSA-0/4, OGC, OSG and SON relays is similar to the description in paragraph 20.63113.

However, if this call was going to terminate on a switchboard the NSO relay instead of the OSG-0/4, OSA-0/4, SON, OGC, and OSC relays would be released.

20.6514 Release of the FC-, FCA-, FCK, FCKA, TBTA and TBTB Relays

The operation of the GS-1/5 relay will release the FC- and FCA- relays which will release the FCK and FCKA relays. The release of the FCK and FCKA relays will release the TBTA and TBTB relays.

20.652 Initiating the Reorder Ringing Condition Functions

If all trunks are busy the marker will route advance and since there are no alternate routes to select will operate the tandem outgoing auxiliary TOA relay. The operation of the TOA relay will initiate the release of the tandem call functions and the setting up of the terminating call functions to provide the reorder ringing signal.

20.6521 Release of the SNK, RAV-1/2 and RA-1/5 Relays

The release of the TFK-1, FCK, FCKA, FTCK, FML, FMP and SON relays will release the selections normal check SNK relay as a check of the release of these relays and as a check that the tandem call functions have been released.

The release of the SNK relay will release the RAV-1/2 relays which in turn will release the operated RA-1/5 relay.

20.6522 Operation of the TOA and ROA Relays

The release of the RA-1/5 relay will operate the TOA relay instead of an R- relay. Ground will be extended to the "RA" cross-connection terminal of Figure 51 upon the release of the RA- relay with the GS- and CKG-3 relays operated. The "RA" cross-connection terminal will be cross-connected to the "LTA" cross-connection terminal of Figure 82 and with the RAV-2 relay released and the TOG-1 relay operated the ground will be extended to the winding of the TOA relay, thereby operating that relay.

The operation of the TOA relay with the RAV-1 relay released will operate the reorder auxiliary ROA relay.

20.6523 Release of the TOG-1/3 Relays and Operation of the TER-1/4 and OV Relays

The release of the OSG-0/4 relay and the operation of the TOA relay will release the TOG-1/3 relays. However, if the NSO relay had been operated instead of the OSG-0/4 relay, the release of the NSO relay and operation of the TOA relay will release the TOG-1/3 relays.

The operation of the ROA relay will operate the TER-1/3 relays. The windings of the TER-1/3 relays are in series with each other and the operating path will be extended with the ROA relay operated and the RTST, LR, and TR2E relays non-operated to the "TRK" lead in the incoming register marker connector. Ground on the "TRK" lead from the incoming register to the marker will operate the TER-1/3 relays. The operation of the TER-2 relay will operate the TER-4 relay.

The operation of the TER-1 relay with the ROA relay operated and the LB relay non-operated, will operate the OV relay.

20.6524 Operation of the TLC-1/3, LLC-1/2, ONW and CKG-4 Relays

The release of the RAV-1/2 relays will operate the TLC-1/3 and CKG-4 relays.

The operation of the CKG-4 relay will operate the LLC-1/2 and ONW relays.

20.6525 Seizure of the Trunk Link Frame and Connection to the Incoming Tandem Trunk Circuit

The seizure of the trunk link frame and connection to the incoming tandem trunk circuit is similar to the description in paragraph 12.61.

20.6526 Setting Up the Reorder Ringing Signal

The setting up of the reorder ringing signal is similar to setting up the selected ringing code for an intra-office call.

20.65261 Operation of the Marker OFH, RS-0/9 and RSK Relays and the Ringing Selection Switch Select Magnets -0/9

The operation of the OV relay, with the SRK, RSK and RCK-2 relays non-operated, will operate the overflow hold magnet OFH relay.

The operation of the OFH relay, with the OV relay operated, will operate the RS-0 and RS-9 relays.

The operation of the RS-0 and RS-9 relays with the FLG and ONX relays operated will extend battery potential over the associated "RS-0" and "RS-9" leads to the trunk link frame where the operated MCA and LV- relays will extend the "RS-0" and "RS-9" leads to the ringing selection switch thereby operating the associated ringing selection switch select magnets -0 and -9.

The operation of one of the ringing selection switch select magnets will place ground on the "RSK" lead which will be extended through the trunk link frame with the LV- and MCA relays operated to the marker circuit thereby operating the ringing selection check RSK relay in the marker.

20.65262 Operation of the Marker SRK and LI Relays and the Incoming Tandem Trunk RC Relay

The operation of the RSK relay will operate the start ringing check SRK relay. The operation of the SRK relay with the CKG-7 and OFH relays operated will operate the LI relay.

The operation of the marker LI relay will extend resistance ground potential to the "RC" lead which will be extended through the trunk link frame with the MCB and LV- relays operated to the incoming trunk circuit to operate the ringing control RC relay in the incoming trunk circuit. Resistance ground potential is placed on the "RC" lead in the marker by extending the "RC" lead from the trunk link frame through the contacts of the non-operated OC, TOG-3, RV-3 and SOG-3 relays to the primary winding of the RCK-1 relay, through the contacts of the operated CKG-6 and LI relays, through the RCK-1 resistance, through the contacts of the operated FLG-1 relay and through the contacts of the non-operated MXT, XRS-1 and XRS-2 relays to ground potential.

20.65263 Operation of the Ringing Selection Switch Hold Magnet and the Marker RCK-1 and RCK-2 Relays

The operation of the RC relay in the incoming trunk circuit will operate the associated ringing selection switch hold magnet.

The RCK-1 relay in the marker will be operated to check that the ringing selection switch crosspoints have been operated. With the operation of the CKG-6 relay, battery potential has been extended to one side of the primary winding of the RCK-1 relay. The other side of the primary winding of the RCK-1 relay is extended to the "RC" lead and to the winding of the RC relay in the incoming trunk circuit. The other side of the winding of the RC relay in the incoming trunk is connected to battery potential, therefore the primary winding of the RCK-1 relay is not energized in the operate polarity. It is to be noted that the ground potential which was extended through the primary winding of the RCK-1 relay energizes the primary winding in the non-operate polarity. When the ringing selection switch crosspoints are operated a holding ground is supplied to the RC relay in the incoming trunk. This holding ground on the winding of the RC relay is extended over the "RC" lead to the marker and to the primary winding of the RCK-1 relay and energizes the primary winding in the operate polarity. Therefore the RCK-1 relay operates as a check that the ringing selection switch crosspoints have operated. The operation of the RCK-1 relay, with the SRK and LI relay operated, will operate the RCK-2 relay.

20.65264 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 20.134. However, those release functions which were initiated by the operation of the BY relay will in this case be initiated by the operation of the OV relay. Also, since those functions associated with line link frame seizure, connecting path selection and line link frame and trunk link frame select magnet operation were not completed certain relays associated with these functions were not operated and therefore are not released.

20.66 All Outgoing Trunks Busy for Non-Local Terminating Intertoll or Tandem Call With Two Outgoing Trunk Subgroups and No Alternate Routes

When the marker in assisting a non-local terminating intertoll or tandem call associated with two subgroups of trunks determines that all trunks within one of the trunk subgroups are busy the marker will advance the two-step allotter. After the two-step allotter has advanced the marker will test the other subgroup of outgoing trunks.

If all trunks within both trunk subgroups are busy the marker will route advance and will set up the reorder ringing condition on the ringing selection switch so that the incoming tandem or intertoll trunk can provide the reorder signal to the calling end. After setting up the reorder ringing condition on the ringing selection switch the marker will release from the connection.

20.661 Allotter Advance to Second Subgroup of Outgoing Trunks

The marker will proceed with the tandem call functions, as described in paragraphs 14.1, 14.2, 14.3, 14.411, 14.412, 14.413 and 14.6, or the intertoll call functions, as described in paragraphs 15.1, 15.2, 15.3, 15.4 and 15.6 until the marker determines, as described in paragraph 20.6611, that an all trunks busy condition exists within the selected subgroup of trunks.

20.6611 Release of the Selected Subgroup of Outgoing Trunks

The release of the selected subgroup of outgoing trunks is similar to the description in paragraph 20.6211. However, if the two-step allotter is also required for sender subgroup selection, the release of the operated GPA or GPB relay will release the OSG-0/4 and OSA-0/4 relays which in turn will release the operated OGC, OSC and SON relays.

20.6612 Initiating the Tandem or Intertoll Call Connection Associated with Other Subgroup of Trunks

After the marker has released the selected subgroup of outgoing trunks the marker will initiate a tandem or intertoll call connection associated with the other subgroup of outgoing trunks.

20.66121 Release of the TBTA, TBTB and SNK Relays

The release of the TBTA, TBTB and SNK relays is similar to the description in paragraph 20.62121.

20.66122 Operation of the GP-3, GZ, GW and GPA or GPB Relays and the Release of the GP-1/3 Relays

The operation of the GP-3, GZ, GW and GPA or GPB relays and the release of the GP-1/3 relays is similar to the description in paragraph 20.62122.

20.66123 Completing the Tandem or Inter-Toll Call Connection

After the GPA or GPB relay is operated the marker will test in the second subgroup of outgoing trunks and will proceed with the completion of the tandem call connection, as described in paragraphs 14.4, 14.5, 14.6, 14.7, 14.8 and 14.9, or the intertoll call connection, as described in paragraphs 15.4, 15.5, 15.6, 15.7, 15.8 and 15.9, if an idle outgoing trunk of the required route is available in the second trunk subgroup.

20.662 Route Advance to Provide Reorder Signal from the Incoming Trunk

When the marker determines that all trunks are busy within the first trunk subgroup and all trunks are busy within the second trunk subgroup, the marker will route advance so as to be able to return a reorder signal to the calling end. The marker will then proceed in a manner similar to the description in paragraphs 20.651 and 20.652.

20.67 All Outgoing Trunks Busy for Non-Local Terminating Intertoll or Tandem Call with Two Outgoing Trunk Subgroups and One Alternate Route with One Outgoing Trunk Subgroup

When the marker in assisting a non-local terminating intertoll or tandem call associated with two subgroups of trunks determines that all trunks within one of the trunk subgroups are busy the marker will advance the two-step allotter. After the two-step allotter has advanced the marker will test the other subgroup of outgoing trunks.

If all trunks within both trunk subgroups are busy the marker will route advance and will complete a tandem or intertoll call connection through the alternate outgoing trunk route, if an alternate outgoing trunk route is idle.

If all alternate outgoing trunks are busy the marker will route advance and will set up the reorder ringing condition on the ringing selection switch so that the incoming tandem or intertoll trunk can provide the reorder signal to the calling end.

20.671 Allotter Advance to Second Subgroup of Outgoing Trunks

The allotter advance to second subgroup of outgoing trunks is similar to the description in paragraph 20.661.

20.672 Route Advance to Alternate Route

When the marker is associated with the second subgroup of trunks of the original route and determines that all trunks within the second trunk subgroup are busy the marker will route advance to the alternate outgoing route.

20.6721 Release of the Marker Tandem or Intertoll Call Functions Associated with the Original Route

The marker will first release those tandem or intertoll call functions which are not required in a manner similar to the description in paragraph 20.651.

20.6722 Initiating the Alternate Route Call Functions

After the marker has released the tandem or intertoll call functions associated with the original outgoing route the marker will initiate the tandem or intertoll call functions associated with the alternate outgoing route in a manner similar to the description in paragraph 20.2523. However, when the marker performs the alternate outgoing trunk selection the marker will determine that all alternate outgoing trunks are busy.

20.673 Route Advance to Provide Reorder in the Incoming Trunk

When the marker is associated with alternate group of trunks and determines that all trunks within the alternate group of trunks are busy the marker will route advance and will proceed in a manner similar to the description in paragraphs 20.651 and 20.652.

20.7 All Senders Busy

When the marker encounters a condition in which all senders within the sender group are busy the marker will advance the two-step allotter if the marker may advance to another sender group. Since one subgroup of trunks can be associated with only one group of senders the two-step allotter will be associated with two subgroups of trunks which are associated with two groups of senders. After the two-step allotter has advanced the marker will test the second group of senders. If the marker again encounters all of the second group of senders busy or if there is only one group of trunks the marker will route advance and for an intra-office call or for an outgoing call will establish a connection between the calling subscriber's line and a tone trunk to provide an overflow tone signal or for a non-local completing intertoll call or tandem call will signal the incoming trunk to provide the overflow tone signal.

It should be noted that for an intra-office call there shall be no two-step allotter advance to a second group of senders.

20.71 All Senders Busy for Intra-Office Call Associated with One Sender Group

When the marker in assisting an intra-office call which requires a sender determines that all senders are busy the marker will route advance by releasing the intra-office call functions and then will initiate a connection from the calling subscriber to a tone trunk which will provide overflow tone to the calling subscriber.

If all tone trunks are busy the marker will again route advance by releasing the tone trunk connection functions and then will initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy for a coin calling subscriber or if all common overflow trunks are busy for a non-coin calling subscriber the marker will initiate a route advance. However, in this case there is no new route to which the marker can route advance to establish a connection. Therefore the marker will place ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone.

20.711 Route Advance To A Tone Trunk Connection from Intra-Office Call Connection

The marker will proceed with the intra-office call functions, as described in paragraphs 19.4201, 19.4202, 19.4203, 19.4204, 19.4205, 19.4206, 19.4207, 19.4208, 19.4209, 19.4210 and 19.4211, until the marker determines, as described in paragraph 20.7111, that an all senders busy condition exists. The marker will then route advance and will establish a connection from the calling subscriber to a tone trunk.

20.7111 Release of the Marker Intra-Office Call Connection Functions

When a marker which is initiating an intra-office call connection determines that an all senders busy condition exists the marker will operate the all senders busy ASB relay.

20.71111 Operation of the ASB Relay

When the marker is testing to determine if idle senders within the sender group are available the marker will operate the SIA relay, as described in paragraph 19.42111, if one or more idle senders are associated with sender subgroup "A", or will operate the SIB relay, as described in paragraph 19.42111, if one or more idle senders are associated with sender subgroup "B".

If one or more idle senders within the sender group are idle the SIA or SIB relay should be operated when the GOS relay operates. If both the SIA and SIB relays are unoperated when the GOS relay operates then all senders within the sender group are busy and the ASB relay is operated.

20.71112 Operation of the RAV-1/2, RA-1/5 and GS-1/5 Relays

The operation of these relays is similar to the description in paragraph 20.61112. However, the operation of the ASB relay will operate the RAV-1/2 relays.

20.71113 Release of the TLC-1/3, LLC-1/2, ONW, CKG-4, OSG-0/4, OSA-0/4, OGC, OSC, SON, ITR-1/3, SCB, SCB-1/2, CB, CB-1/5, CB-7, CBF, CBD and CBD-1 Relays

The operation of the RAV-1 relay will release the TLC-1/3 relays. The operation of the RAV-2 relay will release the CKG-4 relay which in turn will release the LLC-1/2 and ONW relays.

The operation of the GS-1/5 relay will release the NSI, OSG-0/4 and OSA-0/4 relays which will release the ITR-1/3, OGC, OSC and SON relays. The release of the ITR-2 and CKG-4 relays will release the SCB and SCB-1/2 relays which will release the CB relay. The release of the CB relay will release the CB-1/5, CB-7, CBF, CBD and CBD-1 relays.

20.71114 Release of the Intra-Office Trunk Selection Functions

The operation of the GS-1/5 relay will release the FC- and FCA- relays which will initiate the release of the intra-office trunk selection functions in a manner similar to the description in paragraph 8.134.

20.71115 Release of the Hold Magnets Associated with the Connecting Path to the Called Line

The release of the ITR-2 relay will remove the ground potential on the "BST" lead which has been extended to the sleeve conductor of the called line connecting path to hold operated the associated hold magnets.

20.7112 Initiating the Tone Trunk Connection Functions

After the marker has released the intra-office call functions the marker will initiate the tone trunk connection functions which are similar to the description in paragraph 20.1113.

20.712 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

20.713 Route Advance to Provide Overflow Tone from the Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

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20.72 All Senders Busy for Subscriber Outgoing Call Associated with One Sender Group

When the marker in assisting a subscriber outgoing call associated with one sender group determines that all senders are busy the marker will route advance by releasing the subscriber outgoing call functions and then will initiate a connection from the calling subscriber to a tone trunk which will provide overflow tone to the calling subscriber. If all tone trunks are busy the marker will again route advance by releasing the tone trunk connection functions and then will initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy for a coin calling subscriber or if all common overflow trunks are busy for a non-coin calling subscriber the marker will initiate a route advance. However, in this case there is no new route to which the marker can route advance to establish a connection. Therefore, the marker will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone.

20.721 Route Advance To A Tone Trunk Connection from Subscriber Outgoing Call Connection

The marker will proceed with the subscriber outgoing call functions, as described in paragraphs 11.1, 11.2, 11.3, 11.411, 11.412 and 11.413, until the marker determines, as described in paragraph 20.7211, that an all senders busy condition exists.

20.7211 Release of the Marker Subscriber Outgoing Call Connection Functions

When a marker which is initiating a subscriber outgoing call connection determines that an all senders busy condition exists the marker will operate the all senders busy ASB relay.

20.72111 Operation of the ASB Relay

When the marker is testing to determine if idle senders within the sender group are available the marker will operate the SIA relay, as described in paragraph 11.413, if one or more idle senders are associated, with sender subgroup "A" or will operate the SIB relay, as described in paragraph 11.413, if one or more idle senders are associated with sender subgroup "B".

If one or more idle senders within the sender group are idle the SIA or SIB relay should be operated when the GOS relay operates. If both the SIA and SIB relays are unoperated when the GOS relay operates then all senders within the sender group are busy and the ASB relay is operated.

20.72112 Operation of the RAV-1/2, RA-1/5 and GS-1/5 Relays

The operation of these relays is similar to the description in paragraph 20.61112. However the operation of the ASB relay will operate the RAV-1/2 relays.

20.72113 Release of the TLC-1/3, LLC-1/2, ONW, CKG-4, OSG-0/4, OSA-0/4, OGC, OSC, SON, SOG-1/3, CB, CB-1/5, CB-7, CBF, CBD and CBD-1 Relays

These relays will be released as described in paragraph 20.63113.

20.72114 Release of the FC-, FCA-, FCK, FCKA, FTC-, FTCK and FS- Relays

The operation of the GS-1/5 relay will release the FC- and FCA- relays which will release the FCK and FCKA relays which in turn will release the FS- relays. The release of the FC- and FCA- relays will release the FTC- relays which will release the FTCK relay.

20.7212 Initiating the Tone Trunk Connection Functions

After the marker has released the subscriber outgoing call functions the marker will initiate the tone trunk connection functions which are similar to the description in paragraph 20.1113.

However, for a typical office the cross-connections for operating the route R- relay are as follows:

The operated CKG-3 relay contacts will extend ground over the "RA" lead, through the released RA-1/5 relays and the operated GS-1/5 relay, and through the operated subscriber outgoing trunk route R- relay which will extend ground to the route advance "RA" cross-connection terminal. The "RA" cross-connection terminal of Figure 51 will be cross-connected to an "RC" cross-connection terminal of Figure 51 associated with the tone trunk route thereby extending ground to operate the route R- relay associated with a tone trunk connection.

20.722 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

20.723 Route Advance to Provide Overflow Tone from the Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

20.73 All Senders Busy for Subscriber Outgoing Call Associated with Two Sender Groups

When the marker in assisting a subscriber outgoing call associated with two sender groups determines that all senders within the first sender group are busy the marker will advance the two-step allotter. After the two-step allotter has advanced the marker will test the other sender group.

If all senders within both sender groups are busy the marker will route advance by releasing the subscriber outgoing call functions and then will initiate a connection from the calling subscriber to a tone trunk which will provide overflow tone to the calling subscriber.

If all tone trunks are busy the marker will again route advance by releasing the tone trunk connection functions and then will initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy for a coin calling subscriber or if all common overflow trunks are busy for a non-coin calling subscriber the marker will initiate a route advance. However, in this case there is no new route to which the marker can route advance to establish a connection. Therefore, the marker will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone.

20.731 Allotter Advance to Second Group of Senders

The marker will proceed with the subscriber outgoing call functions, as described in paragraphs 11.1, 11.2, 11.3, 11.411, 11.412 and 11.413, until the marker determines, as described in paragraph 20.7311, that an all senders busy condition exists with the first group of senders.

20.7311 Release of the Selected Group of Senders

When a marker which is initiating a subscriber outgoing call connection determines that an all senders busy condition exists the marker will operate the all senders busy ASB relay.

20.73111 Operation of the ASB Relay

The operation of the ASB relay is similar to the description in paragraph 20.72111.

20.73112 Operation of the GP-2 Relay and Release of the GPA or GPB Relay and the FC-, FCA-, FCK, FCKA, FTC-, FTCK and FS- Relays

When the marker is performing the outgoing call functions the marker will operate either the GPA relay to select group "A" senders or will operate the GPB relay to select group "B" senders, as described in paragraph 11.411. The operation of the ASB relay, with the GP-1 relay operated, will operate the GP-2 relay which in turn will release the operated GPA or GPB relay. The release of the GPA or GPB relay will release the FC- and FCA- relays which will release the FCK and FCKA relays which in turn will release the FS- relays. The release of the FC- and FCA- relays will release the FTC- relays which will release the FTCK relay.

20.73113 Release of the OSG-0/4, OSA-0/4, OGC, OSC, SON, SOG-1/3, CB, CB-1/5, CB-7, CBF, CBD and CBD-1 Relays

The release of the operated GPA or GPB relay will release the OSG-0/4 and OSA-0/4 relays which in turn will release the operated SOG-1/3, OGC, OSC, and SON relays. The release of the SOG-1/3 relays will release the CB, CB-1/5, CB-7, CBF, CBD and CBD-1 relays.

20.7312 Initiating the Subscriber Outgoing Call Connection Associated with Other Group of Senders

After the marker has released the selected group of senders the marker will initiate an outgoing call connection associated with the other group of senders.

20.73121 Release of the SNK Relay

The release of the FCK, FCKA, FTCK and SON relays will release the selections normal check SNK relay.

20.73122 Operation of the GP-3, GZ, GW and GPA or GPB Relays and Release of the GP-1/3 Relays

The operation of the GP-3, GZ, GW and GPA or GPB relays and the release of the GP-1/3 relays is similar to the description in paragraph 20.62122.

20.73123 Completing the Subscriber Outgoing Call Connections

After the GPA or GPB relay is operated the marker will test in the second group of senders and will proceed with the completion of the subscriber outgoing call connection as described in paragraphs 11.4, 11.5, 11.6, 11.7 and 11.8 if an idle sender is available in the second sender group.

20.732 Route Advance To A Tone Trunk Connection from Outgoing Call Connection

The marker will proceed with the outgoing call function until the marker determines that all senders within the first sender group are busy. The marker will then proceed as described in paragraph 20.731. However, when the marker is associated with the second sender group the marker will again determine that a l senders within the second sender group are busy. The marker will then proceed in a manner similar to the description in paragraphs 20.7211 and 20.7212.

20.733 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection is similar to the description in paragraph 20.112.

20.734 Route Advance to Provide Overflow Tone from Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

20.74 All Senders Busy for Non-Local Terminating Intertoll or Tandem Call with One Sender Group and No Alternate Routes

When the marker in assisting a nonlocal terminating intertoll or tandem call associated with one group of senders and with no alternate routes determines that all senders are busy the marker will route advance and will set up the overflow tone ringing condition on the ringing selection switch so that the incoming tandem or intertoll trunk can provide the overflow tone to the calling subscriber.

The marker will proceed with the tandem call functions, as described in paragraphs 14.1, 14.2, 14.3, and 14.4, or the intertoll call functions, as described in paragraphs 15.1, 15.2, 15.3 and 15.4, until the marker determines, as described in paragraph 20.741, that an all senders busy condition exists.

20.741 Release of the Marker Tandem or Intertoll Call Functions

When the marker determines that an all senders busy condition exists the ASB relay will be operated.

20.7411 Operation of the ASB Relay

The operation of the ASB relay is similar to the description in paragraph 20.72111.

20.7412 Operation of the RAV-1/2, RA-1/5 and GS-1/5 Relays

The operation of these relays is similar to the description in paragraph 20.61112. However the operation of the ASB relay will operate the RAV-1/2 relays.

20.7413 Release of the TLC-1/3, LLC 1/2, ONW, CKG-4, OSG-0/4, OSA-0/4, OGC OSC and SON Relays

The release of the TLC-1/3, LLC-1/2, ONW, CKG-4 OSG-0/4, OSA-0/4, OGC, OSC and SON relays is similar to the description in paragraph 20.63113.

20.7414 Release of the FC-, FCA-, FCK, FCKA, FTC-, FTCK and FS- Relays

The operation of the GS-1/5 relay will release the FC- and FCA- relays which will release the FCK and FCKA relays which in turn will release the FS- relays. The release of the FC- and FCA- relays will release the FTC- relays which will release the FTCK relay.

20.742 Initiating the Overflow Tone Functions

The initiating overflow tone function is similar to the description in paragraph 20.2513.

20.75 All Senders Busy for Non-Local Terminating Intertoll or Tandem Call with Two Sender Groups and No Alternate Route

When the marker in assisting a nonlocal terminating intertoll or tandem call associated with two sender groups determines that all senders within one of sender groups are busy the marker will advance the two-step allotter. After the two-step allotter has advanced the marker will test the other sender group.

If all senders within both sender groups are busy the marker will route advance and will set up the overflow tone ringing condition on the ringing selection switch so that the incoming tandem or intertoll trunk can provide the overflow tone to the calling subscriber.

20.751 Allotter Advance to Second Sender Group

The marker will proceed with the tandem call functions, as described in paragraphs 14.1, 14.2, 14.3, and 14.4 or the intertoll call functions, as described in paragraphs 15.1, 15.2, 15.3 and 15.4, until the marker determines as described in paragraph 20.7511, that an all senders busy condition exists within the selected group of senders.

20.7511 Release of the Selected Sender Group

When a marker determines that an all senders busy condition exists the marker will operate the all senders busy ASB relay.

20.75111 Operation of the ASB Relay

The operation of the ASB relay is similar to the description in paragraph 20.72111.

20.75112 Operation of the GP-2 Relay and Release of the GPA or GPB Relay and the FC-, FCA-, FCK, FCKA, FTC-, FTCK and FS- Relays

The operation and release of these relays is similar to the description in paragraph 20.73112.

20.75113 Release of the OSG-0/4, OSA-0/4, OGC, OSC and SON Relays

The release of the operated GPA or GPB relay will release the OSG-0/4 and OSA-0/4 relays which in turn will release the operated OGC, OSC and SON relays.

20.7512 Initiating the Tandem or Intertoll Call Connection Associated with the Other Sender Group

After the marker has released the selected group of senders the marker will initiate a tandem or intertoll call connection associated with the other sender group

20.75121 Release of the SNK Relay

The release of the FCK, FCKA, FTCK and SON relays will release the selections normal check SNK relay.

20.75122 Operation of the GP-3, GZ, GW and GPA or GPB Relays and Release of the GP-1/3 Relays

The operation of the GP-3, GZ, GW and GPA or GPB relays and the release of the GP-1/3 relays is similar to the description in paragraph 20.62122.

20.75123 Completing the Tandem or Intertoll Call Connections

After the GPA or GPB relay is operated the marker will test in the second group of senders and will proceed with the completion of the tandem call connection, as described in paragraphs 14.4, 14.5, 14.6, 14.7, 14.8 and 14.9, or the intertoll call connection, as described in paragraphs 15.4, 15.5, 15.6, 15.7, 15.8 and 15.9, if an idle sender is available in the second sender group.

20.752 Route Advance to Provide Overflow Tone from Incoming Trunk

The marker will proceed with the tandem or intertoll call functions until the marker determines that all senders within the first sender group are busy. The marker will then proceed as described in paragraph 20.751. However, when the marker is associated with the second sender group the marker will again determine that all senders within the second sender group are busy. The marker will then proceed in a manner similar to the description in paragraphs 20.741 and 20.742.

20.8 Failure to Match

When a marker encounters a condition in which all connecting paths within the selected group of ten or less channels are busy the marker will initiate a channel retest, as described in paragraph 7.45, in all cases except for a ten non-paired trunk link frame office or a twenty trunk link frame office.

In a ten non-paired trunk link frame office or a twenty trunk link frame office there is only one subgroup of junctors and therefore only one group of channels available for a connection between the selected line link frame and the trunk link frame and therefore a channel retest will not be initiated in these offices.

If the office size is associated with more than one subgroup of junctors within each junctor group and if the marker tests and determines that the selected group of connecting paths or channels are all busy or non-existent the marker will recycle those relays, both in the marker and trunk link and connector circuit, that have selected the subgroup of junctors and the group of trunk links associated with the selected group of channels. After recycle of these relays the marker will reselect another subgroup of junctors and another group of trunk links in the same manner as for the first junctor and trunk link selection. The marker will then proceed to test and select an idle connecting path in the same manner as for the first test and selection of an idle connecting path.

If the marker determines that the second selected group of channels are non-available, the marker will not reselect a third group of ten channels but instead will indicate a "failure-to-match". For those office sizes associated with only one group of channels a "failure-to-match" indication will be given when the marker determines that all channels within the first selected group of ten channels are non-available.

When a marker encounters a failure-to-match condition the marker action will vary depending upon the basic type of call or connection which the marker is assisting and upon the number of failures to match which the marker has previously encountered as follows:

A. Dial Tone Connection

a. For a first failure to match during this marker seizure the marker will recycle, will release the first selected originating register, will select another originating register and will then attempt to complete the dial tone connection.

b. For a second failure to match during this marker seizure the marker will initiate a route advance in order to disconnect from the dial tone connection. This subscriber's dial tone connection must then start anew from the line link frame to seize a marker. The line link frame is gated and the subscriber's dial tone connection will put in a new bid when all other line link frames and register marker connectors have been served.

B. Intra-Office Call Connection -

a. For a first failure to match during this marker seizure when associated with intra-office trunks which are not in an allotted subgroup the marker will recycle, will release the first selected intra-office trunk, will select another intra-office trunk in the same trunk subgroup and will then attempt to complete the intra-office call connection.

b. For a first failure to match during this marker seizure when associated with intra-office trunks which are in the first preferred allotted subgroup the marker will recycle, will release the first selected intra-office trunk, will advance the two-step allotter, will select another intra-office trunk in the second preferred allotted trunk subgroup and will then attempt to complete the intra-office call connection.

c. For a first failure to match during this marker seizure when associated with intra-office trunks which are in the second preferred allotted trunk subgroup the marker will route advance and will connect a tone trunk to the calling line. When the calling line has been connected to the tone trunk, the tone trunk will provide an overflow to the calling subscriber.

d. For a second failure to match during this marker seizure the marker will route advance and will connect a tone trunk to the calling line.

C. Subscriber Outgoing Call Connection

a. For a first failure to match during this marker seizure when associated with outgoing trunks of either the original or alternate route, which are not in an allotted trunk subgroup the marker will recycle, will release the first selected outgoing trunk, will select another outgoing trunk in the same trunk subgroup, and will then attempt to complete the outgoing call connection.

b. For a first failure to match during this marker seizure when associated with outgoing trunks of either the original or alternate route, which are in the first preferred allotted trunk subgroup the marker will recycle, will release the first selected outgoing trunk, will advance the two-step allotter, will select another outgoing trunk in the second preferred allotted trunk subgroup and will then attempt to complete the subscriber outgoing call connection.

c. For a first failure to match during this marker seizure when associated with the original route outgoing trunks which are in the second preferred allotted trunk subgroup the marker will route advance to the alternate outgoing

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route if an alternate route exists and will complete the subscriber outgoing call connection. If an alternate outgoing route does not exist the marker will route advance and will connect a tone trunk to the calling line.

d. For a first failure to match during this marker seizure when associated with an alternate outgoing trunk which is in the second preferred allotted trunk subgroup the marker will route advance and will connect a tone trunk to the calling line.

e. For a second failure to match during this marker seizure when associated with the original route outgoing trunks the marker will route advance to the alternate outgoing route if an alternate route exists and will complete the subscriber outgoing call connection. If an alternate outgoing route does not exist the marker will route advance and will connect a tone trunk to the calling line.

f. For a second failure to match during this marker seizure when associated with the alternate route outgoing trunks the marker will route advance and will connect a tone trunk to the calling line.

g. For a third failure to match during this marker seizure the marker will give a "BT" signal to the originating register which will then provide an overflow tone to the calling subscriber.

D. Terminating Call Connection

a. For a first failure to match during this marker seizure the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber.

E. Tandem or Intertoll Call Connection (Non-Terminating)

a. For a first failure to match during this marker seizure when associated with the first preferred trunk number group circuit, with outgoing trunks of either the original or alternate route and with outgoing trunks of allotted or non-allotted trunk subgroups the marker will recycle, will release the first preferred trunk number group information, will initiate the seizure of the second preferred trunk number group circuit, will release the first selected outgoing trunk, will advance the two-step allotter if the trunk group is allotted, will select another outgoing trunk in the same trunk subgroup if the trunk group is non-allotted or will select another outgoing trunk in the other trunk subgroup if the trunk group is allotted and will then attempt to complete the through tandem or intertoll call connection.

b. For a first failure to match during this marker seizure when associated with the second preferred trunk number group circuit, with outgoing trunks of either the original or alternate route and with outgoing trunks of allotted or non-allotted trunk subgroups the marker will route advance to an alternate route if an alternate outgoing route exists. If an alternate outgoing route does not exist the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber or toll operator.

c. For a second or third failure to match during this marker seizure the marker will be associated with the second preferred trunk number group circuit and with outgoing trunks of either the original or alternate route and with outgoing trunks of allotted or non-allotted trunk subgroups the marker will route advance to an alternate route if an alternate outgoing route exists. If an alternate outgoing route does not exist the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber or toll operator.

F. Tone Trunk or Common Overflow Trunk Connection

a. For a first failure to match during this marker seizure when associated with tone trunks or common overflow trunks which are not in an allotted trunk subgroup the markers will recycle, will release the first selected tone trunk or common overflow trunk, will select another tone trunk or common overflow tone trunk, and will then complete the tone trunk or common overflow tone trunk connection.

b. For a second failure to match during this marker seizure when associated with a tone trunk connection the marker will route advance and will connect a common overflow tone trunk to the calling line if the class of service of the calling subscriber is a non-coin class. If the class of service of the calling subscriber is a coin class the marker will route advance and will give a "BT" signal to the originating register which will provide an overflow tone to the calling subscriber.

c. For a second failure to match during this marker seizure when associated with a common overflow tone trunk connection the marker will route advance and will give a "BT" signal to the originating register which will provide an overflow tone to the calling subscriber.

d. For a third failure to match during this marker seizure the marker will give a "BT" signal to the originating register which will then provide an overflow tone to the calling subscriber.

20.81 Failure to Match Indication

When the marker determines that a failure to match condition exists the marker will operate the failure to match FMP and FM relays and the marker will also operate the 1F, 1FA, 2F, 2FA, RF and RFA relays to indicate the number of failures to match which have occurred.

20.811 Operation and Release of the FMP and FM Relays

When a marker encounters a condition in which all connecting paths within the first selected group of ten or less channels are busy the marker will, as described in paragraph 7.444, extend ground potential to the "E" cross-connection and the all busy "AB" lead. Grounding the "AB" lead will initiate channel retest, as described in paragraph 7.45 for all offices except a ten non-paired trunk link frame office or a twenty trunk link frame office.

If the first selected group of channels are busy for a ten non-paired trunk link frame office or a twenty trunk link frame office or if the second selected group of channels are busy for other office sizes the ground potential on the "AB" lead will be extended to operate the failure to match FMP relay.

The operating path of the FMP relay is extended from the winding of the FMP relay through either the 10TLF relay operated or through the STP, STP-2 and STP-3 relays operated, through the TR2B relay non-operated to the "E" cross-connection terminal which is usually cross-connected to the "OT-9" cross-connection terminal, through the operated TTL-5/9, TJ-5/9 or TLL-5/9 relays to the "IN 5" cross-connection terminal which is usually cross-connected to the "M1" cross-connection terminal, through the operated TR2B relay to the "M" cross-connection terminal which is usually cross-connected to the "OT-4" cross-connection terminal, through the operated TTL-0/4, TJ-0/4 or TLL-0/4 relays to the "INO" cross-connection terminal which is usually cross-connected to the "S" cross-connection terminal, through the non-operated TR2B relay, through either the operated CBD-1 and LOT relays or through the non-operated CBD-1 and LOT relays, through the non-operated NTT relay, through the operated CHT relay, through the non-operated CH-0/9 relays, through the non-operated FMP relay, through the non-operated SPL-1 relay, and through the operated LLC-1, STP-3 and GC relays to ground potential to operate the FMP relay.

The operation of the FMP relay, with the HMS-1 relay non-operated and the ONW relay operated, will operate the failure to match FM relay.

When the marker initiates a recycle or route advance the ONW and LLC-1 relays will be released and thereby releasing the FMP and FM relays.

20.812 Failure to Match Counter

The failure to match counter will count and record the number of failures to match during a marker usage and also the number of failures to match when associated with a certain route.

20.8121 First Failure to Match and the Operation of the 1F and 1FA Relays

On the first failure to match on this marker usage the first failure to match 1F relay will be operated when the FM relay operates. The 1F relay will lock operated with the CKG-2 relay operated and will be held operated until the marker releases from the connection. After the marker has completed the recycle or route advance the release of the FM relay with the 1F and CKG-2 relays operated and the 2F relay non-operated, will operate the first failure to match auxiliary 1FA relay. The 1FA relay will lock operated with the CKG-2 relay operated and will be held operated until the marker releases from this connection.

20.8122 Second Failure to Match and the Operation of the 2F and 2FA Relays

On the second failure to match on this marker usage the second failure to match 2F relay will be operated when the FM relay operates and the 1FA relay is operated. The 2F relay will lock operated with the CKG-2 relay operated and will be held operated until the marker releases from this connection. After the marker has completed the recycle or route advance the release of the FM relay, with the 1F, 2F and CKG-2 relays operated, will operate the 2FA relay. The 2FA relay will lock operated with the CKG-2 relay operated and will be held

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operated until the marker releases from this connection.

20.8123 Operation and Release of the RF and RFA Relays

To indicate the number of failures to match when associated with a certain route the route failure to match RF and RFA relays are provided.

On the first failure to match on this route the route failure to match RF relay will be operated. If the marker recycles the RF relay will be held operated and if the marker route advances the RF relay will be released. The operation of the FM relay, with the CKG-2 relay operated and the 2FA and RFA relays non-operated will operate the RF relay. The RF relay will be held operated with the CKG-2 relay operated and the RAV-1 relay non-operated and therefore the RF relay will be held operated until the marker releases from this connection or until the marker route advances.

After the marker has completed a recycle, but not a route advance, the release of the FM relay, with the RF and CKG-2 relays operated, will operate the route failure to match auxiliary RFA relay. However, if the marker has initiated a route advance the operation of the RAV-1 relay will release the RF relay and the release of the FM relay with the RF relay non-operated will prevent the RFA relay from operating or will release the RFA relay if it is operated.

20.82 Failure to Match Marker Recycle Operations

When the marker determines that a failure to match condition exists and the marker should initiate a recycle the marker recycle RCY and RCY-1 relays will be operated to initiate this recycle.

For a recycle the marker will release the line link frame, the trunk link frame, and the originating register or outgoing intra-office trunk circuit. The marker will then select another originating register or outgoing or intra-office trunk in the same route and will attempt to complete the connection to the same route.

20.821 Operation of the RCY and RCY-1 Relays and Release of the LLC-1/2, ONW, TLC-1/3 and OSG-0/4 Relays

When the marker determines that a recycle is required the RCY and RCY-1 relays will be operated.

The operation of the RCY-1 relay will release the LLC-1/2, ONW and TLC-1/3 relays. If the call is associated with an outgoing sender the operation of the RCY relay will release the OSG-0/4 relays.

20.822 Release of the Originating Register or Intra-Office or Outgoing Trunk Selection Functions

The operation of the RCY relay will release the operated AL-0/3 relay which will in turn release the FC- and FCA- relays if the AL-0/3 relays are required for allotted trunk groups. If the AL-0/3 relays are not required the operation of the RCY relay will release the FC- and FCA- relays. The release of the FC- and FCA- relays will release the FCK and FCKA relays which in turn will release the FS- relays.

All FTC- relays which are operated will be released when the FC- and FCA- relays are released. The release of the FTC- relays will release the FTCK relay.

The release of the TLC-1 relay will release the trunk link and connector MP, MCA, MCB, MCC and MCD relays. The release of the MP relay will release the trunk link frame MC relay.

The release of the trunk link and connector MP relay will release the TFK-1 and TFK-2 relays. The release of the trunk link and connector MCA relay will release the MAK-1 relay and the release of the trunk link and connector MCD relay will release the MDK relay.

The operation of the RCY relay will release the operated TB-0/5 relay and the operated TG-0/19 relay. The release of the TLC-2 relay will release the operated TS-0/19 relay.

The release of the trunk link frame MCA relay will release the trunk circuit F relay which in turn will release the trunk link frame FB- relays which in turn will release the LV-2/9 relays. The release of the trunk link and connector circuit MCB relay will release the operated LC-0/9 relay.

The release of the trunk link frame MCB relay will release the associated TB-0/5 relay in the trunk link and connector circuit.

The release of the trunk link frame MCB and MCD relays will release the TBK and LCK relays.

The release of the TLC-2 relay will release the FMK relay. The release of the TFK-1 relay will release the FML relay.

20.823 Release of the Selection of the Connecting Path Functions

The release of the LLC-1 relay will release the line link and connector MP, MCA, MCB, HG-0/9 and LG-0/11 relays. The release of the line link frame MCA relay will release the VGB-0/11 relay.

The release of the TLC-3 relay will release the STF or PR relay and the operated 2TLF/10TLF relay. The release of the STF or PR relay will release the 20F or 40F relay and the release of the operated 2TLF/10TLF relay will release the 7Q or RQ relay, if operated.

The release of the ONW and LLC-1 relays will release the STP-1 or STP-2 relay which will release the PNR, PA, PB or PC relay. The release of the operated PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the trunk link frame MCC relay will release the operated P-0/9 relay which will in turn release the 2G or 3G relay.

The release of the LLC-2 relay will release the JG-0/4 relay. The release of the trunk link frame MCB relay will release the JCK-0/1 relays.

The release of the trunk link and connector MCC relay will release the trunk link and connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER relays.

The release of the line link frame HG-0/9 relay will release the TLL-0/9 relays. The release of the trunk link frame MCB relay will release the TJ-0/9 relays. The release of the trunk link frame LC-0/9 relay will release the TTL-0/9 relays.

20.824 Release of the SNK, RCY and RCY-1 Relays and Operation of the LLC-1/2, ONW and TLC-1/3 Relays

The release of the TFK-1, FCK, FCKA, FTCK, FML, FMP and SON relays will release the selections normal check SNK relay as a check of the release of these relays and as a check that the functions associated with the first selected line link frame and trunk line frame have been released.

The release of the SNK relay will release the RCY and RCY-1 relays which in turn will reoperate the LLC-1/2, ONW and TLC-1/3 relays.

20.825 Completing the Connection

After the LLC-1/2, ONW and TLC-1/3 relays have been reoperated the marker will select another originating register or trunk circuit in the same route and will then proceed in the usual manner to establish the connection.

20.83 Failure to Match Marker Route Advance to Next Route Operations

When the marker determines that a failure to match condition exists and the marker should initiate a route advance to the next route the marker route advance RAV-1/2 relays will be operated to initiate this route advance.

For a route advance to the next route the marker will release the line link frame, the trunk link frame and the outgoing or intra-office trunk circuit. The marker will then select another trunk in the next route and will attempt to complete the connection to the trunk circuit associated with this route. The next route may be an alternate route, a tone trunk route or a common overflow tone route.

20.831 Operation of the RAV-1/2, RA-1/5 and GS-1/5 Relays and Release of the LLC-1/2, ONW, TLC-1/3 and OSG-0/4 Relays

When the marker determines that a route advance is required the RAV-1/2 relays are operated.

The one route advance RA-1/5 relay associated with the ground supply group associated with this route will be operated when the RAV-1 relay is operated. The winding of this RA-1/5 relay will be extended through the non-operated GA-1/5 relay contacts, through the operated route R-relay contacts, over the "RAL" lead and through the operated RAV-1 relay contacts and over the "G4" lead and through the operated CKG-2 relay contacts to ground, thereby operating the RA-1/5 relay. After operating the RA-1/5 relay will be held operated with the RAV-1 and CKG-2 relays operated.

The operation of one RA-1/5 relay with the CKG-3 relay operated will operate the associated ground supply group GS-1/5 relay. The operated GS-1/5 relay will be held operated with the CKG-3 relay operated,

The operation of the RAV-1 relay will release the TLC-1/3 relays. The operation of the RAV-2 relay will release the CKG-4 relay which in turn will release the

LLC-1/2 and ONW relays. If the call is associated with an outgoing sender the operation of the GS-1/5 relay will release the OSG-0/4 relays.

20.832 Release of the Intra-Office on Outgoing Trunk Selection Functions

The release is similar to the description in paragraph 20.822. However, the operation of the GS-1/5 relay instead of the operation of the RCY relay will initiate certain operations.

20.833 Release of the Selection of the Connecting Path Functions

The release is similar to the description in paragraph 20.823.

20.834 Release of the SNK, RAV-1/2 and RA-1/5 Relays and Operation of the Route R- Relay Associated with the Next Route

The release of the TFK-1, FCK, FCKA, FTCK, FML, FMP and SON relays will release the selections normal check SNK relay.

The release of the SNK relay will release the RAV-1/2 relays which in turn will release the operated RA-1/5 relay.

The release of the operated RA-1/5 relay will extend ground to operate the route R- relay associated with the next route.

20.835 Operation of the LLC-1/2, ONW and TLC-1/3 Relays

The release of the RAV-1/2 relays will reoperate the TLC-1/3 and CKG-4 relays. The operation of the CKG-4 relay will reoperate the LLC-1/2 and ONW relays.

20.836 Completing the Connection

After the route R- relay associated with the next route has been operated and the LLC-1/2, ONW and TLC-1/3 relays have been reoperated the marker will select a trunk circuit in the new route and will then proceed in the usual manner to establish a connection.

21. OTHER MARKER OPERATIONS

21.1 No Such Called Office Code, Vacant Code Connection

When the marker in assisting an originating call determines that the called office code is associated with an unassigned code point or route the marker will, depending upon optional cross-connections, either connect the calling subscriber line to a tone trunk or to a special service trunk which will connect to an operator. If the calling subscriber is connected to a tone trunk the tone trunk will transmit a vacant code tone signal. If the calling subscriber is connected to a special service trunk an operator will be connected to assist the calling subscriber.

When the marker in assisting a call associated with a non-tandem, non-intertoll incoming trunk determines that the called office code is associated with an unassigned code point or route the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber.

When the marker is assisting a call associated with an incoming tandem or intertoll trunk determines that the called office code is associated with an unassigned code point or route the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming tandem or intertoll trunk can provide the overflow tone to the calling subscriber.

21.11 Vacant Code Connection to Tone Trunk for Originating Call

When the marker in assisting an originating call determines that the called office code is associated with an unassigned code point or route the marker will, if cross-connected to do so, connect the calling subscriber to a tone trunk. After the tone trunk connection has been established the tone trunk will transmit the vacant code tone signal to the calling subscriber.

If all tone trunks are busy the marker will route advance by releasing the tone trunk connection functions and will then initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy the marker will be unable to establish a connection from the coin calling subscriber to a tone trunk or if all common overflow trunks are busy the marker will be unable to establish a connection from the non-coin calling subscriber to a common overflow trunk. Therefore, in these cases, the marker will again initiate a route advance. However, in this case there is no route to which the marker can route advance to establish a connection. Therefore, the marker will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone.

21.111 Tone Trunk Connection

The marker will proceed as described in paragraphs 8.01, 8.02 and 8.03. However, since the code point is unassigned this vacant code point will not be cross-connected to operate one of the LPA, LPB, LTA or LTB relays which in turn would operate the intra-office route R- relay and the NSI and ITR-1/3 relays.

21.1111 Operation of the Route R- Relay Associated With the Tone Trunk Connection

The code point or code points associated with unassigned office codes will be cross-connected to provide the proper vacant code routing.

The cross-connections for operating the tone trunk route R- relay for an intra-office call which encounters an unassigned office code are as follows.

The operation of the CKG-1 relay and the AC-0/7 and where required the BC-0/7, the CC-0/7, the AT-2/9 and the BT-20/99 relays will place ground potential on the unassigned code point. The unassigned code point cross-connection terminal will be cross-connected to the "VCG" cross-connection terminal thereby extending this ground potential, with the OR relay operated, to the "VG" cross-connection terminal. When it is desired to route the vacant code connection associated with an originating call to a tone trunk the "VG" cross-connection terminal will be cross-connected to the "VP" cross-connection terminal thereby extending this ground potential thru the winding of the VP relay to the "OV" cross-connection terminal. The "OV" cross-connection terminal will be cross-connected to associated "SC-" cross-connection terminals. The operation of a particular class of service S-00/44 or S-100/144 relay associated with the class of service of the calling subscriber will extend the ground potential on the "OV" cross-connection terminal to one particular "S-" cross-connection terminal. The "S-" cross-connection terminal will be cross-connected to an "RC" cross-connection terminal associated with a tone trunk route thereby extending ground to operate the route R- relay associated with a tone trunk connection and with the class of service of the calling subscriber.

The "R-" cross-connection terminal associated with the winding of the tone trunk route R- relay may be cross-connected to the "RB" cross-connection terminal.

21.1112 Operation of the NSO, SOG-1/3, CB, CB-1/5, CB7, CBF, CBD-1 and CBD Relays

The operation of the NSO, SOG-1/3, CB, CB-1/5, CB7, CBF, CBD-1 and CBD relays are similar to the description in paragraph 20.11133.

21.1113 Tone Trunk Selection

The tone trunk selection will be initiated by the marker when the marker route relay associated with the tone trunk connection is operated. The method of selecting an idle tone trunk circuit is similar to the method of selecting an idle originating register, as described in paragraphs 7.32, 7.33, 7.34, 7.35, 7.36 and 7.37.

21.1114 Selection of the Connecting Path

The marker operations required for the selection of the connecting path between the calling line and the selected tone trunk is similar to the selection of the connecting path between the calling line and the selected intra-office trunk, as described in paragraph 8.11.

21.1115 Setting up the Selecting Connecting Path

The marker operations required for the setting up of the selected connecting path is similar to setting up the selected connecting path for a dial tone connection, as described in paragraphs 7.51, 7.52, 7.53 and 7.54.

21.1116 Release of the Marker and Associated Circuits

The release of the marker will be similar to the release of the marker for a reverting intra-office call, as described in paragraph 9.11.

21.112 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

21.113 Route Advance to Provide Overflow Tone from the Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

21.12 Vacant Code Connection to Special Service Trunk for Originating Call

When the marker is assisting an originating call determines that the called office code is associated with an unassigned code point or route the marker will if cross-connected to do so, connect the calling subscriber to a special service trunk which connects to an operator who will assist the subscriber.

If all special service trunks are busy the marker will route advance by releasing the special service trunk connection functions and will then initiate a connection from the calling subscriber line to a tone trunk.

If all tone trunks are busy the marker will route advance by releasing the tone trunk connection function and will then initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy the marker will be unable to establish a tone trunk or if all common overflow trunks are busy the marker will be unable to establish a connection from the non-coin calling subscriber to a common overflow trunk. Therefore, in these cases, the marker will again initiate a route advance and the marker will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone.

21.121 Special Service Trunk Connection

The marker will proceed as described in paragraphs 8.01, 8.02 and 8.03. However, since the code point is unassigned this vacant code point will not be cross-connected to operate one of the LPA, LPB, LTA or LTB relays which in turn would operate the intra-office route R- relay and the NSI and ITR-1/3 relays.

21.1211 Operation of the R-, OPS-0/3 and OPR Relays Associated with the Special Service Trunk Connection

When it is desired to transmit a class of service trunk to the operator it is necessary to operate the OPS-0/3 relay. The operation of the OPS-0/3 relay will operate the OPR relay which will in turn result in the operation of the route R- relay associated with this special service trunk connection. If it is not necessary to transmit this class of service distinction the route R- relay will be operated but the OPS-0/3 and OPR relays will not be operated.

The operation of the CKG-1 relay and the AC-0/7 and where required the BC-0/7, the CC-0/7, the AT-2/9 and the BT-20/99 relays will place ground potential on the unassigned code point. The unassigned code point cross-connection terminal will be cross-connected to the "VCG" cross-connection terminal thereby extending this ground potential, with the OR relay operated, to the "VG" cross-connection terminal. When it is desired to route the vacant code connection associated with an originating call to a special service trunk the "VG" cross-connection terminal will be cross-connected to associated "SC-" cross-connection terminals. The operation of a particular class of service S-00/44 or S-100/144 relay associated with the class of service of the calling subscriber will extend the ground potential on the "VG" cross-connection terminal to one particular "S-" cross-connection terminal. The "S-" cross-connection terminal will be cross-connected to either and "RC" cross-connection terminal associated with this special service trunk route or to an associated "OS" cross-connection terminal thereby extending ground potential to operate either the route R- relay associated with this special service trunk connection or the operator assistance OPS-0/3 relay.

The operation of the OPS-0/3 relay will operate the OPR relay. The operation of the OPR and OPS-0/3 relays will extend ground to the "OP" cross-connection terminal which will be cross-connected to the "RC" cross-connection terminal associated with this special service trunk route thereby operating the associated route R- relay.

To indicate to the special service trunk circuit that class of service tone distinction is required the operation of the OPR relay will ground the "TC" lead which is extended to the trunk link and connector circuit and then to the special service trunk.

21.1212 Operation of the NSO, SOG-1/3, CB, CB-1/5, CB-7, CBF, CBD-1 and CBD Relays

The operation of the NSO, SOG-1/3, CB, CB-1/5, CB-7, CBF, CBD-1 and CBD relays are similar to the description in paragraph 20.11133.

21.1213 Special Service Trunk Selection

The method of selecting an idle special service trunk is similar to the method of selecting an idle originating register, as described in paragraphs 7.32, 7.33, 7.34, 7.35, 7.36 and 7.37.

21.1214 Selection of the Connecting Path

The marker operations required for the selection of the connecting path are similar to the description in paragraph 8.11.

21.1215 Setting up the Selected Connecting Path

The marker operations required for setting up the selected connecting path are similar to the description in paragraphs 7.51, 7.52, 7.53, and 7.54.

21.1216 Release of the Marker and Associated Circuits

The release of the marker will be similar to the description in paragraph 9.11.

21.122 Route Advance to Tone Trunk Connection

If all special service trunks are busy the marker will be unable to establish a connection from the calling subscriber line to a special service trunk. Under this condition the marker will route advance and will assist a connection from the calling subscriber line to a tone trunk.

The marker will proceed with the special service trunk connection functions as described in paragraph 21.121. However, when the marker initiates the special service trunk selection, as described in paragraph 21.1213, the marker will determine that all special service trunks are busy.

21.1221 Release of the Marker Special Service Trunk Connections Functions

The release of the marker special service trunk connector functions are similar to the description in paragraph 20.1121.

21.1222 Initiating the Tone Trunk Connection Functions

The initiating the tone trunk connection functions are similar to the description in paragraph 20.1122. However, the route R- relay associated with the tone trunk connection will be operated.

21.123 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

21.124 Route Advance to Provide Overflow Tone from the Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

21.13 Vacant Code for Incoming Call Associated with a Non-Tandem, Non-Intertoll Incoming Trunk

Usually when the marker is assisting a terminating call associated with a non-tandem, non-intertoll trunk the marker will not receive any office code digits or any directing digits. Therefore, under these conditions the marker will not be concerned with the vacant code condition. However, if the office consists of two 10,000 directory number series, and if the incoming trunk may be associated with either of the two 10,000 directory number series an office identifying digit will be received from the remote office. The office identifying digit will precede the numerical digits and will identify the office directory number series as an office "A" or office "B". To identify the 10,000 directory number series the associated "C-2/9" code points will be cross-connected. Those "C-2/9" code points which are not cross-connected will be considered as vacant codes.

When the marker in assisting a terminating call determines that the directory digit is associated with an unassigned code point or route the marker will not proceed with the usual terminating call functions and will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber. After setting up the overflow tone ringing condition on the ringing selection switch the marker will release from the connection.

The marker will proceed as described in paragraphs 12.1, 12.2 and 12.3. However, since the code point is unassigned this vacant code point will not be cross-connected to operate one of the LPA, LPB, LTA or LTB relays which in turn would operate the TER-1/4 relays.

21.131 Operation of the ROA, TER-1/3 and OV Relays

The code point or code points associated with unassigned code points will be cross-connected to provide the proper vacant code routing.

The operation of the CKG-1 relay and the AC-0/7 relay will place ground potential on the unassigned code point. The unassigned code point cross-connection terminal will be cross-connected to the "VCG" cross-connection terminal thereby extending this ground potential, with the INC relay operated, to operate the reorder ROA relay.

The operation of the ROA relay will operate the TER-1/3 relays. The windings of the TER-1/3 relays are in series with each other and the operating path will be extended, with the ROA relay operated and the RTST, LR and TR2E relay non-operated, to the "TRK" lead to the incoming register marker connector circuit where the "TRK" lead is grounded when the incoming register marker connector MC relay is operated and the TR-1 relay is non-operated.

The operation of the TER-1 relay, with the ROA relay operated and the LB relay non-operated, will operate the OV relay.

21.132 Seizure of the Trunk Link Frame and Connection to the Incoming Trunk Circuit

The seizure of the trunk link frame and connection to the incoming trunk circuit is similar to the description in paragraph 12.61.

21.133 Setting up the Overflow Tone Ringing Code

The setting up of the overflow tone ringing code is similar to the description in paragraph 20.25135.

21.134 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 20.134. However, those release functions initiated by the operation of the BY relay will in this case be initiated by the operation of the OV relay. Also, since those functions associated with the identification of the location of the called line, with line link frame seizure, connecting path selection and line link frame and trunk link frame select magnet operation were not completed, certain relays associated with these functions were not operated and therefore are not released.

21.14 Vacant Code Routing to Reorder for Incoming Call Associated with a Tandem or Intertoll Incoming Trunk

When the marker is assisting an incoming call associated with a tandem or intertoll incoming trunk determines that the called office code or toll code is associated with an unassigned code point or route the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunks can provide the overflow tone to the calling subscriber. After setting up the overflow tone ringing condition on the ringing selection switch the marker will release from the connection.

If the call is associated with an incoming tandem trunk the marker will proceed as described in paragraphs 14.1, 14.2 and 14.3. If the call is associated with an incoming intertoll trunk the marker will proceed as described in paragraphs 15.1, 15.2 and 15.3. However, since the code point is unassigned this vacant code point will not be cross-connected to operate a route R- relay associated with the incoming tandem or intertoll call.

21.141 Operation of ROA, TER-1/3 and OV Relays

The code point or code points associated with unassigned code points or routes will be cross-connected to provide the proper vacant code routing.

The operation of the CKG-1 relay and the AC-0/7 and where required the BC-0/7, the CC-0/7, the AT-0/9 and the BT-00/99 relays will place ground potential on the unassigned code point. The unassigned code point cross-connection terminal will be cross-connected to the "VCG" cross-connection terminal thereby extending this ground potential to the "TAN" cross-connection terminal with the TAN relay operated or to the "TOL" cross-connection terminal with the TOL relay operated. When it is desired to route the vacant code associated with an incoming tandem trunk to reorder the "TAN" cross-connection terminal will be cross-connected to the "ROA" cross-connection terminal thereby extending this ground potential to operate the ROA relay. When it is desired to route the vacant code associated with an incoming intertoll trunk to reorder the "TOL" cross-connection terminal will be cross-connected to the "ROA" cross-connection terminal thereby extending this ground potential to operate the ROA relay.

The operation of the ROA relay will operate the TER-1/3 relays. The windings of the TER-1/3 relays are in series with each other and the operating path will be extended, with the ROA relay operated and the RTST, LR and TR2E relay non-operated, to the "TRK" lead to the incoming register marker connector circuit where the "TRK" lead is grounded when the incoming register marker connector MC relay is operated and the TR-1 relay is non-operated.

The operation of the TER-1 relay, with the ROA relay operated and the LB relay non-operated, will operate the OV relay.

21.142 Seizure of the Trunk Link Frame and Connection to the Incoming Trunk Circuit

The seizure of the trunk link frame and connection to the incoming tandem or intertoll trunk circuit is similar to the description in paragraph 12.61.

21.143 Setting up the Overflow Tone Ringing Code

The setting up the overflow tone ringing code is similar to the description in paragraph 20.25135.

21.144 Release of the Marker Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 20.134. However, those release functions initiated by the operation of the BY relay will in this case be initiated by the operation of the OV relay. Also, since those functions associated with the identification of the location of the called line, with line link frame seizure, connecting path selection and line link frame and trunk link frame select magnet operation were not completed, certain relays associated with these functions were not operated and therefore are not released.

21.2 Permanent Signal Connection

After the originating register circuit has been connected to the calling subscriber, the called subscriber number should be dialed and recorded in the originating register circuit. However, if the calling subscriber fails to dial any of the digits of the called subscriber number or if a trouble condition prevents the originating register from receiving any of the digits of the called subscriber number the originating register circuit will detect this condition and will initiate a connection to a marker thru an originating register marker connector circuit and will signal to this marker to connect the calling subscriber line to a permanent signal holding trunk.

If all of the permanent signal holding trunks are busy the marker will route advance by releasing the permanent signal holding trunk connection functions and will then initiate a connection from the calling subscriber to a common overflow trunk if the class of service of the calling line indicates a non-coin calling subscriber line.

If all permanent signal holding trunks are busy the marker will be unable to establish a connection from the coin calling subscriber to a permanent signal holding trunk or if all common overflow trunks are busy the marker will be unable to establish a connection from the non-coin calling subscriber to a common overflow trunk. Therefore, in these cases, the marker will again initiate a route advance. However, in this case there is no route to which the marker can route advance to establish a connection. Therefore, the marker will place a ground potential on the "BT" and "RL" leads to the originating register circuit to indicate that the register circuit should release from the connection. The line will be returned to service and will initiate another originating register seizure.

21.21 Permanent Signal Holding Trunk Connection

When the originating register circuit determines that a permanent signal condition exists the originating register will initiate the seizure of a marker in a manner similar to the description in paragraph 8.01. Also, the originating register will transmit to the marker the information which it has recorded in a manner similar to the description in paragraph 8.02. However, for the permanent signal condition the office code and number of the called line will not be available to be transmitted to the marker.

When the originating register is transmitting to the marker the information which has been recorded in the originating register, the originating register will also transmit an indication to the marker that a permanent signal condition exists by placing ground potential on the "PS" lead which will be extended to the marker to operate the permanent signal PS relay.

21.211 Operation of the PS and Route R- Relay Associated with the Permanent Signal Holding Trunk Connection

To indicate a permanent signal condition the originating register will place ground potential on the "PS" lead which is extended to the marker to operate the PS relay.

The operation of CKG-1, SCK and PS relays, with the SCN, CR, PK and PD relays non-operated, will place ground potential on the "PS" cross-connection terminal. The "PS" cross-connection terminal will be cross-connected to the "RC" cross-connection terminal associated with a permanent signal, holding trunk route thereby extending ground potential to operate the route R- relay associated with a permanent signal holding trunk route.

21.212 Operation of the NSO, SOG-1/3, CB, CB-1/5, CB-7 CBF, CBD-1 and CBD Relays

The operation of the NSO SOG-1/3 CB, CB-1/5 CB-7, CBF, CBD-1 and CBD relays are similar to the description in paragraph 20.11133.

21.213 Permanent Signal Holding Trunk Selection

The method of selecting an idle permanent signal holding trunk circuit is similar to the method of selecting an idle originating register, as described in paragraphs 7.32, 7.33, 7.34, 7.35, 7.36 and 7.37.

21.214 Selection of the Connecting Path

The marker operations required for the selection of the connecting path between the calling line and the selected permanent signal holding trunk is similar to the selection of the connecting path between the calling subscriber line and the selected intra-office trunk, as described in paragraph 8.11.

21.215 Setting up the Selected Connecting Path

If marker operations required for the setting up the selected connecting path is similar to setting up the selected connecting path for a dial tone connection, as described in paragraphs 7.51, 7.52, 7.53 and 7.54.

21.216 Release of the Marker and Associated Circuits

The release of the marker will be similar to the release of the marker for a reverting intra-office call, as described in paragraph 9.11.

21.22 Route Advance to Common Overflow Trunk Connection from Permanent Signal Holding Trunk Connections

The route advance to a common overflow trunk connection from a permanent signal holding trunk connection is similar to the route advance to common overflow trunk connection from tone trunk connection as described in paragraphs 20.1121 and 20.1122.

21.23 Route Advance to Initiate the Release of the Originating Register

The route advance to initiate the release of the originating register will be similar to the description for route advance to provide overflow tone from the originating register, paragraph 20.113. The "BT" lead to the originating register marker connector will be grounded in a similar manner to the description in paragraph 20.1132. However, the "RL" lead to the originating register will also be grounded. The operation of the RBT relay with the PS relay operated and the RTST relay non-operated will ground the "RL" lead. Ground on the "RL" lead to the originating register marker connector will operate the register release relay in the originating register. The originating register will be removed from the line, and the line will be allowed to initiate another dial tone call.

21.3 Partial Dial Connection

After the originating register circuit has been connected to the calling subscriber, the called subscriber number should be dialed and recorded in the originating register circuit. However, if the calling subscriber dials some but not all of the digits of the called subscriber number the originating register circuit will detect this condition and will initiate a connection to a marker thru an originating register marker connector circuit and will signal to this marker that a partial dial condition exists. The marker will, depending upon optional cross-connections, either connect the calling subscriber line to a tone trunk or to a special service trunk which will connect to an operator. If the calling subscriber is connected to a tone trunk the tone trunk will transmit a partial dial tone signal. If the calling subscriber is connected to a special service trunk an operator will be connected.

21.31 Partial Dial Connection to Tone Trunk

When the marker determines that a partial dial condition exists the marker will, if cross-connected to do so, connect the calling subscriber to a tone trunk.

If all tone trunks are busy the marker will route advance and will initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy when the marker is assoicated with a coin line or if all common overflow trunks are busy when the marker is associated with a non-coin line the marker will route advance and will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone.

21.311 Tone Trunk Connection

When the originating register circuit determines that a partial dial condition exists the originating register will initiate the seizure of a marker in a manner similar to the description in paragraph 8.01. Also, the originating register will transmit to the marker the information which it has recorded in a manner similar to the description in paragraph 8.02.

When the originating register is transmitting to the marker the information which has been recorded in the originating register, the originating register will also transmit an indication that a partial dial condition exists by placing ground potential on the "PD" lead which will be extended to the marker to operate the partial dial PD relay.

21.3111 Operation of the PD Relay and the Route R- Relay Associated with the Tone Trunk Connection

To indicate a partial dial condition the originating register will place ground potential on the "PD" lead which is extended to the marker to operate the PD relay.

The operation of the CKG-1, SCK and PD relays, with the SCN, CR, PK and PS relays non-operated, will place ground potential on the "PD" cross-connection terminal. When a partial dial connection is to be established to a tone trunk the "PD" cross-connection terminal will be cross-connected to the "VP" cross-connection terminal thereby extending this ground potential thru the winding of the VP relay to the "OV" cross-connection terminal. The "OV" cross-connection terminal will be cross-connected to associated "SC-" cross-connection terminals. The operation of a particular class of service S-00/44 or S-100/144 relay associated with the class of service of the calling subscriber will extend the ground potential on the "PD" cross-connection terminal to one particular "S-" cross-connection terminal. The "S-" cross-connection terminal will be cross-connected to an "RC" cross-connection terminal associated with a tone trunk route thereby extending ground to operate the route R- relay associated with a tone trunk connection.

The "R-" cross-connection terminal associated with the winding of the tone trunk route R- relay may be cross-connected to the "RB" cross-connection terminal.

21.3112 Operation of the NSO, SOG-1/3, CB, CB-1/5, CB7, CBF, CBD-1 and CBD Relays

The operation of the NSO, OSG-1/3, CB, CB-1/5, CB-7, CBF, CBD-1, and CBD relays are similar to the description in paragraph 20.11133.

21.3113 Tone Trunk Selection

The method of selecting an idle tone trunk circuit is similar to the method of selecting an idle originating register, as described in paragraphs 7.32, 7.33, 7.34, 7.35, 7.36, and 7.37.

21.3114 Selection of the Connecting Path

The selection of the connecting path is similar to the selection of the connecting path between the calling line and the selected intra-office trunk, as described in paragraph 8.11.

21.3115 Setting Up the Selected Connecting Path

The setting up the selected connecting path is similar to the description in paragraphs 7.51, 7.52, 7.53 and 7.54.

21.3116 Release of the Marker and Associated Circuits

The release of the marker will be similar to the release of the marker for a reverting intra-office call, as described in paragraph 9.11.

21.312 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

21.313 Route Advance to Provide Overflow Tone from the Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

21.32 Partial Dial Connection to Special Service Trunk

When the marker determines that a partial dial condition exists the marker will, if cross-connected to do so, connect the calling subscriber to a special service trunk which connects to an operator.

If all special service trunks are busy the marker will route advance by releasing the special service trunk connectio functions and will then initiate a connection from the calling subscriber line to a tone trunk.

If all tone trunks are busy the marker will route advance and will initiate a connection from the calling subscriber line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy when the marker is associated with a coin line or if all common overflow trunks are busy when the marker is associated with a non-coin line the marker will route advance and will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register shou provide the overflow tone.

21.321 Special Service Trunk Connection

When the originating register circuit determines that a partial dial condition exists the orignating register will initiate the seizure of a marker in a manner similar to the description in paragraph 8.01. Also, the orignating register will transmit to the marker the informatio which it has recorded in a manner similar to the description in paragraph 8.02.

When the originating register is transmitting to the marker the information which has been recorded in the originating register, the originating register will also transmit an indication that a partial dial condition exists.

21.3211 Operation of the PD Relay and the R-, OPS-0/3 and OPR Relays Associated with the Special Service Trunk Connection

To indicate a partial dial conditi the originating register will place ground potential on the "PD" lead which is extend to the marker to operate the PD relay.

When it is desired to transmit a class of service tone distinction from the special service trunk to the operator it i necessary to operate the OPS-0/3 relay, T operation of the OPS-0/3 relay will operat the OPR relay which will in turn result in the operation of the route R- relay associated with this special service trunk connection. If it is not necessary to transm this class of service distinction the rout R- relay will be operated but the OPS-0/3 and OPR relays will not be operated.

The operation of the CKG-1, SCK and PD relays, with the SCN, CR, PK and PS relays non-operated, will place ground potential on the "PD" cross-connection terminal. When a partial dial connection is to be established to a special service trunk the "PD" cross-connection terminal will be cross-connected to associated "SC-" cross-connection terminals. The operation of a particular class of service S-00/44 or S-100/144 relay associated with the class of service of the calling subscriber will extend the ground potential on the "PD" cross-connection terminal to one particular "S-" cross-connection terminal. The "S-" cross-connection terminal will be cross-connected to either an "RC" cross-connection terminal associated with special service trunk route or to an associated "OS" cross-connection terminal thereby extending ground potential to operate either the route R- relay associated with this special service trunk connector or the operator assistance OPS-0/3 relay.

The operation of the OPS-0/3 relay will operate the OPR relay. The operation of the OPR and OPS-0/3 relays will extend ground to the "OP" cross-connection terminal which will be cross-connected to the "RC" cross-connection terminal associated with this special service trunk route thereby operating the associated route R-relay.

To indicate to the special service trunk circuit that class of service tone distinction is required the operation of the OPR relay will ground the "TC" lead which is extended to the trunk link and connector circuit and then to the special service trunk.

21.3212 Operation of the NSO, SOG-1/3, CB, CB-1/5, CB-7, CBF, CBD-1 and CBD Relays

The operation of the NSO, SOG-1/3, CB, CB-1/5, CB-7, CBF, CBD-1 and CBD relays are similar to the description in paragraph 20.11133.

21.3213 Special Service Trunk Selection

The method of selecting an idle special service trunk is similar to the method of selecting an idle originating register, as described in paragraphs 7.32, 7.33, 7.34, 7.35, 7.36 and 7.37

21.3214 Selection of the Connecting Path

The marker operations required for the selection of the connecting path are similar to the description in paragraph 8.11.

21.3215 Setting Up the Selected Connecting Path

The marker operations required for setting up the selected connecting path are similar to the description in paragraphs 7.51, 7.52, 7.53 and 7.54.

21.3216 Release of the Marker and Associated Circuits

The release of the marker will be similar to the description in paragraph 9.11.

21.322 Route Advance to Tone Trunk Connection

If all special service trunks are busy the marker will be unable to establish a connection from the calling subscriber line to a special service trunk. Under this condition the marker will route advance and will assist a connection from the calling subscriber line to a tone trunk

The marker will proceed with the special service trunk connection functions as described in paragraph 21.321. However, when the marker initiates the special service trunk selection, as described in paragraph 21.3213, the marker will determine that all special service trunks are busy.

21.3221 Release of the Marker Special Service Trunk Connection Functions

The release of the marker special service trunk connection functions are similar to the description in paragraph 20.1121.

21.3222 Initiating the Tone Trunk Connection Functions

The initiating the tone trunk connection functions are similar to the description in paragraph 20.1122. However, the route R- relay associated with the tone trunk connection will be operated.

21.323 Route Advance to Common Overflow Trunk Connection from Tone Trunk Connection

The route advance to common overflow trunk connection from tone trunk connection is similar to the description in paragraph 20.112.

21.324 Route Advance to Provide Overflow Tone from the Originating Register

The route advance to provide overflow tone from the originating register is similar to the description in paragraph 20.113.

21.4 Called Number Associated With Blank Number or Disconnected Number

A directory number which is not associated with any subscriber in the office is known as a "blank number". A directory number which was recently associated with

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a subscriber but which is no longer associated with any subscriber in the office is known as a disconnected number. When the marker in assisting an intra-office call or a non-intertoll terminating call determines that the called number is associated a blank number or disconnected number the marker will, depending upon optional cross-connections, either connect the calling subscriber line to a regular intercept trunk or to a "no-such-number" tone trunk. If the marker is assisting a intertoll call which is terminating within this office, the marker will, depending upon optional cross-connections, connect the calling subscriber line to a regular intercept trunk or to a "no-such-number" tone trunk or the marker will set up the overflow tone ringing condition on the ringing selection switch. If the calling subscriber is connected to a regular intercept trunk an operator will be connected to assist the calling subscriber or toll operator. If the calling subscriber is connected to a "no-such-number" tone trunk a "no-such-number" tone will be transmitted to the calling subscriber or toll operator. If the marker sets up the overflow ringing condition on the ringing selection switch the incoming intertoll trunk will provide the overflow tone to the calling subscriber or to the toll operator.

21.41 Intra-Office Call, Called Number Associated with a Blank or Disconnected Number

When the marker in assisting an intra-office call determines that the called number is associated with a blank or disconnected number the marker will, depending upon option cross-connections, either connect the calling subscriber line to a regular intercept trunk or to a "no-such-number" tone trunk. Unlike most trunk cfrcuits the intercept trunks and the "no-such-number" trunks are associated with and terminate on line link frames.

If all intercept trunks or all "no-such-number" tone trunks are busy the marker will route advance and will initiate a connection from the calling subscriber line to a tone trunk circuit.

If all tone trunks are busy the marker will route advance and will initiate a connection from the calling line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy when the marker is associated with a coin line or if all common overflow trunks are busy when the marker is associated with a non-coin line the marker will route advance and will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone.

The marker will proceed with the intra-office call connection, as described in paragraphs 8.01, 8.02, 8.03 and 8.04, until the marker determines, as described in paragraphs 21.4101, 21.4102, 21.4103 or 21.4104, that the called subscriber number is a blank number or a disconnected number.

The intercept trunk or "no-such-number" tone trunk terminate on and are associated with the line link frame. Therefore in setting up an intercept trunk or no-such-number tone trunk connection a connection will be established from the line link frame associated with the calling line to a trunk link frame and the intra-office trunk, and then from the intra-office trunk to a trunk link frame and to the line link frame associated with the intercept trunk or no-such-number tone trunk.

21.4101 Called Number Associated With Unequipped Number Group, Operation of the BNTH and BN or RI Relays

When the called number is associated with an unequipped number group the marker will proceed with the intra-office call connection functions until the marker initiates the selection and seizure of a number group, as described in paragraph 8.041. However, when the marker extends battery potential to an "ST-" lead as described in paragraph 8.0413 which is associated with a non-existing number group, a number group circuit will not be seized. The battery potential on this "ST-" lead will be extended to the associated "ST-" cross-connection terminal. This "ST-" cross-connection terminal, which is associated with a non-existing number group circuit, will be cross-connected to the "BNTH" cross-connection terminal thereby extending battery potential to operate the blank number thousands or hundreds BNTH relay.

The operation of the BNTH relay, with the LIN relay operated, will extend ground potential to the "BTL" cross-connection terminal. When it is desired to connect the calling subscriber to a regular intercept trunk if the called number is associated with an unequipped number group, or is associated with a blank hundreds group the "BTL" cross-connection terminal will be cross-connected to the "RI" cross-connection terminal thereby operating the regular intercept RI relay. When it is desired to connect the calling subscriber to a "no-such-number" tone trunk if the called number is associated with an unequipped number group or is associated with a blank hundreds group, the "BTL" cross-connection terminal will be cross-connected to the "BN" cross-connection terminal thereby operating the blank number BN relay.

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21.4102 Called Number Associated With Blank Hundreds Group, Operation of the BNTH and BN or RI Relays

When the called number is associated with a blank hundreds group the marker will proceed with the intra-office call connection functions until the marker initiates the number group translation, as described in paragraph 8.042. However, the number group will not extend ground potential over the "PN", "TN", "PTN" lead to operate one of the PN, TN or PTN relays in the marker as described in paragraph 8.0422. Instead the number group will extend ground potential over the "BNK" lead to operate the blank number thousands or hundreds BNTH relay in the marker. The operation of the number group HB-0/9 relay will place ground potential on the "PT" cross-connection terminal in the number group. When the hundreds group associated with the HB-0/9 relay is associated with only blank numbers the associated "PT" cross-connection terminal will be cross-connected to the "BNK" cross-connection terminal in the number group thereby extending ground potential over the "BNK" lead to operate the BNTH relay in the marker.

The operation of the BNTH relay, with the LIN relay operated, will extend ground potential to the "BTL" cross-connection terminal. When it is desired to connect the calling subscriber to a regular intercept trunk if the called number is associated with an unequipped number group or is associated with a blank hundreds group, the "BTL" cross-connection terminal will be cross-connected to the "RI" cross-connection terminal thereby operating the regular intercept RI relay. When it is desired to connect the calling subscriber to a no-such-number tone trunk if the called number is associated with an unequipped number group or is associated with a blank hundreds group, the "BTL" cross-connection terminal will be cross-connected to the "BN" cross-connection terminal thereby operating the blank number BN relay.

21.4103 Called Number Associated With Changed or Disconnected Number or With Individual Blank Number Which is to be Treated the Same as Disconnected Numbers, Operation of the TYM and BN or RI Relays

When the called number is associated with a changed or disconnected number or with an individual blank number which is to be treated the same as a disconnected number the marker will proceed with the intra-office call connection functions until the marker initiates the number group translation, as described in paragraph 8.042. However, in the number group there are no cross-connections to the "F-000/999", "G-000/999" and "L-000/999" cross-connection terminals associated with this called number. Therefore, the number group will not extend the battery potential on the "NL", "WG", and "WF" leads to the "FT-0/3", "FU-0/9", "VG-0/11", "HG-0/9", "VF-0/4" and "RC-1/15" leads which are extended to the marker to operate the FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4 and RCN-1/15 relays, as described in paragraph 8.0425. Since the FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4 and RCN-1/15 relays are not operated, the FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, RCT-1/15, FTL, FUL, VGL, HGL, VFL and RCL relays will not be operated as described in paragraph 8.0426.

In order to determine if the called number is associated with a changed or disconnected number or with an individual blank number which is to be treated the same as a disconnected number the marker will start the TYM timing circuit when the HTUK relay is operated. When the called number is associated with an existing subscriber the called number will be translated, the number group released and the TYM timing circuit recycled before the end of the TYM timing circuit timing period and therefore the marker will proceed with the intra-office call in the usual manner. However, when the called number is associated with a changed or disconnected number or with an individual blank number which is to be treated the same as a disconnected number the TYM timing circuit will time-out and the TYM relay will be operated.

The operation of the HTUK relay removes ground potential from the secondary winding of the TYM relay and the short circuit from the TYM condenser. This permits the TYM condenser to charge through the 2600 ohm winding of the TYM relay and the TYM-0 resistance. After an interval of time the condenser is fully charged, the current flow through the 2600 ohm relay winding will cease and the TYM relay will operate on its 200 ohm winding in series with the 2108 ohm TYM-1 resistance.

The operation of the TYM relay, with the NGC, HTUK and LIN relays operated and the PBX-2, TOG-2, RCL, VFL, HGL, VGL, FUL and FTL relays non-operated, will extend ground potential to the "NL" cross-connection terminal. When it is desired to connect the calling subscriber to a regular intercept trunk if the called number is associated with a changed or disconnected number or with an individual blank number which is to be treated the same as a disconnected number, the "NL" cross-connection terminal will be cross-connected to the "RI" cross-connection terminal thereby operating the regular intercept RI relay. When it is desired to connect the calling subscriber to a no-such-number tone trunk if the called number is associated with a changed or disconnected number or with an individual blank number which is to be treated the same as a disconnected number, the "NL" cross-connection terminal will be cross-connected to the "BN" cross-connection terminal thereby operating the blank number BN relay.

21.4104 Called Number Associated with Individual Blank Number Which Is To Be Treated Differently From Disconnected Numbers, Operation of the TYM and BN or RI Relays

When the called number is associated with an individual blank number which is to be treated differently from a disconnected number the marker will proceed with the intra-office call connection functions until the marker initiates the number group translation, as described in paragraph 8.042. However in the number group there are no cross-connections to the "F-000/999" "L-000/999" cross-connection terminals associated with this called number. Therefore, the number group will not extend the battery potential on the "WL" and "WF" leads to the "FT-0/3", "FU-0/9", "VF-0/4" and "RC-1/15" leads which are extended to the marker to operate the FTN-0/3, FUN-0/9, VFN-0/4 and RCN-1/15 relays as described in paragraph 8.0425. Since the FTN-0/3, FUN-0/9, VFN-0/4 and RCN-1/15 relays are not operated, the FTT-0/3, FUT-0/9, VFT-0/4, RCT-1/15, FTL, FUL, VFL and RCL relays will not be operated as described in paragraph 8.0426. However, in the number group the "G-000/999" cross-connection terminal associated with this called number is cross-connected therefore the number group will extend battery potential on the "WG" lead to the "VG-0/11" and "HG-0/9" leads which are extended to the marker to operate the VGN-0/11, HGN-0/9, VGT-0/11, HGT-0/9, VGL, and HGL relays as described in paragraph 8.0425.

In order to determine if the called number is associated with an individual blank number which is to be treated differently from a disconnect number the marker will start the TYM timing circuit when the HTUK relay is operated. When the called number is associated with an existing subscriber the called number will be translated, the number group released and the TYM timing circuit recycled before the end of the TYM timing circuit timing and therefore the marker will proceed with the intra-office call in the usual manner. However, when the called number is associated with an individual blank number which is to be treated differently from a disconnected number the TYM timing circuit will time-out and the TYM relay will be operated.

The operation of the HTUK relay removes ground potential from the secondary winding of the TYM relay and the short circuit from the TYM condenser. This permits the TYM condenser to charge through the 2600 ohm winding of the TYM relay and the TYM-0 resistance. After an interval of time the condenser is fully charged, the current flow through the 2600 ohm relay winding will cease and the TYM relay will operate on its 200 ohm winding in series with the 2108 ohm TYM-1 resistance.

The operation of the TYM relay, with the NGC, HTUK, VGL, HGL and LIN relays operated and the PBX-2, TOG-2, RCL, VFL, FUL and FTL relays non-operated, will extend ground potential to the "GL" cross-connection terminal. When it is desired to connect the calling subscriber to a regular intercept trunk if the called number is associated with an individual blank number which is to be treated differently from a disconnected number, the "GL" cross-connection terminal will be cross-connected to the "RI" cross-connection terminal thereby operating the regular intercept RI relay. When it is desired to connect the calling subscriber to a no-such-number tone trunk if the called number is associated with an individual blank number which is to be treated differently from a disconnected number, the "GL" cross-connection terminal will be cross-connected to the "BN" cross-connection terminal thereby operating the blank number BN relay.

21.4105 Release of the Called Number Information and the Number Group Associated With the Called Blank or Disconnected Number

When the marker determines that the called number is associated with a blank or disconnected number the marker will release the called number information and will also release the number group associated with the called number if this number group has been seized.

21.41051 Operation of the NR Relay and Release of the OAN or OBN, N-1/4, N-A1A/4A, TH-0/7, HN-0/7, T-0/7, U-0/7 and NE Relays

The operation of the RI or BN relay, as described in paragraph 21.4111, 21.4112, 21.4113 or 21.4114, will operate the number release NR relay. The operation of the NR relay will release the operated OAN or OBN relay and the operated N-1/4 and N-1A/4A relays. The release of the operated N-1/4 and N-1A/4A relays will release the called number recording TH-0/7, HN-0/7, T-0/7 and U-0/7 relays and will release the NE relay.

21.41052 Operation of the CKO Relay and Release of the SNG-1/2, UC and LLI Relays

The operation of the RI or BN relay, with the NGC relay operated will operate the CKO relay. The CKO relay will be held operated with the NGC relay operated.

The operation of the CKO relay will release the operated SNG-1, SNG-2, UC and LLI relays.

21.41053 Release of the Number Group MP, MCA, MCB, MCC, HB-0/9, TB-00/99 and U-0/9 Relays

If the number group circuit associated with the called number which is associated with a blank or disconnected called number has been seized, it will be released.

The release of the SNG-2 relay in the marker will release the operated MP, MCA, MCB, MCC, HB-0/9, TB-00/99 and U-0/9 relays in the seized number group circuit.

21.41054 Release of the VGN-0/11, SGN-0/9, VGT-0/11, HGT-0/9, VGL and HGL Relays and the Operation of the CKR, PBX-1/2, LLI and TR1A Relays

The release of the SNG-2 relay will release the operated VGN-0/11 and HGN-0/9 relays which will release the operated VGT-0/11 and HGT-0/9 relays. The release of the LLI relay will release the operated VGL and HGL relays.

After the release of the called line identification relays, the check releases CKR relay operates. The released condition of the FTL, FUL, VGL, HGL, VFL and RCL relays with the RCT-10, RGT-0/1, PN, TN, PTN relays released and the CKO relay operated will operate the CKR relay.

The operation of the CKR relay with the NGC relay operated and the RCY-3, SPH and TR2 relays non-operated will operate the TR1A relay.

The operation of the CKR relay, with the RI or BN and FLG-1 relays operated and the RNG relay non-operated, will operate the PBX-1 and PBX-2 relays. Since the intercept trunks and no-such-number tone trunks are terminated on the line link frame the marker must hunt thru the group of intercept trunks or no-such-number tone trunks to select an idle trunk and to determine the line link frame location of the selected trunk in the same manner as for a called PBX line. Therefore the PBX-1/2 relays are operated to initiate terminal hunting when the marker is connected to the number group associated with the intercept trunks or no-such-number tone trunks.

The operation of the CKR relay, with the PUL relay non-operated and the FLG-1 relay operated, will operate the LLI relay.

21.4106 Identification of the Location of the Intercept Trunk or No-Such-Number Tone Trunk

Since a no-such-number tone trunk or an intercept trunk terminates on the line link frame the marker will identify and select an idle no-such-number tone trunk or an intercept trunk in a manner similar to the selection of an idle PBX line within a terminal hunting group.

21.41061 Selection and Connection To Number Group

After the marker has released the number group associated with the intercept trunks or no-such number tone trunks will be seized to transmit information to the marker as to the location of the line link frame of an idle intercept trunk or idle no-such-number tone trunk.

21.410611 Operation of RIA or BNA Relay and the SNG-1/2 Relays

The release of the NE relay, with the RI relay operated, will operate the RIA relay. The release of the NE relay, with the BN relay operated, will operate the BNA relay. The operation of the RIA or BNA relay, with the MRL-1, TNR and RNG relays released and the CKO, CKR and FLG relays operated, will operate the SNG-1/2 relays.

21.410612 Operation of the MP, MCA, MCB and MCC Relays In The Number Group and The Operation of The NGK and NGK-1 Relays In The Marker

To seize the number group required for this call the marker will operate in the selected number group the MP relay associated with this marker by placing battery potential on the "ST-" lead associated with the selected number group. Battery potential is extended through the NGS lamp and the non-operated SP relay, the operated TLC-1, FS-, FSA, ITR-3 relays, the non-operated TH-0/7 relays and thru the operated BNA relay to the "BN-ST" cross-connection terminal or thru the operated RIA relay to the "RI-ST" cross-connection terminal of figure 48. The "BN-ST" cross-connection terminal is cross-connected to the "ST-" cross-connection terminal of figure 48 associated with the number group with which the no-such-number tone trunks are associated. The

"RI-ST" cross-connection terminal is cross-connected to the "ST-" cross-connection terminal of figure 48 associated with which the intercept trunks are associated. Therefore, battery potential will be extended over the "ST-" lead to the number group associated with the no-such-number tone trunks or with the intercept trunks. In the number group circuit the battery potential on the "ST-" lead will be extended with the MB-0/1 and TR-0/3 relays, non-operated to the winding of the MP relay thereby operating the MP relay associated with this marker in the selected number group.

The operation of the number group MP relay will result in the operation of the number group MCA, MCB and MCC relays. To check in the marker the operation of the number group MCA (bottom) relay the marker NGK relay will be operated by the ground placed on the "NGK" lead by the operation of the number group MCA (bottom) relay. To check in the marker the operation of the number group MCA (top) and MCB relays the marker NGK-1 relay will be operated by the ground placed on the "W" lead by the operation of the number group MCA (top) and MCB relays.

21.41062 Number Group Translation and Marker Identification of the Location of an Idle No-Such-Number Tone Trunk or Intercept Trunk

The number group translation and marker identification of the location of an idle no-such-number tone trunk or an intercept trunk is similar to the marker operations for a terminal hunting line. However, the marker will not transmit to the number group the called subscriber numericals but instead will transmit to the number group a four digit number which is associated with the no-such-number tone trunks or the intercept trunks.

21.410621 Operation of the HB-0/9 and TB-00/99 Relays the Number Group

The hundreds block HB-0/9 relay in the number group associated with the hundreds digit and the tens block TB-00/99 relay in the number group associated with the tens digit of the four digit number which is associated with the no-such-number tone trunks or the intercept trunks will be operated.

The operation of the marker SNG-2 relay extends battery potential through the HBS resistance lamp, through the operated SNG-2 relay contacts, through the non-operated SLCK-1 relay contacts, through the operated TFK-1 relay contacts, and through the operated BNA relay contacts to the "BN-HB" cross-connection terminal or through the operated RIA relay contacts to the "RI-HB" cross-connection terminal of figure 48. The "BN-HB" cross-connection terminal is cross-connected to the "HB-0/9" cross-connection terminal of figure 48 associated with the hundreds block with which the no-such-number tone trunks are associated. The "RI-HB" cross-connection terminal is cross-connected to the "HB-0/9" cross-connection terminal of figure 48 associated with the hundreds block with which the intercept trunks are associated. Therefore battery potential will be extended over the "HB-0/9" lead to the number group to operate the HB-0/9 relay in the number group associated with the hundreds block associated with the no-such-number tone trunks or intercept trunks.

The operation of the HB-0/9 relay in the number group will extend ground over the "PN", "TN" or "PTN" lead to operate the PN, TN or PTN relay in the marker as a check that the HB-0/9 relay in the marker has operated.

The operation of the marker PN, TN or PTN relay extends battery potential to the "BN-TB" cross-connection terminal or to the "RI-TB" cross-connection terminal of figure 48 with the SNG-2 and BNA or RIA relays operated and the RNG, BNTH, and SLCK-1 relays non-operated. The "BN-TB" cross-connection terminal is cross-connected to the "TB-0/9" cross-connection terminal of figure 48 associated with the tens block with which the no-such-number tone trunks are associated. The "RI-TB" cross-connection terminal is cross-connected to the "TB-0/9" cross-connection terminal of figure 48 associated with the tens block with which the intercept trunks are associated. Therefore, battery potential will be extended over the "TB-0/9" lead to the number group and with the number group HB-0/9 relay operated this battery potential will be extended to operate the number group tens block TB-00/99 relay. The marker TBW relay will also be operated since its operating path is in series with the operating path of the number group TB-00/99 relay.

21.410622 Operation of the SC- Relay in the Number Group and the Marker SLCK, SLCK-1, SLC, SL-0/9, SA-0/9 and SAE Relays

In order to extend the sleeve conductors of the trunks in the terminal hunting group to the marker for terminal hunting, an SC- relay in the number group will be operated in parallel with the associated number group TB-00/99 relay by cross-connecting the associated "TB-00/99" and "TB" cross-connection terminals in the number group.

The operation of the PBX-1 and PBX-2 relays will extend the winding of the SLCK relay over the "SCK" lead to the battery potential which has operated the SC- relay in the number group. The other side of the SLCK relay winding is at ground potential with the NGC relay operated and the GB relay non-operated. After operating the SLCK relay will be held operated with the PBX-2 relay operated.

The operation of the SLCK relay will operate the SLCK-1 relay which will be held operated with the FLG-1 relay operated.

The operation of the PBX-1 relay, with the UC relay operated and the SAE, and GB relays non-operated, will operate the sleeve cut-in SLC relay which extends the sleeves of the trunk circuits to the sleeve test SL-0/9 relays.

One side of the SL-0/9 relay windings are connected to ground potential thru the SL-0/9 resistances when the SA-0/9 and MT-10 relays are non-operated. The other side of the SL-0/9 relay windings are extended to the number group over the "S-0/9" leads when the SLC relay is operated. With the number group MCC and SC- relays operated the "S-0/9" leads are extended to the "S-0/9" cross-connection terminals in the number group circuit. Each "S-0/9" cross-connection terminal in the number group is cross-connected to the sleeve conductor of the trunk circuit with which it is associated. If the associated trunk circuit is busy a ground potential will be applied to the sleeve conductor or if the trunk circuit is idle a battery potential thru the line link frame hold magnet winding, will be applied to the sleeve conductor. Therefore each idle trunk circuit within the terminal hunting group and within the selected tens block and associated with the operated number group SC- relay will extend battery potential to the marker to operate the associated SL-0/9 relay.

The operation of the SL-0/9 relays with the MT-10 relay non-operated will operate the associated SA-0/9 relays to record those trunk circuits which are idle and available for completing this call. The operated SA-0/9 relays will be held operated with the NGC relay operated and the GB relay non-operated.

The operation of any SA-0/9 relay will operate the SAE relay which in turn will release the SLC relay which in releasing will release the operated SL-0/9 relays and will remove the operating path for the other non-operated SL-0/9 relays. By removing the operating path for the SL-0/9 relays the marker may proceed in the selection of an idle trunk circuit without interference from other trunk circuits becoming idle.

21.410623 Operation of the U-0/9 Relay in the Number Group

If any of the trunk circuits within the terminal hunting group are idle the associated SA-0/9 relays have been operated. The marker will select the preferred idle trunk circuit for this connection to the called subscriber by selecting the idle trunk circuit associated with the lowest numbered operated SA-0/9 relay. Since the operated units U-0/9 relay in the number group has not been operated it is necessary to operate the U-0/9 relay in the number group associated with the selected trunk circuit to identify the trunk circuit before the number group translation can be made. Battery potential is extended through the UBS resistance lamp through the non-operated UT relay contacts, to the "BN-U" cross-connection terminal or to the "RI-U" cross-connection terminal of figure 48. The "BN-U" cross-connection terminal and the "RI-U" cross-connection terminals are cross-connected to the associated "U-0/9" cross-connection terminals of figure 48.

With one of the SA-0/9 relays operated battery potential is further extended to the number group circuit over the "U-0/9" lead associated with the lowest numbered operated SA-0/9 relay. The operation of the number group MCA (top) will extend the "U-0/9" leads to the number group units digit U-0/9 relays thereby operating in the number group the units digit U-0/9 relay associated with the units digit of the trunk circuit.

21.410624 Operation of the FTN-0/3, FUN-0/9, VGN-0/11, HGN-0/9, VFN-0/4 and RCN-1/15 Relays

The operation in the marker of one frame units number FUN-0/9 relay will identify the units digit and the operation of one frame tens number FTN-0/3 relay will identify the tens digit of the line link frame associated with the trunk circuit. The operation of one vertical group number VGN-0/11 relay will identify the vertical group, the operation of one horizontal group number HGN-0/9 relay will identify the horizontal group and the operation of one vertical file number VFN-0/4 relay will identify the vertical file. The operation of one ringing combination number RCN-1/15 relay will identify the ringing combination or code.

The operation of the SNG-2 relay and the NGK-1 relay in the marker will extend one battery potential through the WL lamp and over the "WL" lead to the number group, will extend a second battery potential through the WG lamp and over the "WG" lead to the number group and will extend a third battery potential through the WF lamp and over the "WF" lead to the number group circuit. The operation of the MCB relay, the one U-0/9 relay and the one TB-00/99 relay in the number group will extend the "WF" lead to one of a group of one thousand "F-000/999" cross-connection terminals in the number group, will extend the "WG" lead to one of a group of one thousand "G-000/999" cross-connection terminals and will extend the "WL" lead to one of a group of one thousand "L-000/999" cross-connection terminals. In the number group circuit there is one "F-000/999" cross-connection terminal, one "G-000/999" cross-connection terminal and one "L-000/999" cross-connection terminal for each of the one thousand directory numbers associated with this number group. The "L-000/999" cross-connection terminal associated with a directory number will be cross-connected to the one "LL-00/39" cross-connection terminal which is associated with the line link frame number with which the directory number is associated. The "G-000/999" cross-connection terminal associated with a directory number will be cross-connected to the one "VHG-000/119" cross-connection terminal which is associated with the vertical group and with the horizontal group with which the directory number is associated. The "F-000/999" cross-connection terminal associated with a directory number will be cross-connected to the one "RF-" cross-connection terminal which is associated with the vertical file and with the ringing combination with which the directory number is associated. Therefore, the battery potential on the "LL-00/39" cross-connection terminal is extended with the number group MCA relay operated over one "FT-0/3" lead and one "FU-0/9" lead to the marker circuit thereby operating in the marker the one frame tens number, FTN-0/3 relay and the one frame units number FUN-0/3 relay associated with the line link frame number associated with the trunk circuit. Also, the battery potential on the "VHG-000/119" cross-connection terminal is extended, with the number group MCB relay operated, over one "VG-0/11" lead and one "HG-0/9" lead to the marker circuit thereby operating in the marker the one vertical group number VGN-0/11 relay and the one horizontal group number HGN-0/9 relay associated with the called line. The battery potential on the "RF-" cross-connection terminal is extended, with the number group MCB relay operated, over one "VF-0/4" lead and one "RC-1/15" lead to the marker circuit thereby operating in the marker the one vertical file number VFN-0/4 relay and the one ringing combination number RCN-1/15 relay.

21.410625 Operation of the FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, RCT-1/15, FTL, FUL, VGL, HGL, VFL, and RCL Relays

The operation of the FTN-0/3, FUN-0/9, VGN-0/13, HGN-0/9, VFN-0/4 and RCN-1/15 relays will operate the associated identification test FTT-0/3, FUT-0/9, VGT-0/13, HGT-0/9, VFT-0/4 and RCT-1/15 relays which in turn will operate the FTL, FUL, VGL, HGL, VFL and RCL Relays.

21.410626 Terminal Hunting Where Hunting Group of No-Such-Number Tone Trunks or Intercept Trunks are Distributed Over More Than One Tens Block

If more than ten no-such-number tone trunks or more than ten intercept trunks are required in a terminal hunting group it becomes necessary to distribute them over several tens blocks. Where a terminal hunting group is distributed over more than one tens block the marker and number group will test for an idle trunk circuit within the first tens block and if none is idle the marker and number group will advance to the next tens block associated with this terminal hunting group. In this manner the marker and number group will test all of the trunks within all of the tens blocks until an idle trunk is found.

The circuit operations for terminal hunting within the first tens block where the hunting group is distributed over more than one tens block is similar to the operations described in paragraphs 21.410621, 21.410622, 21.410623, 21.410624 and 21.410625. If all of the trunk circuits in the first tens block are busy the marker and number group must advance to terminal hunt in the second tens block which requires the relay operations in paragraphs 8.04322, 8.04323, 8.04324, 8.04325, 8.04326, 8.04327 and 8.04328.

21.41063 Release of the Number Group

The release of the number group is similar to the description in paragraph 8.045. However, the NR relay has previously operated to release the N-1/4, N-1A/4A, TH-0/7, HN-0/7, TX-0/7, U-0/7 and the OAN or OBN relays.

21.4107 Intra-Office, Non-Reverting Trunk Selection

The intra-office trunk selection is similar to the description in paragraph 8.05.

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21.4108 No-Such-Number Tone Trunk or Intercept Trunk Busy Test

The no-such-number tone trunk or intercept trunk busy test is similar to the called line busy test as described in paragraph 8.06.

21.4109 Selection of the Connecting Path To The No-Such-Number Tone Trunk or Intercept Trunk

The selection of the connecting path to the no-such-number tone trunk or intercept trunk is similar to the selection of the connecting path to the called line as described in paragraph 8.07.

21.4110 Setting Up the Selected Connecting Path to the No-Such-Number Tone Trunk or Intercept Trunk

The setting up the selected connecting path to the no-such-number tone trunk or intercept trunk is similar to the setting up the selected connecting path to the called line as described in paragraph 8.08.

21.4111 Releasing The No-Such-Number Tone Trunk or Intercept Trunk Connecting Path Functions and Initiating the Calling Line Connecting Path Functions

Releasing the no-such-number tone trunk or intercept trunk connecting path functions and initiating the calling line connecting path functions is similar to the description in paragraph 8.10.

21.4112 Selection of the Connecting Path to the Calling Line

The selection of the connecting path to the calling line is similar to the description in paragraph 8.11.

21.4113 Setting Up The Selected Connecting Path To The Calling Line

The setting up the selected connecting path to the calling line is similar to the description in paragraph 8.12.

21.4114 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 8.13.

21.42 Terminating Call, Non-Intertoll, Called Number Associated With Blank or Disconnected Number

When the marker is assisting a terminating call, which is a non-intertoll call, determines that the called number is associated with a blank or disconnected number the marker will, depending upon optional cross-connections, either connect the incoming trunk circuit to a regular intercept trunk or to a no-such-number tone trunk.

If all intercept trunks or all no-such-number tone trunks are busy the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber. After setting up the overflow tone ringing condition on the ringing selection switch the marker will release from the connection.

The marker will proceed with the terminating call connection, as described in paragraphs 12.1, 12.2, 12.3 and 12.4, until the marker determines, as described in paragraphs 21.4201, 21.4202, 21.4203 or 21.4204, that the called subscriber number is a blank number or a disconnected number.

21.4201 Called Number Associated With Unequipped Number Group, Operation of the BNTH and BN or RI Relays

The operation of the BNTH and BN or RI relays will be similar to the description in paragraph 21.4101.

21.4202 Called Number Associated With Blank Hundreds Group, Operation of the BNTH and BN or RI Relays

The operation of the BNTH and BN or RI relays will be similar to the description in paragraph 21.4102.

21.4203 Called Number Associated With Changed or Disconnected Number or With Individual Blank Number Which is to be Treated the Same as Disconnected Numbers, Operation of the TYM and BN or RI Relays

The operation of the TYM and BN or RI relays will be similar to the description in paragraph 21.4103.

21.4204 Called Number Associated with Individual Blank Number Which is To Be Treated Differently From Disconnected Numbers, Operation of the TYM and BN or RI Relays

The operation of the TYM and BN or RI relays will be similar to the description in paragraph 21.4104.

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21.4205 Release of the Called Number Information and the Number Group Associated with the Called Blank or Disconnected Number

The release of the Called number information and the number group associated with the called blank or disconnected number is similar to the description in paragraph 21.4105.

21.4206 Identification of the Location of the Intercept Trunk or No-Such-Number Tone Trunk

The identification of the location of the intercept trunk or no-such-number tone trunk is similar to the description in paragraph 21.4106.

21.4207 No-Such-Number Tone Trunk or Intercept Trunk Busy Test

The no-such-number tone trunk or intercept trunk busy test is similar to the called line busy test as described in paragraph 12.5.

21.4208 Selection of the Connecting Path

The selection of the connecting path is similar to the description in paragraph 12.6.

21.4209 Setting Up the Selected Connecting Path

Setting up the selected connecting path is similar to the description in paragraph 12.7.

21.4210 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 12.9

21.43 Intertoll Terminating Call, Called Number Associated with Blank or Disconnected Number

When the marker in assisting an intertoll terminating call determines that the called number is associated with a blank or disconnected number the marker will, depending upon optional cross-connections, either connect the incoming trunk circuit to a regular intercept trunk or to a no-such-number tone trunk or the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the toll operator or calling subscriber.

The marker will proceed with the intertoll terminating call connection, as described in paragraph 13.1, 13.2, 13.3 and 13.4 until the marker determines, as described in paragraph 21.431, 21.432, 21.433 or 21.434 that the called subscriber number is a blank number or a disconnected number.

21.431 Called Number Associated With Unequipped Number Group, Operation of the BNTH and BN, RI or PMO Relays

The operation of the BNTH relay will be similar to the description in paragraph 21.4101. However, the operation of the BNTH relay, with the TIN relay operated, will extend ground potential to the "BTT" cross-connection terminal instead of to the "BTL" cross-connection terminal. When it is desired to connect the incoming trunk to a regular intercept trunk if the called number is associated with an unequipped number group or is associated with a blank hundreds group, the "BTT" cross-connection terminal will be cross-connected to the "RI" cross-connection terminal thereby operating the regular intercept RI relay. When it is desired to connect the incoming trunk to a "no-such-number" tone trunk if the called number is associated with an unequipped number group or is associated with a blank hundreds group, the "BTT" cross-connection terminal will be cross-connected to the "BN" cross-connection terminal thereby operating the blank number BN relay. When it is desired to set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone if the called number is associated with an unequipped number group or is associated with a blank hundreds group, the "BTT" cross-connection terminal will be cross-connected to the "RO" cross-connection terminal thereby operating the permanent overflow PMO relay.

21.432 Called Number Associated with Blank Hundreds Group, Operation of the BNTH and BN, RI or PMO Relays

The operation of the BNTH relay will be similar to the description in paragraph 21.4102. However, the operation of the BNTH relay, with the TIN relay operated, will extend ground potential to the "BTT" cross-connection terminal instead of to the "BTL" cross-connection terminal. When it is desired to connect the incoming trunk to a regular intercept trunk if the called number is associated with an unequipped number group or is associated with a blank hundreds group, the "BTT" cross-connection terminal will be cross-connected to the "RI" cross-connection terminal thereby operating the regular intercept RI relay. When it is desired to connect the incoming trunk to a no-such-number tone trunk if the called number is associated with an unequipped number group or is associated with a blank hundreds group, the "BTT" cross-connection terminal will be cross-connected to the "BN" cross-connection terminal thereby operating the blank number BN relay. When it is desired to set the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone if the called number is associated with an unequipped number group or is associated with a blank hundreds group, the "BTT" cross-connection terminal will be cross-connected to the "RO" cross-connection terminal thereby operating the permanent overflow PMO relay.

21.433 Called Number Associated With Changed or Disconnected Number or With Individual Blank Number Which is To Be Treated the Same as Disconnected Numbers, Operation of the TYM and BN, RI or PMO Relays

The operation of the TYM relay will be similar to the description in paragraph 21.4103. However, the operation of the TYM relay, with the NGC, HTUK and TIN relays operated and the PBX-2, TOG-2, RCL, VFL, HGL, VGL, FUL and FTL relays non-operated, will extend ground potential to the "NT" cross-connection terminal instead of to the "NL" cross-connection terminal. When it is desired to connect the incoming trunk to a regular intercept trunk if the called number is associated with a changed or disconnected number or with an individual blank number which is to be treated the same as a disconnected number, the "NT" cross-connection terminal will be cross-connected to the "RI" cross-connection terminal thereby operating the regular intercept RI relay. When it is desired to connect the incoming trunk to a no-such-number tone trunk if the called number is associated with a changed or disconnected number or with an individual blank number which is to be treated the same as a disconnected number, the "NT" cross-connection terminal will be cross-connected to the "BN" cross-connection terminal thereby operating the blank number BN relay. When it is desired to set the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone if the called number is associated with a changed or disconnected number or with an individual blank number which is to be treated the same as a disconnected number, the "NT" cross-connection terminal will be cross-connected to the "RO" cross-connection terminal thereby operating the PMO relay.

21.434 Called Number Associated With Individual Blank Number Which is to Be Treated Differently from Disconnected Numbers, Operation of the TYM and BN, RI or PMO Relays

The operation of the TYM relay will be similar to the description in paragraph 21.4104. However, the operation of the TYM relay, with the NGC, HTUK, VGL, HGL and TIN relays operated and the PBX-2, TOG-2, RCL, VFL, FUL, and FTL relays non-operated, will extend ground to the "GT" cross-connection terminal instead of to the "GL" cross-connection terminal. When it is desired to connect the incoming trunk to a regular intercept trunk if the called number is associated with an individual blank number which is to be treated differently from a disconnected number, the "GT" cross-connection terminal will be cross-connected to the "RI" cross-connection terminal thereby operating the regular intercept RI relay. When it is desired to connect the incoming trunk to a no-such-number tone trunk if the called number is associated with an individual blank number which is to be treated differently from a disconnected number, the "GT" cross-connection terminal will be cross-connected to the "BN" cross-connection terminal thereby operating the blank number BN relay. When it is desired to set the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone if the called number is associated with an individual blank number which is to be treated differently from a disconnected number, the "GT" cross-connection terminal will be cross-connected to the "RO" cross-connection terminal thereby operating the PMO relay.

21.435 Intercept Trunk or No-Such-Number Tone Trunk Connection

The operation of the BN relay will indicate that a connection should be established between the incoming trunk and an idle no-such-number tone trunk. The operation of the RI relay will indicate that a connection should be established between the incoming trunk and an idle regular intercept trunk. If the PMO relay operates the marker will initiate the setting up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the toll operator or calling subscriber as described in paragraph 21.436.

21.4351 Release of the Called Number Information and the Number Group Associated with the Called Blank or Disconnected Number

The release of the called number information and the number group associated with the called blank or disconnected number is similar to the description in paragraph 21.4105.

21.4352 Identification of the Location of the Intercept Trunk or No-Such-Number Tone Trunk

The identification of the location of the intercept trunk or no-such-number tone trunk is similar to the description in paragraph 21.4106.

21.4353 No-Such-Number Tone Trunk or Intercept Trunk Busy Test

The no-such-number tone trunk or intercept trunk busy test is similar to the called line busy test as described in paragraph 12.5.

21.4354 Selection of the Connecting Path

The selection of the connecting path is similar to the description in paragraph 12.6.

21.4355 Setting Up the Selected Connecting Path

Setting up the selected connecting path in similar to the description in paragraph 12.7.

21.4356 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 12.9.

21.436 Initiating Overflow Tone Ringing from Ringing Selection Switch

The operation of the PMO relay will indicate that the marker should initiate the setting up of the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the toll operator or calling subscriber. After setting up the overflow tone ringing condition on the ringing selection switch the marker will release from the connection.

21.4361 Operation of the OV Relay

The operation of the PMO relay, with the TER-2 relay operated, will operate the OV relay.

21.4362 Setting Up the Overflow Tone Ringing Code

The setting up the overflow tone ringing code is similar to the description in paragraph 20.25135.

21.4363 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 20.134. However, those release functions initiated by the operation of the BY relay will in this case be initiated by the operation of the OV relay. Also, since those functions associated with the identification of the called line, with line link frame seizure connecting path selection and line link frame and trunk link frame select magnet operation were not completed, certain relays associated with these functions were not operated and therefore are not released.

21.5 Trouble Intercept Connection

When the marker is assisting a call determines that a connection to the called number cannot be completed because the subscriber's line is out of service, the marker will connect the intra-office or incoming trunk to a trouble intercept trunk. The trouble intercept trunk will connect the calling subscriber to an operator.

The trouble intercept trunks terminates on and are associated with the line link frame. Therefore in setting up a trouble intercept trunk connection a connection will be established from the line link frame associated with the trouble intercept trunk to the trunk link frame associated with the intra-office or incoming trunk.

21.51 Intra-Office Call, Non-PBX Called Number

When the called number is a non-PBX subscriber's line the line out of service will be "plugged-up", on the MDF. When the subscriber's line is "plugged-up" a battery potential will be placed on the ring conductor of the subscriber's line circuit and a ground potential on the tip conductor of the subscriber's line circuit to indicate to the marker that the call should be routed to a trouble intercept trunk.

If all trouble intercept trunks are busy the marker will route advance and will initiate a connection from the calling subscriber line to a tone trunk circuit.

If all tone trunks are busy the marker will route advance and will initiate a connection from the calling line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy when the marker is associated with a coin line or if all common overflow trunks are busy when the marker is associated with a non-coin line the marker will route advance and will place a ground potential on the "BT" lead to the originating register circuit to indicate that the originating register should provide the overflow tone.

The marker will proceed with the intra-office call connection, as described in paragraphs 8.01, 8.02, 8.03, 8.04, 8.05, 8.06, 8.07 and 8.08, until the marker determines, as described in paragraph 21.5101, that the called subscriber is associated with a "plugged-up" line.

21.5101 Called Number Associated With Plugged-Up Line, Operation of the PU, PU-1, RCY, RCY-1 and PUL Relays

After the continuity test has been completed and the CON-1 relay has operated the PU relay will be connected across the tip and ring conductors of the called subscriber line. One side of the winding of the PU relay will be extended to the "BTT" lead with the LGT relay non-operated and the CON-1, GLH-1 and FBK relays operated. The other side of the PU relay winding will be extended to the "BRT" lead with the LGT relay non-operated and the CON-1, GLH-1, GLH and FBK relays operated. The "BTT" and "BRT" leads are extended to the trunk link frame and to the tip and ring conductors of the called subscriber's line. When the subscriber's line is "plugged-up" a battery potential will be placed on the ring conductor of the subscriber's line circuit and a ground potential on the tip conductor thereby operating the PU relay.

The operation of the PU relay will operate the PU-1 relay which in turn will operate the RCY, RCY-1 and PUL relays.

21.5102 Release of the Intra-Office Call Functions and Initiating the Trouble Intercept Trunk Connection Functions

When the marker determines that the calling subscriber should be connected to a trouble intercept trunk the intra-office call functions will be released and then the marker will initiate a connection from the calling subscriber's line to a trouble intercept trunk circuit.

21.51021 Release of the LLC-1/2, ONW, CKG-4, LLI, and TLC-1/3 Relays

The operation of the RCY relay will release the TLC-1/3 relays. The operation of the RCY-1 relay will release the CKG-4 relay which in turn will release the LLC-1/2 and ONW relays. The operation of the PUL relay will release the LLI relay.

21.51022 Release of the Identification of the Location of the Called Line

21.510221 Release of the FTL, FUL, VGL, HGL, VFL, RCL, FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, RCT-1/15, VTK-1, HTK-1 and FTK-1 Relays

The release of the LLI relay will release the VGL, HGL, VFL, FTL, FUL, and RCL relays. The release of the FTL, FUL, VGL, HGL, VFL, and RCL, relays will release the operated FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4 and RCT-1/15 relays which in turn will release the VTK-1, HTK-1 and FTK-1 relays.

21.510222 Release of the PN, TN or PTN Relays

The release of the LLI relay will release the operated PN, TN or PTN relay.

21.51023 Release of the Intra-Office, Non-Reverting, Trunk Selection Functions

21.510231 Release of the AL-0/3, FC-, FCA-, FCK, FCKA and FS- Relays

The operation of the RCY relay will release the operated AL-0/3 relay which will in turn release the FC- and FCA- relays if the AL-0/3 relays are provided. If the AL-0/3 relays are not provided the operation of the RCY relay will release the FC- and FCA- relays. The release of the FC- and FCA- relays will release the FCK and FCKA relays which in turn will release the FS- relay.

21.510232 Release of the FTC- and FCK Relays

All FTC- relays which are operated will be released when the FC- and FCA- relays are released. The release, of the FTC- relays will release the FTCK relay.

21.510233 Release of the Trunk Link and Connector MP, MC, MCA, MCB, MCC and MCD Relays

The release of the TLC-1 relay will release the trunk link and connector MP, MCA, MCB, MCC and MCD relays. The release of the MP relay will release the trunk link frame MC relay.

21.510234 Release of the TFK-1, TFK-2, MAK-1 and MDK Relays

The release of the trunk link and connector MP relay will release the TFK-1 and TFK-2 relays. The release of the trunk link and connector MCA relay will release the MAK-1 relay and the release of the trunk link and connector MCD relay will release the MDK relay.

21.510235 Release of the TB-0/5, TG-0/19 and TS-0/19 Relays

The operation of the RCY relay will release the operated TB-0/5 relay and the operated TG-0/19 relay. The release of the TLC-2 relay will release the operated TS-0/19 relay.

21.510236 Release of the Trunk Circuit F Relay and the Trunk Link Frame FB-, TB-0/5, LV-2/9 and LC-0/9 Relays

The release of the trunk link frame MCA relay will release the trunk circuit F

The marker will proceed with the terminating call connection, as described in paragraphs 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, and 12.7 or in paragraphs 13.1, 13.2, 13.3, 13.4, 13.5, 13.6 and 13.7, until the marker determines, as described in paragraph 21.521, that the called subscriber is associated with a "plugged-up" line.

21.521 Called number Associated With Plugged-Up Line, Operation of the PU, PU-1, RCY, RCY-1 and PUL Relays

After the continuity test has been completed and the CON-1 relay has operated the PU relay will be connected across the tip and ring conductors of the called subscriber line. One side of the winding of the PU relay will be extended to the "BTT" lead with the LGT relay non-operated and the CON-1, GLH-1 and FBK relays operated. The other side of the PU relay winding will be extended to the "BRT" lead with the LGT relay non-operated and the CON-1, GLH-1, GLH and FBK relays operated. The "BTT" and "BRT" leads are extended to the trunk link frame and to the tip and ring conductors of the called subscriber's line. When the subscriber's line is "plugged-up" a battery potential will be placed on the ring conductor of the subscriber's line circuit and a ground potential on the tip conductor thereby operating the PU relay.

The operation of the PU relay will operate the PU-1 relay which in turn will operate the RCY, RCY-1 and PUL relays.

21.522 Release of the Terminating Call Functions and Initiating the Trouble Intercept Trunk Connection Functions

When the marker determines that the calling subscriber should be connected to a trouble intercept trunk the terminating call functions will be released and then the marker will initiate a connection from the incoming trunk to a trouble intercept trunk circuit.

21.5221 Release of the LLC-1/2, ONW, CKG-4 and LLI relays

The operation of the RCY-1 relay will release the CKG-4 relay which in turn will release the LLC-1/2 and ONW relays.

21.5222 Release of the Identification of the Location of the Called Line

21.52221 Release of the FTL, FUL, VGL, HGL, VFL, RCL, FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4, RCT-1/15, VTK-1, HTK-1 and FTK-1 Relays

The release of the LLI relay will release the FTL, FUL, VGL, HGL, VFL and RCL relays. The release of the FTL, FUL, RCL, VGL, HGL, and VFL relays will release the operated FTT-0/3, FUT-0/9, VGT-0/11, HGT-0/9, VFT-0/4 and RCT-1/15 relays which in turn will release the VTK-1, HTK-1 and FTK-1 relays.

21.52222 Release of the PN, TN or PTN relays

The release of the LLI relay will release the operated PN, TN or PTN relay.

21.5223 Release of the Line Link Frame

21.52231 Release of the Line Link and Connector MP, MCA and MCB Relays and the Marker LFK Relay

The release of the LLC-1 relay will release the line link and connector MP, MCA and MCB relays. The release of the MCA relay will release the LFK relay in the marker.

21.52232 Release of the Line Link and Connector VGB-0/11, HG-0/9 and LG-0/11 Relays

The release of the operated VGT-0/11 relay in the marker will release the line link frame VGB-0/11 relay. The release of the LLC-1 relay will release the operated HG-0/9 and LG-0/11 relays in the line link frame.

21.5224 Release of Certain Functions of the Selection of the Connecting Path

21.52241 Release of the PNR, PA, PB, PC, P-0/9, 2G, 3G, TCH-0/9, TCHK, JG-0/4 and JCK-0/1 Relays

The release of the ONW or LLC-1 relay will release the STP-1 or STP-2 relay which will release the PNR, PA, PB or PC relay. The release of the operated, PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the FUT-0/9 relay will release the operated P-0/9 relay which will in turn release the 2G or 3G relay, if operated.

The release of the LLC-2 relay will release the JG-0/4 relay. The release of the trunk link and connector JC-0/19 relay will release the JCK-0/1 relays.

21.52242 Release of the Trunk Link and Connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER Relays

The release of the marker JG-0/4 relay will release the G-0/4, RF, EF, JC-0/19, L, R, EL and ER relays.

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21.51028 Release of the RNG and Operation of the NGC, CKO, CKR, PBX-1/2, LLI and TR1A Relays

The release of the RCY relay will release the RNG relay which in turn will operate the NGC relay. The operation of the NGC relay, with the TBI relay operated, will operate the CKO relay. The released condition of the FTL, FUL, VGL, HGL, VFL and RCL relays with the RCT-10, RGT-0/1, PN, TN relays released and the CKO relay operated will operate the CKR relay.

The operation of the CKR relay with the NGC relay operated and the RCY-3, SPH and TR-2 relays non-operated, will operate the TR1A relay.

The operation of the CKR relay, with the TBI and FLG-1 relays operated and the RNG relay non-operated, will operate the PBX-1 and PBX-2 relays.

The operation of the CKR relay, with the TBIA and FLG-1 relays operated, will operate the LLI relay.

21.5103 Identification of the Location of the Trouble Intercept Trunk

After the intra-office call functions have been released and the LLC-1/2, ONW, CKG-4 and TLC-1/3 relays have been reoperated the marker will proceed with the functions of connecting the calling subscriber to a trouble intercept trunk.

The identification of the location of the trouble intercept trunk is similar to the description in paragraph 21.4106. However, instead of the RIA or BNA relay being operated the TBIA relay will be operated and therefore information will be transmitted to the number group thru the cross-connections of the "TBI-ST", "TBI-HB", "TBI-TB" and "TBI-U" cross-connection terminals instead of thru the "RI-ST", "RI-HB", "RI-TB" and "RI-U" cross-connection terminals.

21.5104 Intra-Office Trunk Selection

The intra-office trunk selection is similar to the description in paragraph 8.05.

21.5105 Trouble Intercept Trunk Busy Test

The intercept trunk busy test is similar to the called line busy test as described in paragraph 8.06.

21.5106 Selection of the Connecting Path to the Trouble Intercept Trunk

The selection of the connecting path to the intercept trunk is similar to the selection of the connecting path to the called line as described in paragraph 8.07.

21.5107 Setting up the Selected Connecting Path to the Trouble Intercept Trunk

The setting up the selected connecting path to the trouble intercept trunk is similar to the setting up the selected connecting path to the called line as described in paragraph 8.08.

21.5108 Releasing the Trouble Intercept Trunk Connecting Path Functions and Initiating the Calling Line Connecting Path Functions

Releasing the trouble intercept trunk connecting path functions and initiating the calling line connecting path functions is similar to the description in paragraph 8.10.

21.5109 Selection of the Connecting Path to the Calling Line

The selection of the connecting path to the calling line is similar to the description in paragraph 8.11.

21.5110 Setting up the Selected Connecting Path to the Calling Line

The setting up the selected connecting path to the calling line is similar to the description in paragraph 8.12.

21.5111 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 8.13.

21.52 Terminating Call, Non-PBX Called Number

When the called number is a non-PBX subscriber's line the line out of service will be "plugged-up" on the MDF. When the subscriber's line is "plugged-up" a battery potential will be placed on the ring conductor of the subscriber's line circuit and a ground potential on the tip conductor of the subscriber's line circuit to indicate to the marker that the call should be routed to a trouble intercept trunk.

If all trouble intercept trunks are busy the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber. After setting up the overflow tone ringing condition on the ringing selection switch the marker will release from the connection.

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relay which in turn will release the trunk link frame FB- relay which in turn will release the LV-2/9 relay. The release of the trunk link and connector circuit MCB relay will release the operated LC-0/9 relays.

The release of the trunk link frame MCB relay in the marker circuit will release the associated TB-0/5 relay in the trunk link and connector circuit.

21.510237 Release of the TBK and LCK Relays

The release of the trunk link frame MCB and MCD relays will release the TBK and LCK relays.

21.510238 Release of the FMK and FML Relays

The release of the TLC-2 relay will release the FMK relay. The release of the TFK-1 relay will release the FML relay.

21.51024 Release of the Non-Reverting Intra-Office Selection of the Connecting Path Functions

21.510241 Release of the Line Link Frame MP, MCA, MCB, VGB-011, HG-0/9 and LG-0/11 Relays

The release of the LLC-1 relay will release the line link and connector MP, MCA, MCB, HG-0/9 and LG-0/11 relays. The release of the line link frame MCA relay will release the VGB-0/11 relay.

21.510242 Release of the STF, PR, 2TLF/10TLF, 20F, 40F, 7Q, RQ, PNR, PA, PB, PC, P-0/9, 2G, 3G, TCH-0/9, TCHK, JG-0/4 and JCK-0/1, Relays

The release of the TCL-3 relay will release the STF or PR relay and the operated 2TLF/10TLF relay. The release of the STF or PR relay will release the 20F or 40F relay and the release of the operated 2TLF/10TLF relay will release the 7Q or RQ relay, if operated.

The release of the ONW relay will release the STP-1 or STP-2 relay which will release the PNR, PA, PB or PC relay. The release of the operated PNR, PA, PB or PC relay will release the operated TCH-0/9 relays which in turn will release the TCHK relay.

The release of the trunk link frame MCC relay will release the operated P-0/9 relay which will in turn release the 2G or 3G relay, if operated.

The release of the LLC-2 relay will release the JG-0/4 relay. The release of the trunk link frame MCB relay will release the JCK-0/1 relays.

21.510243 Release of the Trunk Link and Connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER Relays

The release of the marker JG-0/4 relay will release the trunk link and connector G-0/4, RF, EF, JC-0/19, L, R, EL and ER relays.

21.510244 Release of the TLL-0/9 TJ-0/9, TTL-0/9, TK, CHT, CH-0/9 and CHA relays

The release of the line link frame HG-0/9 relay will release the TLL-0/9 relays. The release of the trunk link frame JC-0/19 relay will release the TJ-0/9 and TTL-0/9 relays.

The release of the LLC-1 relay will release the CH-0/9 and CHA relays. The release of the LLC-2 relay will also release the HMS-1 relay which in turn will release the TK and CHT relays.

21.51025 Release of the Setting up the Connecting Path to the Called Line Functions

21.510251 Release of the Line Link and Trunk Link Frame Select Magnets

The operation of the RCY-1 relay will release the ONX relay which in turn will release the operated select magnets on the line link frame and on the trunk link frame.

21.510252 Release of the Line Link and Trunk Link Frame Hold Magnets

The release of LLC-2 relay will release the operated hold magnets on the line link frame and on the trunk link frame.

21.51026 Operation of the TBI, TBIA, TBIB and Release of the PU-1, RCY and RCY-1 Relays

After the marker has released the intra-office call functions the TBI relay will be operated. The release of the SL, GLH-1, GT-2, CON-1, RCY-3, TK, RK, LK, TCHK, HGK, LCK, JCK-1 and JCK-0 relays with the PUL, HMT-1 and PU-1 relays operated will operate the TBI relay.

The operation of the TBI relay will operate the TBIA and TBIB relays. The operation of the TBIB relay will release the PU-1 relay which in turn will release the RCY and RCY-1 relays.

21.51027 Operation of the LLC-1/2, ONW, CKG-4, and TLC-1/3 Relays

The release of the RCY and RCY-1 relays will result in the reoperation of the LLC-1/2, ONW, CKG-4, and TLC-1/3 relays.

21.52243 Release of the TLL-0/9, TJ-0/9, TTL-0/9, TK, CHT, CH-0/9 and CHA Relays

The release of the line link frame HG-0/9 relay will release the TLL-0/9 relays. The release of the trunk link frame JC-0/19 relay will release the TJ-0/9 and TTL-0/9 relays.

The release of the LLC-1 relay will release the CH-0/9 and CHA relays. The release of the LLC-2 relay will also release the HMS-1 relay which in turn will release the TK relay and the CHT relay.

21.5225 Release of the Setting Up the Selected Connecting Path

21.52251 Release of the Line Link and Trunk Link Frame Select Magnets

The operation of the RCY-1 relay will release the ONX relay which in turn will release the operated select magnets on the link link frame, line and junctor switches and on the trunk link frame junctor and trunk switches.

21.52252 Release of the Line Link and Trunk Link Frame Hold Magnets

The release of the LLC-2 relay will release the operated hold magnets on the line link frame and on the trunk link frame.

21.5226 Operation of the TBI, TBIA, TBIB and Release of the PU-1, RCY and RCY-1 Relays

After the marker has released the terminating call functions the TBI relay will be operated. The release of the SL, GLH-1, GT-2, CON-1, RCY-3, TK, RK, LK, TCHK, HGK, LCK, JCK-1 and JCK-0 relays with the PUL, HMT-1 and PU-1 relays operated will operate the TBI relay.

The operation of the TBI relay will operate the TBIA and TBIB relays. The operation of the TBIB relay will release the PU-1 relay which in turn will release the RCY and RCY-1 relays.

21.5227 Operation of the LLC-1/2, ONW and CKG-4 Relays

The release of the RCY and RCY-1 relays will result in the reoperation of the LLC-1/2, ONW and CKG-4 relays.

21.5228 Release of the RNG and Operation of the NGC, CKO, CKR, PBX-1/2, LLI and TR1A Relays

The release of the RCY relay will release the RNG relay which in turn will operate the NGC relay. The operation of the NGC relay, with the TBI relay operated, will operate the CKO relay. The released condition of the FTL, FUL, VGL, HGL, VFL and RCL relays with the RCT-10, RGT-0/1, PN, TN relays released and the CKO relay operated will operate the CKR relay.

The operation of the CKR relay, with the NGC relay operated and the RCY-3, SPH and TR-2 relays non-operated, will operate the TR1A relay.

The operation of the CKR relay, with the TBI and FLG-1 relays operated and the RNG relay non-operated, will operate the PBX-1 and PBX-2 relays.

The operation of the CKR relay, with the TBIA and FLG-1 relays operated, will operate the LLI relay.

21.523 Identification of the Location of the Trouble Intercept Trunk

After the terminating call functions have been released and the LLC-1/2, ONW and CKG-4 relays have been reoperated the marker will proceed with the functions of connecting the incoming trunk circuit to a trouble intercept trunk.

The identification of the location of the trouble intercept trunk is similar to the description in paragraph 21.4106. However, instead of the RIA or BNA relay being operated the TBIA relay will be operated and therefore information will be transmitted to the number group thru the cross-connections of the "TBI-ST", "TBI-HB", "TBI-TB" and "TBI-U" cross-connection terminals instead of through the "RI-ST", "RI-HB" "RI-TB" and "RI-U" cross-connection terminals.

21.524 Trouble Intercept Trunk Busy Test

The intercept trunk busy test is similar to the called line busy test as described in paragraph 12.5.

21.525 Selection of the Connecting Path

The selection of the connecting path to the intercept trunk is similar to the description in paragraph 12.6. However, the trunk link frame has been seized, as described in paragraph 12.61, and was not released when the marker released the terminating call functions. Therefore the functions associated with the seizure of the trunk link frame have been previously completed.

21.526 Setting Up the Selected Connecting Path to the Trouble Intercept Trunk

The setting up the selected connecting path to the trouble intercept trunk is similar to the description in paragraph 12.7.

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21.527 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 12.9.

21.53 Intra-Office Call, PBX Called Number

On calls to non-hunting numbers which are plugged-up, the marker distinguishes the plugged-up condition by finding the proper potential on the tip and ring conductors. This method cannot be used on calls to hunting numbers because improper operation of the PBX may present conditions on the tip and ring conductors which look to the marker like the plugged-up line signal.

If it is desired to take out of service one or more lines but not all lines of a PBX line group the lines which it is desired to take out of service will be made-busy. The marker in performing the terminal hunting functions will not select one of these made-busy lines for service but will select one of the lines in the PBX line group which is both idle and is not made-busy. Therefore the marker operations will proceed in a manner similar to the description in paragraph 8, and no further description of this condition is necessary.

If it is desired to take out of service all of the lines in a PBX line group they all are made busy except the first PBX line which is associated with the dialed directory number. The "G-" and "F-" cross-connection terminals in the number group which are associated with the first PBX line will be disconnected. Therefore, the marker in performing the terminal hunting functions will recognize that only the "L-" cross-connection terminal is cross-connected to provide information to the marker and the marker should establish a connection from the intra-office trunk to the trouble intercept trunk. The marker operations for establishing a connection from the intra-office trunk to the trouble intercept trunk are described in the following paragraphs.

If all trouble intercept trunks are busy the marker will route advance and will initiate a connection from the calling subscriber line to a tone trunk circuit.

If all tone trunks are busy the marker will route advance and will initiate a connection from the calling line to a common overflow trunk if the class of service of the calling line indicates a non-coin line.

If all tone trunks are busy when the marker is associated with a coin line or if all common overflow trunks are busy when the marker is associated with a non-coin line the marker will route advance and will place a ground potential on the "BT" lead to the originating register should provide the overflow tone.

When the marker attempts to set up a call to a PBX directory number of which all of the PBX lines within the PBX line group are out of service the marker will proceed with the intra-office call connection, as described in paragraphs 8.01, 8.02, 8.03 and 8.04, until the marker determines, as described in paragraph 21.5301, that the called subscriber is associated with a PBX line group all of which PBX lines are out of service.

21.5301 Called Number Associated With PBX Line Group Which is Out of Service, Operation of TYM and TBI Relays

The marker will proceed with the intra-office call connection functions until the marker initiates the number group translation, as described in paragraph 8.042. However, in the number group there are cross-connections to the "F-000/999" and "G-000/999" cross-connection terminals associated with this called number. Therefore, the number group will not extend the battery potential on the "WF" and "WG" leads to the "VG-0/11", "HG-0/9" "VF-0/4" and "RC-1/15" leads which are extended to the marker to operate the VGN-0/11, HGN-0/9, VFN-0/4 and RCN-1/15 relays, as described in paragraph 8.0425. Since the VGN-0/11, HGN-0/9, VFN-0/4 and RCN-1/3 relays are not operated, the VGT-0/11, HGT-0/9, VFT-0/4, RCT-1/15, VGL, HGL, VFL and RCL relays will not be operated as described in paragraph 8.0426. However, in the number group the "L-000/999" cross-connection terminal associated with this called number is cross-connected therefore the number group will extend battery potential on the "WL" lead to the "FT-0/3" "FU-0/9" leads which are extended to the marker to operate the FTN-0/3, FUN-0/9, FTL and FUL relays, as described in paragraph 8.0425.

The marker will start the TYM timing circuit when the HTUK relay is operated. When the called number is associated with a PBX line group which is not out of service the called number will be translated, the number group released and the TYM timing circuit recycled before the end of the TYM timing circuit timing and therefore the marker will proceed with the intra-office call in the usual manner. However, when the called number is associated with a PBX line group which is out of service the TYM timing circuit will time-out and the TYM relay will be operated.

The operation of the HTUK relay removes ground potential from the secondary winding of the TYM relay and the short circuit from the TYM condenser. This permits the TYM condenser to charge through the 2600 ohm winding of the TYM relay and the TYM-0 resistance. After an interval of time the condenser is fully charged, the current flow through the 2600 ohm relay winding will cease and the TYM relay will operate on its 200 ohm winding in series with the 2108 ohm TYM-1 resistance.

The operation of the TYM relay, with the NGC, HTUK, FUL and FTL relays operated and the PBX-2, TOG-2, RCL, VFL, HGL, VGL, BN and RI relays non-operated, will operate the trouble intercept TBI relay.

21.5302 Release of the Called Number Information and the Number Group Circuit

The release of the called number information and the number group circuit is similar to the description in paragraph 21.4105.

21.5303 Identification of the Location of the Trouble Intercept Trunk

The identification of the location of the trouble intercept trunk is similar to the description in paragraph 21.4106. However, instead of the RIA or BNA relay being operated the TBIA relay will be operated and therefore information will be transmitted to the number group through the cross-connections of the "TBI-ST", "TBI-HB", "TBI-TB" and "TBI-U" cross-connection terminals instead of through the "RI-ST", "BN-ST", "RI-HB", "BN-HB", "RI-TB", "BN-TB", "RI-U" and "BN-U" cross-connection terminals.

21.5304 Intra-Office Trunk Selection

The intra-office trunk selection is similar to the description in paragraph 8.05.

21.5305 Trouble Intercept Trunk Busy Test

The intercept trunk busy test is similar to the called line busy test as described in paragraph 8.06.

21.5306 Selection of the Connecting Path to the Trouble Intercept Trunk

The selection of the connecting path to the intercept trunk is similar to the selection of the connecting path to the called line as described in paragraph 8.07.

21.5307 Setting Up the Selected Connecting Path to the Trouble Intercept Trunk

The setting up the selected connecting path to the trouble intercept trunk is similar to the setting up the selected connecting path to the called line as described in paragraph 8.08.

21.5308 Releasing the Trouble Intercept Trunk Connecting Path Functions and Initiating the Calling Line Connecting Path Functions

Releasing the trouble intercept trunk connecting path functions and initiating the calling line connecting path functions is similar to the description in paragraph 8.10.

21.5309 Selection of the Connecting Path to the Calling Line

The selection of the connecting path to the calling line is similar to the description in paragraph 8.11.

21.5310 Setting Up the Selected Connecting Path to the Calling Line

The setting up of the selected connecting path to the calling line is similar to the description in paragraph 8.12.

21.5311 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 8.13.

21.54 Terminating Call, PBX Called Number

The marker when assisting a terminating call will determine, in the same manner as described in paragraph 21.53, that the incoming trunk should be connected to a trouble intercept trunk.

If all trouble intercept trunks are busy the marker will set up the overflow tone ringing condition on the ringing selection switch so that the incoming trunk can provide the overflow tone to the calling subscriber. After setting up the overflow tone ringing condition on the ringing selection switch the marker will release from the connection.

The marker will proceed with the terminating call connection, as described in paragraphs 12.1, 12.2, 12.3, and 12.4 or paragraphs 13.1, 13.2, 13.3 and 13.4, until the marker determines that the called subscriber is associated with a PBX line group all of which PBX lines are out of service.

21.541 Called Number Associated with PBX Line Group Which is Out of Service, Operation of TYM and TBI Relays

The operation of the TYM and TBI relays will be similar to the description in paragraph 21.5301.

21.542 Release of the Called Number Information and the Number Group Circuit

The release of the called number information and the number group circuit is similar to the description in paragraph 21.4105.

21.543 Identification of the Location of the Trouble Intercept Trunk

The identification of the location of the trouble intercept trunk is similar to the description in paragraph 21.4106.

21.544 Trouble Intercept Trunk Busy Test

The trouble intercept trunk busy test is similar to the called line busy test as described in paragraph 12.5.

21.545 Selection of the Connecting Path

The selection of the connecting path is similar to the description in paragraph 12.6.

21.546 Setting Up the Selected Connecting Path

Setting up the selected connecting path is similar to the description in paragraph 12.7.

21.547 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 12.9.

21.6 Service Observing Call

The service observing feature is provided to initiate the printing of a detailed four line entry on the AMA tape. The service observing feature is only used with lines that have AMA service. There are two types of line observing either complaint or routine. Complaint observing is used with subscriber lines on which there have been subscriber complaints. Routine observing is used to check office performance. In both cases the operation of the marker is identical.

21.61 Service Observing Operation with Dial Tone Marker Functions

21.611 Operation of the OBS-1 Relay

The functions of the observing line circuit will be initiated with the operation of the HMS-1 relay. When the observing line circuit has completed its operation, resistance ground will be transmitted to the marker on the "OBS" lead from the line link frame. This resistance ground will operate the OBS-1 relay. The OBS-1 relay in operating will lock up to ground with the CKG-6 relay operated. The service observing circuit will check that the OBS-1 relay in the marker has operated by recognizing the OBS-1 relay locking ground on the "OBS" lead to the line link frame and will initiate its functions. The operation of the OBS-1 relay indicates that the calling line being served is connected for complaint or routine service observing.

If the "OBS" lead is grounded falsely before the operation of the HMS-1 relay, the OBS-1 relay will be operated and will prevent the operation of the LTR relay. This forces the marker to time out and take a trouble record. The test is only made on light traffic operation and is cancelled during heavy traffic operation.

21.612 Operation of the OBS-2 Relay

The operation of the OBS-1 relay will initiate the operation of the service observing relay in the originating register. The operation of the OBS-1 relay with the CKG-6 relay operated will extend ground through the OBS-1 resistance and through the primary winding of the OBS-2 relay to the "OBS" lead to the trunk link and connector. This resistance ground on the "OBS" lead will operate the service observing relay in the originating register. The service observing relay in the originating register when operated will lock up to ground. This ground will be transmitted to the marker on the "OBS" lead from the trunk link and connector to operate the OBS-2 relay.

21.62 Service Observing Operation with Completing Marker Functions

The originating register will inform the marker that this call is associated with a line that requires the service observing feature. Ground will be extended to the marker from the originating register thru the originating register marker connector cut-in relays on the "OBS" lead. Ground on the "OBS" lead will operate the OBS relay in the marker as an indication of a service observing call. However, if the service observing feature was not required for this call, ground would be extended to the marker on the "NOB" lead from the originating register thru the originating register marker connector. Ground on the "NOB" lead will operate the NOB relay as an indication that service observing is not required.

The marker checks that only the NOB or the OBS relay operates.

The marker will relay the information that the service observing feature is required for this call by grounding the "OBS" lead to the outgoing sender connector. The outgoing sender will then transmit the information that a detailed four line entry should be printed on the AMA tape.

22. TEST CALLS OR CONNECTIONS ASSISTED BY THE MARKER

The marker circuit will assist a test connection initiated at the master test frame, will assist the automatic monitor on calls which are being monitored, will assist no-test, no-hunt and special hunt test calls, and will assist a ringer test connection.

The master test frame test connections which the marker will assist are the marker test connections, the register and sender test connections, the trunk test connections, the marker line verification tests and the subscriber line tests.

The automatic monitor circuit will monitor calls associated with an originating register, an incoming register and an outgoing sender. The automatic monitor circuit provides means for automatically sampling service calls handled by registers and senders. It performs its functions by checking the performance of a register or sender. The automatic monitor functions on a sampling basis and the circuit to be sampled is selected at random.

No-test calls are originated at the local or central DSA switchboard, no-hunt calls are originated at the message register rack or at the master test frame, and special hunt test calls are originated at the local or central test desk.

The ringer test connection is originated by a maintenance man at the subscriber's station to test for proper ringing. To initiate the ringer test connection the maintenance man will dial a special ringer test code instead of the office code digits and will then dial the numerical digits of the subscriber's station. After receiving a tone signal the maintenance man will hang-up the receiver and wait for the ringing at the subscriber's station.

The service observing feature is provided to initiate the printing of a detailed four line entry on the AMA tape. The service observing feature is only used with lines that have AMA service.

22.1 Master Test Frame Test Connections

The master test control circuit controls all of the testing functions of the master test frame. The functions of the master test frame tests with which the marker is associated are:

(1) To test the marker and its connecting circuits.

(2) To control the connections required by the automatic monitor register and sender test circuit.

(3) To control the connections required by the trunk test circuit.

(4) To verify line cross-connections in the number group.

(5) To control the connections required by the subscriber line test circuit.

The detailed description of the method of initiating a test call from the master test frame is described in the master test control circuit CD-25800-01.

In making master test frame tests, the marker is primed with information set up on keys of the master test control circuit and closed through on leads corresponding to those of the circuit which the test circuit is simulating. The marker functions in accordance with the information with which it is primed, makes required translations, connects to line and trunk link frames, number group, registers and senders as required and sets up connections through linkages in as nearly a normal manner as is consistent with avoiding interference with service.

When the marker is associated with a master test frame test connection, the marker relays will be operated in a manner similar to the operation under service conditions except that the master test control circuit will simulate certain of the circuits to which the marker would connect to under service conditions. However, in addition to the operation of these relays other marker test relays in the marker will be operated as follows:

Desig.	Function
MT	Operates on all test calls - controls operation of other test relays.
MT1	Opens circuits in marker to provide test control and blocking points.
MT2	Operates only when a particular sender is to be selected.
MT3 MT3A MT4 MT4A	Operate only when a particular trunk link frame is to be selected - Battery is supplied by test circuit on lead corresponding to frame to be selected - When MT9 is operated FS (0-19) relays will not operate.
MT9	Operates along with MT3, MT3A, MT4, MT4A when a particular trunk link frame is to be selected without first testing for busy on dial tone, outgoing, IAO (intraoffice or intermarker group class of trunk test), etc. calls. Test frame gives frame number on FG (0-1) and TF (0-7) leads. MT9 relay operated caused marker to select trunk link frame in same manner it does on terminating calls.
MT5 MT6	Operate instead of TSE2 and TSE3 relays only when a particular trunk is to be selected. Test frame supplies battery on lead corresponding to trunk to be selected.
MT7	Operates only when a particular channel is to be selected. Test frame supplies ground on lead corresponding to channel to be selected.
MT8	Operates only when marker is to be reset to select a particular junctor walking position.
MT10	Operates only when marker is to be directed to hunt to a particular PBX number. Test frame supplies ground on lead corresponding to units digit of number.
MT11	Operates on all test calls. Opens VFT (0-4) leads to prevent service dial tone attempts from interfering with test calls. Also opens class of service and line

Desig.	Function
	hold magnet leads to give test frame control of these functions.
MT12	Operates only on marker test calls and certain trunk tests where marker is required to operate TT relay in trunk and give ND signal to sender if trunk has a TT relay. Also applies operate test to GT relay and prevents AMA relay of out sender from operating on AMA calls.
MT13	Prevents alarms and operation of traffic and plant registers on test calls.
MT14	Opens and transfers leads to give test access and blocking points. Insures that senders used on AMA tests receive a TVT instead of an SC signal.
MT15	Operates only on dial tone marker tests and originating register tests - Causes one of the FTT (0-3) relays to operate to close start leads to line link frame. This is necessary because no line link marker connector is used on test calls.
MT16 MT17	Operates only on marker test calls for use in testing no test features. (Provided only in special markers.)
MT18	Operates on all master test frame test calls to disable peg-count.
MT19 MT20	Operate only for line verification test calls only for verifying PBX sleeve cross-connections. (Provided only in special markers.)

22.11 Marker Test Connections

Three general marker test classes are provided wherein the master test control circuit simulates the three classes of marker seizure by directing the connection to the desired marker via the master test frame connector. The marker tests are divided into three general classes as follows:

(1) The dial tone class which simulates a dial tone connection.

(2) The originating class which simulates an intraoffice call connection and an outgoing call connection.

(3) The incoming class which simulates a terminating call connection.

In testing a marker, the functions of the frames and circuits to which it connects are also tested. The marker is prevented from operating the line hold magnets. Instead, the operation of the line hold magnet is simulated by the master test frame. If the marker encounters a trouble during a test, it calls in the trouble recorder to take a record after which it functions as it would in service to complete the connection or to give a trouble release.

If the record REC key is operated at the master test frame the marker is blocked just before it starts to release connecting circuits and a record is taken on the trouble recorder of the progress, route and connecting circuits involved.

Upon receiving a regular or trouble release from the marker, the master test frame control circuit lights a corresponding lamp and releases the master test frame connector and the marker.

22.111 Dial Tone Class Marker Test

On a dial tone class of marker test, the master test control circuit simulates those parts of a line link frame which function with the marker through the line link marker connector. By means of the keys on the master test control circuit the dial tone class of marker test and the particular marker to be tested is selected. Also by means of keys on the master test control circuit the line location and other conditions of the dial tone class marker test are selected to simulate service conditions.

22.112 Originating Class Marker Test

On an originating class of marker test, the test circuit simulates an originating register. By means of the keys on the master test control circuit the originating class of marker test and the particular marker to be tested is selected. Also by means of keys on the master test control circuit the called subscriber office code and digits, the originating line location the class of service and other conditions of the originating class of marker test are selected to simulate service conditions. A test connection will be established, according to the keys which were operated on the master test control circuit, to simulate one of the following service connections.

(1) From the originating line location to an outgoing trunk without a sender required.

(2) From the originating line location to an outgoing or inter-marker group trunk with a sender required.

(3) From the terminating line location to an intraoffice trunk and from the originating line location to the intraoffice trunk.

(4) From the originating line location to a reverting intraoffice trunk.

22.113 Incoming Class Marker Test

On an incoming class of marker test, the test circuit simulates an incoming trunk and an incoming register. By means of the keys on the master test control circuit the incoming class of marker test and the particular marker to be tested are selected. Also by means of keys on the master test control circuit the called number, the trunk link frame number and other conditions of the incoming class of marker test are selected to simulate service conditions. A test connection will be established, according to the keys which are operated on the master test control circuit, to simulate one of the following service conditions.

(1) From the called line location to the trunk link frame on which the simulated trunk is made to seem to appear. Operation of hold magnets, on the trunk link frame is simulated.

(2) From the line location of a simulated toll or tandem incoming trunk to an outgoing trunk.

22.12 Register and Sender Test Connections

The master test control circuit provides the means of controlling the connection to be established for the testing of a register or sender circuit and also provides means of selecting a particular register or sender for test. The register and senders are tested by the automatic monitor register and sender test circuit. When the automatic monitor register and sender test circuit is used to test a register or a sender, the master test control circuit is used to set up the test connection and to furnish the control of the called number and the calling line location information which is to be used on the test. After the connection has been established to the register or sender under test, the particular tests to be applied and the checks for satisfactory completion are under control of the automatic monitor register and sender test circuit.

The trouble recorder will be attached and a record perforated if the marker encounters trouble in establishing the test connection. If no trouble is encountered a record will be taken only when the "record" key is operated. This records marker operation and identifies connecting circuits but does not record the results of the tests by the automatic monitor register and sender test circuit. The automatic monitor register and sender test circuit will cause a record to be perforated if the number pulsed into the register does not match the number passed from the register to the marker or, when testing senders, if the number passed from the marker to the sender does not match the number pulsed out by the sender.

The master test control circuit works in conjunction with the automatic monitor register and sender test circuit in making tests of originating registers, incoming registers and senders.

22.121 Originating Register Test Connection

On an originating register class of test, the master test control circuit connects to the automatic monitor register and sender test circuit and, after determining that it is ready for a test, gives the automatic monitor register and sender test circuit a start signal and proceeds to connect to a marker which is directed to set up a test connection either from an originating test line or through the no test connector to a particular originating register. When the marker has set up the connection to the originating register it returns a release signal to the master test control circuit which releases the marker.

The automatic monitor register and sender test circuit pulses a number selected by keys on the master test control circuit into the originating register in a manner to simulate the calling subscriber dialing the called subscriber directory number. The number selected by keys on the master test control circuit is transmitted directly to the automatic monitor register and sender test circuit and stored on register relays when the originating register circuit has received the necessary number of digits from the pulsing circuit, it connects to a marker and transmits the called number information to the marker. At this time the master test frame connector is also seized by a signal from the marker and as the marker receives this information from the originating register the automatic monitor register and sender test circuit receives and records the same information through the master test frame connector circuit. The automatic monitor register and sender test circuit will then compare the number which was dialed into the register and the number which the register transmitted to the marker. If these numbers do not match a trouble record is perforated to indicate an originating register test failure.

22.122 Incoming Register Test Connections

On an incoming register class of test the master test control circuit connects to the automatic monitor register and sender test circuit and after determining that it is ready for a test, gives the automatic monitor register and sender test circuit a start signal. The automatic monitor register and sender test circuit proceeds to set up a connection to the incoming register and to test it. Keys of the master test control circuit are used to control some of the information normally received by the incoming register via the register link such as incoming class of call. The called number keys of the master test control circuit are used to control the number pulsed into the incoming register by the automatic monitor register and sender test circuit. The master test control circuit makes no connection to a marker on this class of test. When the incoming register has received the required number of digits it connects to a marker and gives a signal which causes the automatic monitor register and sender test circuit to be connected to the marker. Connection to a marker and registration of information in the automatic monitor register and sender test circuit is accomplished in the same manner as for an originating register test. Also, the method of checking the registered numbers is similar to that described for an originating register test.

The detailed description of the operations of a marker when associated with automatic monitor register and sender test circuit is described in CD-25680-01. Therefore, no detailed circuit description will be given in this circuit description.

22.123 Outgoing Sender Test Connections

On a sender class of test, the master test control circuit connects to the automatic monitor register and sender test circuit and, after determining that it is ready for a test gives the automatic monitor register and sender test circuit a signal and proceeds to connect to a marker which it directs to set up a test connection either from an originating test line or through the no test connector to an outgoing trunk and to connect to that trunk a particular sender. When the master test control circuit is connected through the master test frame connector to the marker, it signals the automatic monitor register and sender test circuit to also connect to the master test frame connector so that it can be provided with information received by the marker from the master test control circuit and transmitted by the marker to the sender. When the marker has completed setting up the connection it gives a release signal to the master test control circuit which releases the marker. However, a connection between the sender circuit and the automatic monitor register and sender test circuit is held. The automatic monitor register and sender test circuit checks, by its connection to the sender circuit, the information pulsed out by the sender against the number which was set up in the marker by the test circuit.

22.13 Trunk Test Connections

The master test control circuit works in conjunction with the trunk test circuit in making tests of nearly all types of trunks in the No. 5 Crossbar office and incoming trunks in distant offices. In general the master test control circuit directs the marker to set up the test connection and the trunk test circuit tests the trunk.

22.131 Outgoing Trunk Test

The outgoing trunk class of trunk test is used for testing outgoing trunks which require senders and for testing subscriber to trunk intermarker group trunks. The master test control circuit connects to the trunk test circuit, and signals it to prepare for a test of an outgoing trunk. The master test control circuit simulates an originating register and proceeds to connect to a marker which it directs to set up a connection from the originating test line to the outgoing trunk to be tested. The marker is signalled to operate the TT relay in the trunk which gives the trunk test circuit access to the outgoing end of the trunk. A signal is given to the sender to allow it to release without pulsing.

22.132 Intra-office Trunk Test

The intra-office trunk class of trunk test is used for testing intra-office trunks where the connection is to be completed to the trunk test circuit terminating test line. The master test control circuit connects to the trunk test circuit and signals it to prepare for an intra-office class of trunk test. The master test control circuit proceeds to connect to a marker which it directs to set up a connection to the intra-office trunk to be tested.

22.133 Incoming Trunk Test

There are two types of incoming trunk class of trunk tests, the incoming trunk class of trunk test for testing incoming trunks which are within the office and the incoming trunk class of trunk test for testing incoming trunks in distant offices.

The general description of the incoming trunk test for testing trunks which are within the office is as follows. Before starting the test, the trunk test circuit is patched to the incoming trunk to be tested. The master test control circuit connects to the trunk test circuit and signals it to prepare for an incoming trunk class of trunk test. The trunk test circuit puts a closure on the tip and ring leads to the incoming trunk and grounds its "D" lead. The trunk connects to an incoming register and extends the grounded "D" lead which causes the register to recognize that it is handling a test call. The register connects to a marker without waiting for a number to be pulsed and operates the TST relay in the marker as a test signal. The marker upon receiving the test signal connects through the master test frame connector to the master test control circuit which supplies the number of the line to which the trunk is to be connected. The marker then proceeds to set up the connection for completion to a number in the No. 5 Crossbar office.

The general description of the incoming trunk test for testing incoming trunks in distant offices is as follows. The master test control circuit connects to the trunk test circuit and signals it to prepare for a test of an incoming trunk in a distant office. The test circuit simulates an originating register to connect to a marker which it directs to set up a connection from the originating test line to that outgoing trunk which is cabled to the incoming trunk which is to be tested in the distant office. The TT relay of the outgoing trunk is operated to give the trunk test circuit access to the outgoing end of the outgoing trunk and to the tip and ring of the distant incoming trunk. The sender which the marker connects to the outgoing trunk is primed with the number to which the incoming trunk is to be directed. Pulses from the sender direct the setting up of the connection in the distant office to the called line.

22.134 Miscellaneous Trunk Test

The miscellaneous class of trunk test is used for making miscellaneous tests of many types of trunks including:

- Outgoing trunk with senders
- Intra-office trunks
- Subscriber to subscriber inter-marker group trunks
- Subscriber to trunk inter-marker group trunks
- Stuck coin trunks
- Permanent signal holding trunks
- Recording completing trunks
- Special service trunks
- Tone trunks
- Common overflow trunks
- Reverting call trunks
- Service trunks
- Station ringer test trunks

The master test control circuit connects to the trunk test circuit, signals it to prepare for a miscellaneous class of test and, after receiving a signal that the trunk test circuit is normal, grounds its start lead and proceeds to connect to a marker which is directed to set up a connection from the originating test line to the trunk to be tested.

22.14 Marker Line Verification Test

The marker line verification class of test is used to verify the cross-connections in the number group and the class of service cross-connections in the line link frame for any line and for intercept and similar trunks to which arbitrary class of service and line number have been assigned.

The numerical digits, the line location, the ringing combination and the office code (in terms of office "A" or "B", physical or theoretical) of the line to be verified are set up on keys of the master test control circuit. The master test control circuit simulating a no hunt incoming trunk and incoming register, connects to and primes a marker with the office indication and the number of the line. The marker connects to a number group to obtain the line location and then connects to the line link frame to which it is directed by the number group. The line location and ringing combination received from the number group and the class of service received from the line link frame are matched against the operated keys of the test circuit.

22.15 Subscriber Line Test

The line test class of test is used to set up a connection from the master test frame voltmeter test circuit to any line for making tests of the line.

The office code (expressed in terms of office "A" or "B" physical or theoretical) and numerical digits of the line to be tested are set up on keys of the master test control circuit. The master test control circuit, simulating a no hunt incoming trunk and an incoming register, connects to a marker and primes it with the office indication and number of the line. The marker sets up a connection from the test circuit incoming trunk appearance on a trunk link frame to the line to be tested. The tip and ring conductors are extended through the master test control circuit to the master test frame voltmeter test circuit.

22.2 Automatic Monitored Call

The automatic monitor register and sender test circuit checks the performance of the originating registers, incoming registers and outgoing senders by automatically monitoring on service calls. In monitoring the input station number to a register or sender is compared with its output station number and if the two do not match a trouble record is made.

The automatic monitor register and sender test circuit, referred to as the monitor in the following description, is arranged to monitor successively on originating registers, outgoing senders and incoming registers. However, monitoring can be confined to originating registers only, to outgoing senders only or to incoming registers only. A further choice permits exclusive monitoring on a particular register or sender.

The detailed description of the method of initiating a monitored call is described in the automatic monitor register and sender test circuit CD-25680-01.

22.21 Monitoring on Originating Registers

At the time a marker establishes a dial tone connection it requests the use of the monitor on that call. The marker which is successful in selecting the monitor will connect the selected originating register to the monitor. The monitor then remains attached to that register during the period of register usage. A high impedance pulse amplifier of the monitor is connected across the incoming tip and ring to the register. During dialing the digits are recorded in the register and also independently in the monitor.

When all digits have been received the register selects a marker and signals this fact to the monitor. In response to this signal the monitor selects the master test frame connector to gain access to the marker. A signal is also passed from the monitor thru the register to the marker to inform it that it is a monitored call. In addition to performing other functions associated with monitoring the marker cuts through a number of signalling leads between the monitor and marker. Over one of these leads the monitor operates several multicontact relays associated with that marker but located in the master test frame connector. These relays give the monitor access to the leads from register to marker which transmit the called number. Similar cut-in relays at the monitor end of the master test frame connector were operated when that circuit was selected by the monitor.

The number passed from the register to marker is registered on relays in the monitor and after a sufficient registration interval the monitor releases the connection through the master test frame connector. The monitor then compares the number it recorded from the register input with the number passed from register to marker. If they are the same the monitor restores to normal and accepts the next call. If the numbers do not match the monitor again selects the master test frame connector, this time to gain access to the trouble recorder.

To monitor on a particular register the master test control circuit is used to seize a marker and direct it to the desired register. During this operation the register is connected to the monitor. The call is then abandoned restoring all circuits to normal but leaving the register connected to the monitor. All calls reaching that register are then monitored.

22.22 Monitoring on Incoming Registers

When a trunk selects a register the register requests the use of the monitor on that call. If the register successfully selects the monitor the register will be connected to the monitor for the duration of register usage. The operation from this point on is similar, with minor variations, to the description for monitoring the originating register.

22.23 Monitoring on Outgoing Senders

At the time that the marker is establishing an outgoing call which requires a sender the marker requests the use of the monitor on the call. The monitor gains access to the marker thru the master test frame connector.

The number passed from register to marker is then registered in the monitor. This is the number which is passed through the marker to the outsenders. At the same time information passed to the outgoing sender such as the number of digits to delete and an arbitrary digit, if any, are recorded in the monitor. This latter information is used to modify the check path through the recorded digits to correspond to the digits to be outpulsed by the sender. When the marker first connects to the outgoing sender it connects the outgoing sender to the monitor, this latter connection remaining until the sender restores to normal.

During the time the monitor is connected to the marker the monitor records the location of the trunk used on the call. When the marker has progressed to the point of connecting the trunk to the calling line, the monitor releases the connection thru the master test frame connector to the marker, the marker releasing normally. The monitor then records the outpulsed number and upon completion of pulsing compares the outpulsed number with that received from the marker. If they match the monitor releases. If they do not match the monitor leaves a trouble record and then releases.

When monitoring on a particular sender the sender is marked so that it tells the marker that it is a monitored call each time the sender is selected. The marker then selects the monitor directly and the call proceeds as described.

22.3 No Test, No Hunt and Special Hunt Test Calls

No-Test calls are originated at the local or central test desk and the local or central DSA board.

No-Hunt calls are originated at the message register rack and the master test frame.

Special-Hunt test calls are originated at the local or central test desk.

For all of these special calls a "special" marker, having additional circuits over the regular marker, is required. Any of these special calls cause the marker connectors to select only a "special" marker. Usually two markers of a marker group are equipped to handle these special calls in addition to regular calls.

22.31 No-Test Call

No test calls are made when an operator or test desk man wishes to connect to a given subscriber line. The no test call will connect to the subscriber line even if the subscriber line is busy. No test trunks appear on the trunk link frame. When a no test call is originated, the trunk circuit associates itself with an incoming register. The called number is then dialed using only the numericals but preceded by a directing digit if the marker group serves more than one number series. The register engages a special marker and the marker proceeds normally to line-busy test. If the called line is idle, the marker establishes a connection between the line and the trunk using a connecting path as for a terminating call. If the called line tests busy, the marker completes the call through the no-test connector.

The no-test connector is a circuit including a crossbar switch which has a horizontal connected to the no-test trunk and the verticals connected to the no-test verticals of the line link frames. The no-test connector allows a connection directly between the no-test trunk and the line switch containing the called number.

22.311 No-Test Call With Called Subscriber Line Idle

The no-test call with the called subscriber line idle is similar to a terminating call, as described in paragraph 12, except that the marker being informed that this is a special call will cancel the ground test and the continuity test. If the called subscriber line is in a terminal hunting group, the connection is established to the subscriber line whose number was dialed regardless of its being idle or busy, since terminal hunting is not allowed on a no-test call.

22.3111 Seizure of the Marker By The Incoming Register

The seizure of the marker by the incoming register is similar to the description in paragraph 12.1.

22.3112 Registration of Information From The Incoming Register

The registration of information from the incoming register is similar to the description in paragraph 12.2. However, to identify this call as a special call the "SPL" lead will be grounded by the incoming register marker connector thereby operating the SPL and SPL-1 relays in offices not equipped with the PBX allotter. In offices equipped with the PBX allotter, however, ground on the "SPL" lead will operate the SPLC relay. The SPLC relay in operating will operate the SPL and SPL-1 relays.

22.3113 Identification of the Basic Call or Connection

The identification of the basic call or connection is similar to the description in paragraph 12.3 since the marker operations required are similar to a terminating call. However, the operation of the SPL and SPL-1 relays, and if required the SPLC relay will identify this call as a special call.

22.3114 Identification of the Location of the Called Line

The identification of the location of the called line is similar to the description in paragraph 12.4. If the called subscriber line is in a terminal hunting group the marker will proceed to identify the location of the called line as described in paragraph 8.042 and will not proceed with terminal hunting as described in paragraph 8.043. This is to insure that the particular subscriber line which is desired will be connected to the no-test trunk. If terminal hunting was permitted the person initiating the no test call would be unable to determine to which subscriber line, within the terminal hunting group, a connection had been made.

The operated SPL-1 relay will prevent the operation of the PBX-1/2 relays and therefore the marker will proceed in the same manner as for a non-terminal hunting subscriber line.

22.3115 Called Line Busy Test

The called line busy test is similar to the description in paragraph 12.5.

22.3116 Selection of the Connecting Path

The selection of the connecting path is similar to the description in paragraph 12.6.

To prevent interactions which would occur if two markers were simultaneously setting up special calls the master test frame lockout circuit will be used to permit only one marker at a time to set up a special call. The operation of the SPL-1 relay, as described in paragraph 22.3112, will extend battery potential over the "SP" lead to the Master Test Frame Connector Circuit. If this marker is the only marker setting up a special call the associated special call preference SP-relay in the Master Test Frame Connector Circuit will be operated, thereby extending ground potential over the "SPC" lead to the marker to operate the SPC relay. The operation of the SPC relay with the SFT relay non-operated will operate the SFR relay.

On a special call the trunk link frame seizure will not be initiated until the SFR relay has operated as a check that this marker has the preference in setting up a special call.

22.3117 Setting Up the Selected Connecting Path

The setting up the selected connecting path is similar to the description in paragraph 12.7.

However, the operation of the SPL relay has operated the cancel ground test CGT relay which will cancel the ground, loop or receiver-off-hook test as described in paragrapy 12.733, and has operated the cancel continuity test CCT relay which will cancel the continuity test as described in paragraph 12.732

22.3118 Setting Up The Selected Ringing Code

The setting up the selected ringing code is similar to the description in paragraph 12.8.

22.3119 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 12.9.

22.312 No-Test Call With Called Subscriber Line Busy

When the marker in assisting a no-test call determines that the called subscriber line is busy, the marker will be unable to set up a connection from the no-test trunk to the subscriber line in the manner as described in paragraph 22.311.

The called line busy condition indicates to the marker that a regular connection exists between the called subscriber line associated with the line link frame and a trunk circuit associated with the trunk link frame. With a called line busy condition the marker will be unable to establish a connection between the no-test trunk and the called subscriber line thru the trunk link frame and the line link frame. Therefore, the no-test connector will provide means for connecting the no-test trunk to the called subscriber line. The no-test connector is a circuit including a crossbar switch which has the horizontal terminations of the crossbar switch connected to the no-test trunks and has the vertical terminations of the crossbar switch connected to the no-test verticals of the line link frames. By operating the proper no-test connector select and hold magnets and the proper line link frame line switch select and hold magnets associated with the no-test verticals a direct connection will be made between the no-test trunk and the called subscriber line.

22.3121 Seizure of the Marker By the Incoming Register

The seizure of the marker by the incoming register is similar to the description in paragraph 12.1.

22.3122 Registration of Information From the Incoming Register

The registration of information from the incoming register is similar to the description in paragraph 12.2. However, to identify this call as a special call the "SPL" lead will be grounded by the incoming register marker connector, thereby operating the SPL and SPL-1 relays in offices not equipped with the PBX allotter, however, ground on the "SPL" lead will operate the SPLC relay. The SPLC relay in operating will operate the SPL and SPL-1 relays.

22.3123 Identification of the Basic Call or Connection

The identification of the basic call or connection is similar to the description in paragraph 12.3. However, the operation of the SPL and SPL-1 relays, and if required the SPLC relay will identify this call as a special call.

22.3124 Identification of the Location of the Called Line

The identification of the location of the called line is similar to the description in paragraph 12.4. If the called subscriber line is in a terminal hunting group the marker will proceed to identify the location of the called line as described in paragraph 8.042 and will not proceed with terminal hunting as described in paragraph 8.043. This is to insure that the particular subscriber line which is desired will be connected to the no-test trunk. If terminal hunting was permitted the person initiating the no-test call would be unable to determine to which subscriber line, within the terminal hunting group, a connection had been made.

The operated SPL-1 relay will prevent the operation of the PBX-1/2 relays and therefore the marker will proceed in the same manner as for a non-terminal hunting subscriber line.

22.3125 Called Line Busy Test

The marker will proceed with the called line busy test functions until the marker determines by the operation of the LBT relay, as described in paragraph 12.5, that the called line is busy.

22.3126 Connection of No-Test Trunk To The Called Subscriber Line Thru the No-Test Connector

When the marker determines that the called subscriber line is busy the marker will not attempt to set up a connection from the no-test trunk to the called subscriber line thru the trunk link frame and line link frame. Instead the marker will initiate the operations required for connecting the no-test trunk to the called subscriber line thru the no-test connector circuit.

22.31261 Operation of the NTC, NT, NTH, NTT, NT-1, NT-5 and MN-1 Relays

To provide a number of control circuits for a no-test call the NTC, NT, NTH, NTT, NT-1 and NT-5 relays will be operated.

The operation of the SPL relay, with the NT-5 and NT-4 relays non-operated, will operate the NTC relay.

The operation of the F1 relay in the no-test trunk will extend ground potential over the "NT" lead to operate the NT relay in the marker circuit.

The operation of the NT relay, with the CHE relay operated, will operate the NTH relay.

The operation of the LBT relay, with the NT, SPL-1, and LLC-2 relays operated and the RCY-2 and CKR relays non-operated, will operate the NTT relay.

The operation of the CHT relay, with the NTT relay operated, will operate the NT-1 relay. The operation of the NTT relay with the NTC and SPL relays operated will operate the NT-5 relay.

In offices equipped for message register operation the operation of the SPL relay with the MN relay non-operated will operate the MN-1 relay.

22.31262 Operation of the NT-2, NT-3 and NT-4 Relays

The operation of the NT-1 relay will operate the NT-2 relay in offices not equipped for message register operation. In offices equipped for message register operation, the operation of the NT-1 relay will operate the NT-2 relay with the MPT relay non-operated.

The NT-2 relay in operating will operate the NT-3 relay. The operation of the NT-2 relay with the NT-5 relay operated will operate the NT-4 relay.

22.31263 Identification of the Line Link to Which the Busy Line is Connected and Operation of the LF-0/9 and CH-0/9 Relays

In order to connect the no-test vertical to the subscriber line it is necessary to operate the line link frame line switch select magnet which is associated with the line link with which the busy subscriber line is associated. To identify the line link associated with the busy subscriber line a potential of approximately +10 volts will be applied to the sleeve conductor associated with the called subscriber line. The marker will then examine the sleeve conductors of each of the ten possible line links to which the called subscriber line could be connected to determine which of these line links is marked with this +10 volt potential. The line link sleeve conductor which is marked with the +10 volt potential is associated with the called subscriber line.

The sleeve conductors of the five subscriber lines within the selected line group will be extended from the line link frame to the marker over the "LH-" leads when the MCB and LG-relays in the line link frame are operated. The operation of the marker VFT-, FTK-1, NTT, NT-1, NT-3, NT, NT-4, NT-2 and NT-5 relays will extend the one "LH-" lead associated with the called subscriber line to approximately +10 volts potential, which is obtained by the voltage divider effect of the NT-1 and NT-2 resistances.

This +10 volt potential will be extended to the sleeve conductor of the line link which is associated with the called subscriber line. Test leads designated "LL-" will be extended to the marker from the group of ten line links within which the line link associated with the called subscriber line is located. In the marker circuit a group of relays designated LF-0/9 will test for the presence of this +10 volt potential on the "LL-" leads and the one LF-0/9 relay associated with numerical designation of the line link which is associated with the called subscriber line will be operated. The operation of one LF-0/9 relay will initiate the operation of the associated CH-0/9 relay and the CHA relay.

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22.31264 Operation of the PT-0/9, and PTL Vacuum Tubes and the MPT Relay

In offices equipped for message register operation it is necessary to provide the PT-0/9 and PTL vacuum tubes and the MPT relay. It is necessary to check that the message register charging potential is not on the link before the LF-0/9 relays are connected. This is necessary to insure that the message register charging potential will not be shunted by the low resistance operate path of the LF-0/9 relays. The operation of the NT-1 relay will extend the "LL-" leads from the line link frame line links to the PT-0/9 vacuum tube in the marker. If a message register potential is being applied to any of the line links with which the "LL-" leads are associated, the associated PT-0/9 tube will become conductive. The MPT relay will be operated in series with the PT-0/9 vacuum tube.

It is necessary to insure that the potential applied to the line link by the voltage divider network is not such a value that would cause the operation of a message register. Therefore, the PTL vacuum tube will be provided to make a check on this potential. The PTL tube will become conductive when a high potential appears at the output of the voltage divider network. The MPT relay will be operated in series with the PTL vacuum tube.

The operation of MPT relay will open the operating circuit for the NT-2 relay, thereby preventing the marker from advancing to the point where the +10 volts is applied to the sleeve.

The PT-0/9 tube and the MPT relay will release when the message register potential is removed and the LF-0/9 and CH-0/9 relays will be operated similar to the description, in paragraph 22.31263.

22.31265 Operation of the M-0/1, M-2/3, M-4/5, M-6/7, and M-8/9 Relays

The operation of the NT-3 relay will extend the "LL-" leads from the line link frame line links to the windings of the LF-0/9 relays. The M-0/1, M-2/3, M-4/5, M-6/7, and M-8/9 relay windings are connected in series with the LF-0/9 relays. If the +10 volts is applied to the "LL-" lead, only the LF-0/9 relay will be operated. However, if message register potential is now applied to the link, the M-0/1, M-2/3, M-4/5, M-6/7 and M-8/9 relays will operate in series with the LF-0/9 relays. The MN relay will operate in series with the LF-0/9 and M-0/9 relays.

The operation of the M-0/9 relay will release the NT-1 relay, while the operation of the MN relay will release the MN-1 relay. The release of the MN-1 relay will release the M-0/9 and the MN relay.

The release of the MN relay will operate the MN-1 relay. The release of the NT-1 relay will release the NT-2, NT-3, and the LF-0/9 relay. The release of the NT-2 relay will release the NT-4 relay. The NT-5 relay will remain operated.

The operation of the MN-1 relay will operate the NT-1 relay which will initiate the operation of the NT-2, NT-3, and NT-4 relays. If at this time the message register potential is still applied to the link, the PT-0/9 tube and the MPT relay will be operated. This will prevent the operation of the LF-0/9 relays until the message register potential is removed.

22.31266 Operation of the NO-Test Connector Circuit and the Line Link Frame Line Switch No-Test Vertical Select and Hold Magnets

A connection will be established from the no-test trunk, to the no-test connector circuit, thru a crosspoint on the crossbar switch of the no-test connector, to the line link frame line switch no-test vertical, thru a crosspoint on the no-test vertical, to the line link to which the called subscriber line is connected.

The operation of the no-test trunk F1 relay operates the no-test connector circuit S- select magnet.

The operation of the one CH-0/9 relay, which has identified the numerical designation of the line link associated with the called subscriber line, will operate the associated line link frame line switch L- and LJ- by placing battery potential on the associated "SM-" lead.

The operation of the CHA relay will release the CHE relay which in turn will release the NTH relay. The release of the NTH relay, with the NTT relay operated and the JB relay non-operated, will extend ground potential over the "NT" lead to the line link frame where the operated MCA and HG- relays will further extend the "NT" lead to the no-test connector circuit to operate the H- hold magnet. After operating the H- hold magnet will be held operated when the H relay in the no-test trunk is operated.

The operation of the no-test connector circuit H- hold magnet will extend ground over the "H" lead to the line link frame line switch to operate the no-test vertical hold magnet.

22.31267 Release of the Marker and Associated Circuits

After the marker circuit has completely performed the no-test call functions, the marker circuit will be released.

Since the operating path for holding operated the various marker relays may be opened at several different points almost simultaneously, this circuit description will describe only one point at which the operating circuit is opened to release the marker relays.

22.312671 Recycle of the Marker Release Control

22.3126711 Release of the NTR Relay and Operation of the LK-1 Relay

The operation of the CHA relay will release the CHE relay which in turn will release the NTH relay. The release of the NTH relay will release the slow release NTR relay.

The release of the NTR relay, with the SPL, and NTT relays operated and the MT-17 and ITR-2 relays non-operated, will operate the LK-1 relay. The LK-1 relay will be locked operated with the CKG-4 relay operated.

22.3126712 Release of the LLC-1/2 and ONW Relays and the Operation of the DIS-1/2 Relays

The release of the LLC-1/2 and ONW relays and the operation of the DIS-1/2 relays is similar to the description in paragraph 12.912.

22.3126713 Release of the TLC-1/3 and CKG-1/7 Relays

The release of the TLC-1/3 and CKG-1/7 relays is similar to the description in paragraph 12.913.

22.3126714 Operation of the Incoming Register MRL Relay and the Release of the Register Marker Connector RS, RA, RB, RC, RD, MS, MA, MB, MC and MD relays

The release of these relays is similar to the description in paragraph 12.914.

22.3126715 Release of the DIS-1/2 Relays

The release of the DIS-1/2 relays is similar to the description in paragraph 12.915.

22.3126716 Release of the MCB-1/6 Relays and the Marker Connector CB Relays

The release of these relays is similar to the description in paragraph 12.916.

22.312673 Release of the Identification of the Call Functions

The release of the identification of the call functions is similar to the description in paragraph 12.93.

22.312674 Release of the Identification of the Location of the Called Line Functions

The release of the identification of the location of the called line functions is similar to the description in paragraph 12.94.

22.312675 Release of the Line Link Frame

The release of the line link frame is similar to the description in paragraph 12.95.

22.312676 Release of the Selection of the Connecting Path Functions

Although a connecting path between the called subscriber line and the no-test trunk was not set up through the usual connecting path from the trunk link frame to the line link frame, certain of the relays associated with the functions of selecting a connecting path from the trunk link frame to the line link frame were operated.

The release of those relays which have operated and which are associated with the selection of the connecting path is similar to the description in paragraph 12.96.

22.312677 Release of the No-Test Functions

The release of the marker connector circuit will release the SPL and SPL-1 relays.

The release of the LLC-1 relay will release the NT-1 relay which in turn will release the NT-2, NT-3, and NT-4 relays which in turn will release the operated LF-0/9 relay.

The release of the SPL and SPL-1 relays will release the NTC, MN-1, and NTT relays.

The release of the trunk link frame MCB relay will release the NT relay.

22.312678 Release of the No-Test Connector Circuit and Line Link Frame Line Switch Select Magnets

The release of the TLC-1 relay will release the F relay in the no-test trunk which in turn will release the F1 relay in the no-test trunk circuit. The release of the F1 relay in the no-test trunk circuit will release the operated select magnet in the no-test connector circuit.

The release of the NTR relay will release the ONX relay which will release the operated line link frame line switch selects magnets.

22.32 No-Hunt Call

No-hunt calls may be made from the master test frame and the message register rack. The no-hunt trunk uses a special marker and causes terminal hunting to be canceled and the omission of the subscriber line tests and the test to determine if a plugging up shoe is connected to the line.

No-hunt calls from the master test frame may be made by the maintenance force for routine tests of subscriber lines, or to verify subscriber line test failures indicated by the trouble recorder before reporting the failure to the test deskman. The trunk closes the tip and ring through to the voltmeter test circuit with which the maintenance force may test the line. Terminal hunting is cancelled to insure reaching the line associated with the dialed number, which may be an intermediate line of a terminal hunting group.

No-hunt calls made from the message register rack are used in connection with the so-called "100-message register operation test". Since a message register may be assigned to an intermediate line of a terminal hunting group, it is necessary that the trunk cancel terminal hunting.

The no-hunt call is similar to a terminating call, as described in paragraph 12, except that the marker being informed that this is a special call will cancel the ground test and the continuity test. If the called subscriber line is in a terminal hunting group, the connection is established to the subscriber line whose number was dialed if that particular line is idle. If the called subscriber line whose number was dialed is busy the marker will not select another subscriber line within the terminal hunting group and the marker will make no connection between the called subscriber line and the no-hunt trunk.

The marker operations in assisting a no-hunt call is also similar to the marker operations in assisting a no-test call with the called subscriber line idle, as described in paragraph 22.311. However, if the called subscriber line is busy a busy tone will be supplied by the no-hunt trunk and the marker will not set up a connection to the subscriber line. To identify the call as a no-hunt call the "NH" lead from the no-hunt trunk will be grounded thereby operating the NH relay in the marker.

22.33 Special-Hunt Call

Special hunt test calls are made from the test desk for making voltmeter and other tests on subscriber line. The connections are established by a connecting path in the same manner as for a terminating call except that subscriber line tests by the marker are omitted.

A special marker is required to establish a special hunt test call and terminal hunting is permitted. If a deskman wishes to connect to a particular line of a terminal hunting group, he originates the call over a no-test trunk.

The special-hunt call is similar to a terminating call, as described in paragraph 12, except that the marker being informed that this is a special call will cancel the ground test and the continuity test. If the called subscriber line is in a terminal hunting group, the connection is established to the subscriber line whose number was dialed if that particular line is idle. If the called subscriber line whose number was dialed is busy the marker will select the next preferred idle subscriber line within the terminal hunting group and will establish a connection between this subscriber line and the special hunt trunk. If the individual subscriber line is busy or if all subscriber's lines within a terminal hunting group are busy the marker will make no connection between the called subscriber line and the special hunt trunk and the marker will initiate the operations required so that the trunk circuit will transmit a busy tone signal.

The marker operations in assisting a no-hunt call is also similar to the marker operations in assisting a no-test call with the called subscriber line idle, as described in paragraph 22.311. However, on a special hunt call to a subscriber line within a terminal hunting group the marker will be allowed to proceed with terminal hunting as described in paragraph 8.043. Also, if the called subscriber line is busy a busy tone will be supplied by the special hunt trunk and the marker will not set up a connection to the subscriber line. To identify the call as a special hunt call the "NN" lead from the special hunt trunk will be grounded thereby operating the SPH relay in the marker.

22.4 Ringer Test Connection

The ringer test connection is originated by a maintenance man at the subscriber's station to test for proper ringing. To initiate the ringer test connection the maintenance man will dial a special ringer test code instead of the office code digits and will then dial the numerical digits of the subscriber's station. After receiving a tone signal the maintenance man will hang-up the receiver and will wait for the ringing at the subscriber's station.

The marker in assisting a ringer test connection will set up a connection from the subscriber's line, thru a line link frame and a trunk link frame to the ringer test trunk circuit which will provide the ringing signal in the same manner as any reverting trunk circuit.

An office may be arranged for either of two methods of operation. It can operate with loop start coin and non-coin lines or with loop start non-coin and ground start coin lines.

Where loop start coin and non-coin lines are employed, one trunk group of ringer test trunks may be used for both types of lines since the register is arranged to return coin on no-charge coin class calls and the trunk requires no coin or non-coin indication.

Where loop start non-coin and ground start coin lines are employed the register is not equipped to return coin. Therefore, if separate coin and non-coin ringer test trunks are employed, two separate coin and non-coin trunk groups must be equipped. If, however, the ringer test trunks used are arranged for both coin and non-coin operation, a single trunk group of ringer test trunks is equipped. Cross connections for each of the arrangements are made as follows:

(a) Loop start coin and non-coin lines. The code point cross-connection terminal will be cross-connected to the associated "TR-O/1" cross-connection terminal of figure 62. The "TRB-O/1" cross-connection terminal is cross-connected to the associated "SC-" cross-connection terminals of figure 61, or to the "PSC-" cross-connection terminals of figure 135, if the presort feature is provided. For a non-coin subscriber line, the "S-" cross-connection terminal 61 or the "PSA-" or "PSB" cross-connection terminal of figure 135 will be cross-connected to the "NN" cross-connection terminal of figure 53. For a coin subscriber line, the "S-" cross-connection terminal of figure 61, or the "PSB-" or "PSA-" cross-connection terminals of figure 135 will be cross-connected to the "CC" of figure 61. For a non-coin subscriber line the "S-" cross-connection terminal of figure 61 will be cross-connected to the "NN" cross-connection terminal of figure 53. For a coin subscriber line, the "S-" cross-connection terminal of figure 61 will be cross-connected to the "CC" cross-connection terminal of figure 37. The "RGTO/1" cross-connection terminals will be cross-connected to the "RC-" terminal associated with the R-, route relay, assigned to ringer test routes.

(b) Loop start non-coin and ground start coin lines where two trunk groups are necessary - The code point cross-connection terminal will be cross-connected to the associated "TRO/1" cross-connection terminal of figure 62. The "TRBO/1" cross-connection terminal is cross-connected to the "RB" cross-connection terminal of figure 53. The "RGTO/1" cross-connection terminals will be cross-connected to the "SC-" cross-connection terminals of figure 61, or to the "PSC-" cross-connection terminals of figure 135. For coin subscriber lines, the "S-" cross-connection terminal or the "PSA-" or the "PSB-" cross-connection terminal will be cross-connected to the "RC-" cross-connection terminal associated with the route relay assigned to the coin ringer test trunk group. For non-coin subscriber lines, the "S-" cross-connection terminal or the "PSA-" or "PSB-" cross-connection terminal is cross-connected "RC" cross-connection terminal associated with the route relay assigned to the non-coin ringer test trunk group. The "R" cross-connection terminals of both the coin and non-coin route relays is connected to the "NN" cross-connection terminal of figure 53.

(c) Loop start non-coin lines and ground start coin lines where one trunk group is employed - The code point cross-connected to the associated "TRO/1" cross-connection terminal of figure 62. The "TRBO/1" cross-connection terminal is cross-connected to the "RB" cross-connection terminal of figure 53. The "RGTO/1" cross-connection terminals will be cross-connected to the "RC-" terminal associated with the R-, route relay, assigned to ringer test routes. The "R-" cross-connection terminal of this route relay is connected to the "SC-" cross-connection terminals of figure 61 or to the "PSC-" cross-connection terminals of figure 135. For a non-coin subscriber line, the "S-" cross-connection terminal of figure 61 or the "PSA-" or the "PSB-" cross-connection terminal of figure 135 will be cross-connected to the "TN" cross-connection terminal of figure 53. For a coin subscriber line, the "S-" cross-connection terminal of figure 61 or the "PSA-" or "PSB-" cross-connection terminal of figure 135 will be cross-connected to the "TC" cross-connection terminal of figure 53

22.401 Seizure of the Marker by the Originating Marker

The seizure of the marker by the originating register is similar to the description in paragraph 8.01.

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22.402 Registration of Information from the Originating Register

The registration of information from the originating register is similar to the description in paragraph 8.02. However, instead of receiving the office code digits the marker will receive the ringer test code digits.

22.403 Identification of the Location of the Called Line

The identification of the location of the called line is similar to the description for a reverting call in paragraph 9.04. However, the FLG, FLG1, FLG2, NGC, LLI, VGL1/2, HGL1, VFL1, and CBF relays will not be operated. The operation of the RGTO/1 relay will operate the SNG1/2 relays.

22.404 Identification of the Basic Call or Connection

The marker will place ground on the code point associated with the ringer test code thereby identifying the call as a ringer test call.

22.4041 Operation of the TC-5/7 Relay

The operation of the TC-5/7 relay is similar to the description in paragraph 8.031.

22.4042 Operation of the AT-2/9 Relay

The operation of the AT-2/9 relay is similar to the description in paragraph 8.032.

22.4043 Operation of the BT-20/99 Relay

The operation of the BT-20/99 relay is similar to the description in paragraph 8.033.

22.4044 The operation of the CKG1 relay and the ACO/7 relays, and where required, the BCO/7 and CCO/7 relays, and the AT2/9 and BT20/99 relays will ground the ringer test code point thereby identifying the call as a ringer test call.

22.4045 Initiating the ringer test call route functions.

After the marker has grounded the code point assigned to ringer test codes, it must operate the proper relays to route the call to the ringer test trunk and to prevent charging.

For each of the aforementioned office arrangements, these functions will be accomplished as follows:

For Loop start non-coin lines, the grounded code point will operate the RGTO/1 relay in series with the NCNC relay through the contacts of the operated S- or PSA- or PSB- relay associated with non-coin lines. The operation of the RGTO/1 relay with the RV relay operated, and the FTL, FUL, VGL, VFL, PN, TN, and PTN relays non-operated will operate the ringer test route, R-, relay.

For loop start coin lines, the RGTO/1 and the RR relays will be connected in series through contacts on the SCK relay operated and through contacts on the operated S- or PSA- or PSB- relay associated with coin lines. The circuit of the RR relay in series with one of the RGTO/1 relays is such that when ground is applied to the code point for ringer test codes, the RR relay will operate but the RGTO/1 relay will remain non-operated. The RR relay in operating will ground the CNR lead to the register circuit, indicating to the register that coin return is required. The RR relay in operating will also operate the RRK relay in the marker. The RRK relay in operating will operate the RRC relay and the RRC relay in turn will operate the DIS1, 2 relays, whose operation will cause the marker to release. After the originating register has completed its coin return operation it will reseize a marker as explained in paragraph 8.01. On this seizure, the CR relay will be operated instead of the SCK relay. With the CR relay operated, the SCK relay non-operated and the S- or PSA- or PSB- relay associated with coin lines operated, a series circuit of the FGT-0/1 and NCNC relays is formed. Under these conditions, when ground is applied to the ringer test code point, both the RGTO/1 and NCNC relays will operate. The operation of the RGTO/1 relay with the RV relay operated and the non-operated FTL, FUL, VGL, HGL, VFL, PN, TN, and PTN relays non-operated will operate the ringer test route, R-, relay.

For offices having loop start non-coin lines and ground start coin lines where separate groups of coin and non-coin ringer test trunks are equipped, grounding the ringer test code point will operate the RGTO/1 relay. With the RV relay operated and the FTL, FUL, VFL, HGL, VFL, PN, TN, PTN relays non-operated, the operation of the RGTO/1 relay will extend ground to the "SC-" cross-connection terminals of the S-relay, or to the "PSA-" or PSB-" cross-connection terminals of the PSA- or PSB-relays. Depending on whether a coin or non-coin class S- or PSA- or PSB- relay is operated, a route relay for coin or non-coin ringer test routes will be operated in series with the NCNC relay.

For offices having loop start non-coin and ground start coin lines, where a single group of ringer test trunks arranged for coin and non-coin operation is equipped, grounding the ringer test code point will operate the RGTO/1 relay. With the RV

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relay operated and the FTL, FUL, VFL, HGL, PN, TN, and PTN relays non-operated, the operation of the RGTO/1 relay will extend ground to the RC- cross-connection terminal associated with the ringer test route, R-, relay.

If a coin class S-, PSA- or PSB- relay is operated, the R- relay will be operated in series with the TCCN relay. If a non-coin class S-, PSA- or PSB- relay is operated, the R- relay will be operated in series with the TCNC relay.

The operation of the ringer test route, R-, relay will initiate the actions required for connecting the subscriber's line to the ringer test trunk.

22.4051 Operation of the NSO, SOG-1/3, CB, CB-1/5, CB-7, CBF, CBD-1 and CBD Relays

The operation of these relays is similar to the description in paragraph 9.0623.

22.406 Ringer Test Trunk Selection

The ringer test trunk selection is similar to the description in paragraph 9.07.

22.407 Selection of the Connecting Path

The selection of the connecting path is similar to the description in paragraph 9.08.

22.408 Setting Up the Selected Connecting Path

The setting up the selected connecting path is similar to the description in paragraph 9.09.

22.409 Setting up the Selected Ringing Code

The setting up the selected ringing code is similar to the description in paragraph 8.09.

22.410 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the description in paragraph 9.11.

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23. MARKER TROUBLE INDICATING AND RECORDING

Trouble conditions within the marker circuit and in certain cases within the circuits with which the marker circuit is associated are detected by either trouble indicating tests or by trouble indicating timers. The trouble indicating tests provide a positive and immediate indication that a trouble condition exists on certain leads or relays. The trouble may exist within the marker or within other circuits which are connected to the marker circuit. The trouble indicating timers detect trouble within the marker or associated circuits by checking that the time required by the marker in performing certain functions is not greater than the maximum time that a marker should require to complete the function. If a trouble condition exists which does not provide a specific test indication but, however, prevents the marker from completing its functions, one of the trouble indicating timers will time-out to indicate a trouble condition.

The trouble indicating test may be made only when the marker is assisting a call or connection or the test may be made when the marker is idle. If the test is made when the marker is idle the test is known as a "standing test". If the test is made only when the marker is assisting a call or connection the test is known as a "non-standing test".

There are four different trouble indicating timers in the marker as follows:

1. The work timer which is used to time a function or group of functions which the marker performs and to give a rapid time-out and trouble indication if the marker encounters trouble. Usually the work timer is recycled and restarted many times during a single marker usage so as to time more than a single function or group of functions. The work timer time interval is about 0.3 second.

2. The short delay timer which is used to time the delay of a marker in seizing other circuits, such as a trunk link frame or a line link frame and to give a time-out and trouble indication if the marker is unable to seize the required circuit. However, if a trouble record is being taken by a marker circuit the short delay timer is made inoperative and the timing is provided by the long delay timer. The short delay timer time interval is about 3. seconds.

The short delay timer is disabled when the trouble recorder is off-normal.

3. The long delay timer performs the same functions as the short delay timer and which is substituted for the short delay timer when the short delay timer is disabled. The long delay timer time interval is about 6. seconds thereby allowing for the additional time required when a trouble record is being perforated.

4. The over-all timer which is started when the marker is seized and is stopped when the marker returns to normal. This timer guards against the failure of the other timing circuits. The over-all timer time interval is about 13. seconds.

The purpose of the trouble recorder is to indicate as nearly as possible the source of trouble encountered during the completion of a service call or of a test call. In a crossbar system, such as the No. 5 Crossbar System, which may be unattended by maintenance personnel for the greater part of the day and even in some cases unattended for an entire day it is desirable to provide some means of permanently recording information with respect to each trouble condition encountered. It is then possible to record the information of the service trouble conditions during unattended operation of the central office for later use during attended operation periods.

When the trouble condition is encountered a trouble record card is perforated in most cases to indicate the necessary information required. On this trouble record card there are 1080 positions and every point in the central office from which an indication might be expected is given a designation and assigned a position on the trouble record card. As a trouble record is being taken each of these indicating points which might be involved are tested and where a positive signal, a point at ground potential in a majority of cases, is received the trouble recorder perforator will perforate a hole in the corresponding position on the trouble record card. The pattern of these perforations will convey information as to the possible location of the trouble condition.

Whenever a marker encounters a trouble condition in the completion of a service call for which a trouble record is required the marker will send a "trouble recorder request" signal to the master test frame connector circuit which acts as the common control point for access to the trouble recorder. If the trouble recorder is idle and available the master test frame connector circuit will operate the connector relays associated

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with the circuit requesting the trouble recorder. If more than one circuit requests the trouble recorder at the same time the master test frame connector circuit will give preference to one of the requesting circuits and will exclude the others.

The information which may be perforated on a trouble record card consists of five major groups of information as follows:

1. Information as to the equipment that is involved in establishing the connection. This would identify which particular marker detected the trouble and would also identify the trunk link frame, the line link frame and the other circuits involved.

2. Information as to the type of connection, that is, the identification of the major function which the equipment is performing. For example, the major function which the equipment is performing may be the assistance of an outgoing call or an incoming call or perhaps an intra-office call.

3. Information as to the progress of the connection, that is, how far the various circuit operations have progressed before the trouble condition occurred.

4. Information as to the failure of a specific trouble detecting test.

5. Information which is necessary or helpful in determining the source of the trouble such as the calling line information, called line information, trunk information and information to identify the connecting channel through which the connection is established.

23.1 Trouble Indicating Timers

The marker contains four trouble indicating timers, the work timer, the short delay timer, the long delay timer and the over-all timer. The time-out of the work timer, the short delay timer of the long delay timer will initiate the marker to seize the trouble recorder to perforate a trouble record as described in paragraph 23.3.

After the trouble record has been perforated the marker TRB relay will be operated, as described in paragraph 23.3. The operation of the TRB relay will operate the TRL or DIS-1/2 relays to initiate the marker release or will operate the RAV-1/2 relays to initiate a route advance. The operation of the TRL relay will operate the TRLA relay which will extend ground potential over the "TRL" lead to the marker connector if this marker is associated with a first trial. The grounded "TRL" lead to the marker connector will indicate that the marker connector should release from the marker and should then initiate a second trial. The operation of the TRL and TRLA relays will extend ground potential over the "BT" lead to the marker connector if this marker is associated with a second trial. The grounded "BT" lead to the marker connector will indicate that the marker connector should release from the connection. The operation of the DIS-1/2 relays will release the marker and will place ground potential on the "MRL" lead to the marker connector to indicate that the marker connector should release from the connection and should not initiate a second trial.

A. Dial Tone Class of Call

Type of Failure	Method of Release of Marker
WT, SDT or LDT Timeout, First or Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.

B. Intra-Office Class of Call, Connection To Called Line

WT, SDT or LDT Timeout, First or Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.

C. Intra-Office Class of Call, Connection To Calling Line

WT, SDT or LDT Timeout Before Reg. RL Relay Operates, First or Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release Connection Not Completed.
WT, SDT or LDT Timeout After Reg. RL Relay Operates, First Trial	After Trouble Record Has Been Completed The DIS-1/2 Relays Operate To Initiate Marker Release. Connection Not Completed.
WT, SDT or LDT Timeout After Reg. RL Relay Operates, Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.

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D. Subscriber Outgoing Class of Call

Type of Failure	Method of Release of Marker
WT, SDT or LDT Timeout Before Reg. RL Relay Operates, First or Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
WT, SDT or LDT Timeout After Reg. RL Relay Operates, First Trial	After Trouble Record Has Been Completed The DIS-1/2 Relays Operate To Initiate Marker Release. Connection Not Completed.
WT, SDT or LDT Timeout After Reg. RL Relay Operates, Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.

E. Terminating Class of Call

WT, SDT or LDT Timeout, First Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
WT, SDT or LDT Timeout, Second Trial	After Trouble Record Has Been Completed The RAV-1/2 Relays Operate To Initiate a Route Advance To Set The Incoming Trunk To Provide Overflow Tone.

F. Tandem Outgoing Class of Call

WT, SDT or LDT Timeout, First Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
WT, SDT or LDT Timeout, Second Trial	After Trouble Record Has Been Completed The RAV-1/2 Relays Operate To Initiate a Route Advance To Set The Incoming Trunk To Provide Overflow Tone.

The time-out of the over-all timer will release the marker without initiating a trouble record by operating the MRL and MRL-1 relays for all classes of calls.

There is also provided a trouble recording timer which is described in paragraph 22.34.

23.11 Work Timer Operation

The purpose of the work timer is to time certain marker functions. If the marker in completing a marker function which is associated with the work timer should not complete this function in the work timer timing period of 245 to 455 milliseconds the work timer will time-out. A work timer time-out will indicate a trouble condition in the marker or associated circuits.

When the work timer timing interval is to be initiated the timing start TMS relay of figure 79 is operated. The operation of the TMS relay removes the WT-3 resistor shunting the WT condenser. The operation of the TMS relay also connects ground, through the WT relay winding, to one side of the WT condenser. The other side of the WT condenser is connected to +130 volts thru the WT-1 resistance. This causes the WT condenser to be slowly charged. As a result, the potential at the control grid of the WT electronic tube thru resistor WT-2 is therefore gradually increased. After an interval of 245 to 455 milliseconds the potential on the condenser, and therefore on the control anode of the WT tube, will be increased to approximately +72 volts at which time the tube will fire, that is, become conductive, causing a current flow which will operate the WT relay. When the work timer timing interval is to be discontinued the TMS relay will be released. If the TMS relay releases at any time before the WT tube fires, the WT condenser will be discharged by placing the 2000 ohm WT-3 resistor across it to recycle the WT tube timing.

If the WT relay is operated the marker will seize the trouble recorder to perforate a trouble record. The operation of the WT relay will operate the TRT relay which in turn will operate the stop progress relay which will prevent the marker from progressing too far beyond the point at which the trouble was detected and thus obscuring the conditions which initiated the trouble condition.

23.111 Work Timer Started When Call is Initiated:

The release of the MAK, MCK or MSK relay when the call is initiated will operate the TM relay which in turn will operate the TMS relay which will start the work timer.

23.112 Work Timer Stopped When Call Is Completed:

The operation of the MAK, MCK and MSK relays when the call is completed will release the TM relay which will in turn release the TMS relay which will stop the work timer.

23.113 Work Timer Recycle:

To recycle the work timer the RYT relay will be operated which will release the TMS relay. The release of the TMS relay will recycle the work timer so that on any future use of the work timer the timing period will be 245 to 455 seconds. The release of the TMS relay will operate the RYT-1 relay which will release the RYT relay. The release of the RYT relay will reoperate the TMS relay which will restart the work timer.

23.1131 Work Timer Recycle Points

Class of Call	Work Timer Recycle Point
Dial Tone	a. TK relay operates. b. GLH relay operates.
Subscriber Outgoing	a. TK relay operates. b. OST-1 relay operates (overlaps TK relay recycle point unless there is a delay in obtaining the trunk link frame. c. FTCK relay operates (effective only after recycle or route advance). d. GLH relay operates.
Terminating	a. HTUK relay operates. b. TK relay operates (effective only after recycle, route advance, junctor retest or on a call to a PBX or a no test call). c. GLH relay operates.
Intra-Office When Associated With Called Line	a. HTUK relay operates. b. TK relay operates (effective only after recycle, route advance, junctor retest or on a call to a PBX. c. GLH relay operates.
Intra-Office When Associated With Calling Line	a. TK relay operates. b. GLH relay operates. c. SCB2 relay operates.
Tandem Outgoing	a. HTUK relay operates. b. TK relay operates (effective only after recycle or route advance or junctor retest). c. OST-1 relay operates (overlaps TK or HTUK recycle point unless there is a delay in obtaining the trunk link frame. d. FTCK relay operates (effective only after recycle or route advance). e. GLH relay operates.
Pulse Conversion	a. OST-1 relay operates. b. FAK or FBK relay operates. c. SLK-2 relay operates
Reverting When Associated With Called Line	a. HTUK relay operates. b. RV-1 relay operates (HTUK and RV-1 recycle points overlap).
Reverting When Associated With Calling Line	a. TK relay operates. b. FTCK relay operates. c. GLH relay operates.

Class of Call	Work Timer Recycle Point
Ringer Test	a. TK relay operates. b. RV-1 relay operates c. GLH relay operates.
Miscellaneous Condition	
Marker Recycle	a. RCY relay operates.
Route Advance	a. RAV-1 relay operates.
Allotter Advance	a. GP-2 relay operates.
PBX Lens Block Advance	a. A relay operates.
PBX Recycle	a. RCY-2 relay operates.
Called Line Busy	a. RSK relay operates.
Incoming Call Overflow	a. RSK relay operates.
Reverse Continuity Test	a. RCTA relay releases.
Blank Called Thousands Digit	a. BNTH relay operates.

23.114 Work Timer Stopped During Progress of a Call:

The operation of the SFT or TRST relay will release the TMS relay which will remain released until the SFT and TRST relays are released. The release of the TMS relay will stop the work timer.

The SFT relay will operate under the conditions as described in paragraph 23.12.

The TRST relay will be operated when the marker is associated with the trouble recorder, as described in paragraph 23.31.

23.12 Short Delay Timer Operation

The purpose of the short delay timer is to time those marker functions which are associated with the seizure of other equipment, such as a sender group, a trunk link frame, a number group or a line link frame. The short delay timer timing period is sufficient to allow the marker to wait until a sender group, a trunk link frame, a number group or a line link frame becomes available for use with this marker without the short delay timer timing out. However, if a trouble condition prevents the marker from seizing certain other equipment the short delay timer will time-out to indicate a trouble condition in the marker or associated circuit.

When the short delay timer timing interval is to be initiated the seize frame timing SFT relay is operated. The operation of the SFT relay, with the RON and SPL-1 relays non-operated, removes the SDT-3 resistor shunting the SDT condenser. The operation of the SFT relay also connects ground through the SDT relay winding, to one side of the SDT condenser. The other side of the SDT condenser is connected to +130 volts thru the SDT-5 resistance when the NTT relay is operated or thru the SDT-5 and SDT-1 resistances in series when the NTT relay is in the non-operated condition. This causes the SDT condenser to be slowly charged. As a result, the potential at the control grid of the SDT electronic tube thru resistor SDT-2 is therefore gradually increased. After an interval of 2600 to 4250 milliseconds with the NTT relay in the non-operated condition or 1100 to 1900 milliseconds with the NTT relay operated the potential on the SDT condenser, and therefore on the control anode of the SDT tube, will be increased to approximately +72 volts at which time the tube will fire causing a current flow which will operate the SDT relay. When the short delay timer timing interval is to be discontinued the SF relay will be released. Also if any other marker seizes the trouble recorder or is associated with a test call the "RON" lead from the master test frame connector circuit will be grounded thereby operating the recorder off-normal RON relay in this marker to disable or to discontinue the timing interval of the short delay timing. It is necessary to disable or to discontinue the short delay timing if any other marker seizes the trouble recorder or is associated with a test call since under these conditions this marker may be unable to get access within the short delay timing interval to other circuits such as a line link frame, which are associated with the other marker in the process of assisting a test call or in the process of perforating a trouble record. If the SFT relay releases or the RON relay operates at any time before the SDT tube fires, the SDT condenser will be discharged by placing the 2000 ohm SDT-3 resistor across it to recycle the SDT tube timing.

If the SDT relay is operated the marker will seize the trouble recorder to perforate a trouble record. The operation of the SDT will operate the

TRT relay which in turn will operate the SF relay.

The operation of the short delay timer is controlled by the SFT relay, assuming the RON relay is non-operated. The SFT relay is operated when the SF relay operates. The operate time of the SF and SFT relays is such as to prevent the SDT timer from being started and recycled under normal conditions of sender group seizure, trunk link frame seizure, number group seizure and line link frame seizure.

The SF relay will be energized and deenergized under the following conditions:

Class of Call	Purpose of Timing	Control of SF Relay
Dial Tone	Trunk Link Frame Seizure	a. Operation of FTCK relay energizes SF relay. b. Operation of TFK-2 relay deenergizes SF relay.
	Line Link Frame Seizure	a. Operation of MAK-1 relay energizes SF relay. b. Operation of LFK relay deenergizes SF relay.
Subscriber Outgoing	Sender Group Seizure	a. Operation of SIA or SIB relay energizes SF relay. b. Operation of SKA or SKB relay deenergizes SF relay.
	Trunk Link Frame Seizure	a. Operation of FTCK relay energizes SF relay (when OSC or SON relay is non-operated). b. Operation of FS relay deenergizes SF relay (when OSC or SON relay is non-operated).
	Line Link Frame Seizure	a. Operation of MAK-1 relay energizes SF relay (when OSC or SON relay is non-operated). b. Operation of LFK relay deenergizes SF relay (when OSC or SON relay is non-operated).
	TG Test	a. Operation of TGT relay energizes SF relay. b. Release of TGT relay deenergizes SF relay.
Terminating	Trunk Link Frame Seizure	a. Operation of TER-3 relay energizes SF relay. b. Operation of TFK-3 relay deenergizes SF relay.
	Number Group Seizure	a. Operation of MAK-1 relay energizes SF relay. b. Operation of NGK relay deenergizes SF relay.
	Line Link Frame Seizure	a. Operation of MAK-1 relay energizes SF relay (when SNG-1 relay is non-operated). b. Operation of LFK relay deenergizes SF relay.
Intra-Office When Associated With Called Line	Trunk Link Frame Seizure	a. Operation of FTCK relay energizes SF relay. b. Operation of FS relay deenergizes SF relay.
	Number Group Seizure	a. Operation of MAK-1 relay energizes SF relay. b. Operation of MGK relay deenergizes SF relay.
	Line Link Frame Seizure (Associated With Called Line)	a. Operation of MAK-1 relay energizes SF relay (when SMG-1 relay is non-operated). b. Operation of LFK relay deenergizes SF relay.

Class of Call	Purpose of Timing	Control of SF Relay
Intra-Office When associated With Calling Line	Sender Group Seizure (When Sender is Required)	a. Operation of SIA or SIB relay energizes SF relay. b. Operation of SKA or SKB relay deenergizes SF relay.
	Line Link Frame Seizure (Associated With Calling Line)	a. Operation of MAK-1 relay energizes SF relay (when SNG-1 relay is non-operated). b. Operation of LFK relay deenergizes SF relay.
Tandem Outgoing	Sender Group Seizure	a. Operation of SIA or SIB relay energizes SF relay. b. Operation SKA or SKB relay deenergizes SF relay.
	Trunk Link Frame Seizure	a. Operation of FTCK relay energizes SF relay (when OSC or SON relay is non-operated). b. Operation of FS relay deenergizes SF relay (when OSC or SON relay is non-operated).
	Number Group Seizure	a. Operation of MAK-1 relay energizes SF relay. b. Operation of NGK relay deenergizes SF relay.
	Line Link Frame Seizure	a. Operation of MAK-1 relay energizes SF relay (when OSC or SON relay is non-operated).
		Operation of LFK relay energizes SF relay (when OSC or SON relay is non-operated).
Pulse Conversion	Sender Group Seizure	a. Operation of SIA or SIB relay energizes SF relay. b. Operation of SKA or SKB relay deenergizes SF relay.
	Trunk Link Frame Seizure	a. Release of OSG relay energizes SF relay. b. Operation of TFK-3 relay deenergizes SF relay.
	Check for Outgoing Sender Trunk Test (Light Traffic)	a. Operation of TGT relay energizes SF relay. b. Release of TGT relay deenergizes SF relay.
Reverting When Associated With Called Line	Trunk Link Frame Seizure	a. Operation of FTCK relay energizes SF relay. b. Operation of FS relay deenergizes SF relay.
	Number Group Seizure	a. Operation of MAK-1 relay energizes SF relay. b. Operation of NGK relay deenergizes SF relay.
Reverting When Associated With Calling Line	Trunk Link Frame Seizure	a. Operation of FTCK relay energizes SF relay. b. Operation of FS relay deenergizes SF relay.
	Line Link Frame Seizure	a. Operation of MAK-1 relay energizes SF relay.

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Class of Call	Purpose of Timing	Control of Timing
		b. Operation of LFK relay deenergizes SF relay.
Ringer Test	Trunk Link Frame	a. Operation of FTCK relay energizes SF relay.
		b. Operation of FS relay deenergizes SF relay.
	Line Link Frame Seizure	a. Operation of MAK-1 relay energizes SF relay.
		b. Operation of LFK relay deenergizes SF relay.

23.13 Long Delay Timer Operation

The long delay timer is required to provide a timer having a longer timing interval than the short delay timer and which is substituted for the short delay timer when the short delay timer is disabled. Since the long delay timer timing interval is longer than that of the short delay timer timing interval, the long delay timer will not time out unless the short delay timer is disabled by the operation of the recorder off-normal RON relay.

When the long delay timer timing interval is to be initiated the seized frame timing SFT relay is operated. The operation of the SFT relay removes the LDT-3 resistor shunting the LDT condenser. The operation of the SFT relay also connects ground, through the LDT relay winding, to one side of the LDT condenser. The other side of the LDT condenser is connected to +130 volts thru the LDT-1 resistance. This causes the LDT condenser to be slowly changed. As a result, the potential at the control grid of the LDT electronic tube thru resistor LDT-2 is therefore gradually increased. After an interval of 4600 to 7500 milliseconds the potential on the LDT condenser, and therefore on the control anode of the LDT tube, will be increased to approximately +72 volts at which time the tube will fire causing a current flow which will operate the LDT relay. When the long delay timer timing interval is to be discontinued the SFT relay will be released. If the SFT relay releases at any time before the LDT tube fires, the LDT condenser will be discharged by placing the 2000 ohm LDT-3 resistor across it to recycle the LDT tube timing.

If the LDT relay is operated the marker will seize the trouble recorder to perforate a trouble record. The operation of the LDT relay will operate the TRT relay which in turn will operate the SP relay.

23.14 Over-all Timer

The over-all timer is started when the marker is seized and is stopped when the marker returns to normal. The function of the over-all timer is to guard against the failure of the other trouble indicating timers and if such failure occurs to time-out and release the marker from the call or connection without requesting a trouble record. When the over-all timer timing interval is to be initiated the over-all timing OAT relay is operated. The operation of the OAT relay removes the OAT-3 resistor shunting the OAT condenser. The operation of the OAT relay also connects ground, through the MRL relay winding, to one side of the OAT condenser. The other side of the OAT condenser is connected to +130 volts thru the OAT-1 resistance. This causes the OAT condenser to be slowly charged. As a result, the potential at the control grid of the OAT electronic tube thru resistor OAT-2 is therefore gradually increased. After an interval of 9.6 to 16.0 seconds the potential on the OAT condenser, and therefore on the control anode of the OAT tube, will be increased to approximately +72 volts at which time the tube will fire causing a current flow which will operate the MRL relay. When the over-all timing is to be discontinued the OAT relay will be released. If the OAT relay releases at any time before the OAT tube fires, the OAT condenser will be discharged by placing the 2000 ohm OAT-3 resistor across it to recycle the OAT tube timer.

23.2 Trouble Indicating Tests

When the marker detects a trouble condition by the operation of a cross-detecting relay, the cross-detecting relay will operate a master cross-detecting MXT relay or in certain cases the cross-detecting relay will operate an auxiliary cross-detecting relay which in turn will operate the master cross-detecting MXT relay. The operation of the master cross-detecting MXT relay will initiate a trouble record by operating either the take trouble record and give normal release TRR relay or the take trouble record and give trouble release TR-1 relay. The operation of the MXT relay will also operate the stop progress SP relay which will prevent the marker from progressing too far beyond the point at which the trouble was detected and thus obscuring the conditions which initiated the trouble condition.

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The marker circuit when assisting various calls or connections will perform a false cross and ground test, a continuity test, a double connection test and a ground, loop or receiver-off-hook test as described in paragraphs 7 to 18. When the marker detects the failure of one of these tests the marker may operate the take trouble record and give normal release TRR relay or the take trouble record and give trouble release TR-1 relay or the marker may release without operating the TRR relay or the TR-1 relay and without taking a trouble record. Under certain conditions some of these tests may be cancelled.

The marker when assisting a dial tone connection will perform a crossed line hold magnet (XLH) test. When the marker detects a crossed line hold magnet with the XLH test the marker will initiate the seizure of the trouble recorder.

After the marker has detected a trouble condition by means of the cross-detecting test, the false cross and ground test, the continuity test, the ground, loop or receiver-off hook test, the double connection test or the crossed line hold magnet test, the marker may or may not take a trouble record and may release immediately without completing the connection or may release only after the connection has been completed as follows:

A. Dial Tone Class of Call

Type of Failure	Method of Release of Marker
False Cross and Ground, First or Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Continuity, First Trial (Cancelled Second Trial)	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Double Connection, First or Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Ground, Loop or Receiver-Off-Hook, (Cancelled First and Second Trial)	
Crossed Line Hold Magnet, First or Second Trial	After Trouble Record Has Been Completed the DIS-1/2 Relays Operate To Initiate Marker Release. Connection is Completed.
Cross-Detecting	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.

B. Intra-Office Class of Call, Connection To Called Line

Type of Failure	Method of Release of Marker
False Cross and Ground Test, First or Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Continuity, First Trial (Cancelled Second Trial)	After Trouble Record Has Been Completed The TRL Relay Operates to Initiate Marker Release. Connection Not Completed.
Double Connection, First or Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Ground, Loop or Receiver-Off-Hook, First Trial	No Trouble Record Will Be Taken. Operation of GT-5 Relay will Operate TRL-1, TRB and TRL Relays To Initiate Marker Release. Connection Not Completed.
Ground, Loop or Receiver-Off-Hook, Not a PBX or Ground Start Coin Line, Second Trial	After Trouble Record Has Been Completed The CGT Relay is Operated and the GT-5 Relay Is Released and Marker Completes The Connection.
Ground, Loop or Receiver-Off-Hook, With PBX or Ground Start Coin Line With Loop Test Not Cancelled Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Ground, Loop or Receiver-Off-Hook With PBX or	No Trouble Record Will Be Taken Operation of GT-5

Type of Failure	Method of Release of Marker
Ground Start Coin Line With Loop Test Cancelled, Second Trial	Relay Will Operate TRL-1, TRB and TRL Relays To Initiate Marker Release. Connection Not Completed.
Cross-Detecting, First or Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.

C. Intra-Office Class of Call, Connection To Calling Line

Type of Failure	Method of Release of Marker
False Cross and Ground, First Trial	After Trouble Record Has Been Completed The DIS-1/2 Relays Operate To Initiate Marker Release. Connection Not Completed.
False Cross and Ground, Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Continuity Test, First Trial (Cancelled Second Trial)	After Trouble Record Has Been Completed The DIS-1/2 Relays Operate To Initiate Marker Release. Connection Not Completed.
Double Connection, First Trial	After Trouble Record Has Been Completed The DIS-1/2 Relays Operate To Initiate Marker Release. Connection Not Completed.
Double Connection, Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates to Initiate Marker Release. Connection Not Completed.
Ground, Loop or Receiver-Off-Hook (Cancelled First and Second Trial)	

Type of Failure	Method of Release of Marker
Cross-Detecting Failure Before Reg. RL Relay Operates, First or Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Cross-Detecting Failure After Reg. RL Relay Operates, First Trial	After Trouble Record Has Been Completed The DIS-1/2 Relays Operate To Initiate Marker Release. Connection Not Completed.
Cross-Detecting Failure After Reg. RL Relay Operates, Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.

D. Subscriber Outgoing Class of Call

Type of Failure	Method of Release of Marker
False Cross and Ground, First Trial	After Trouble Record Has Been Completed The DIS-1/2 Relays Operate To Initiate Marker Release. Connection Not Completed.
False Cross and Ground, Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Continuity Test, First Trial (Cancelled Second Trial)	After Trouble Record Has Been Completed The DIS-1/2 Relays Operate To Initiate Marker Release. Connection Not Completed.
Double Connection, First Trial	After Trouble Record Has Been Completed The DIS-1/2 Relays Operate To Indicate Marker Release. Connection Not Completed.
Double Connection, Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release.

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Type of Failure	Method of Release of Marker
	Connection Not Completed.
Ground Loop or Receiver-Off-Hook (Cancelled First and Second Trial)	-
Cross-Detecting Failure Before Reg. RL Relay Operates, First or Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection not Completed
Cross-Detecting Failure After Reg. RL Relay Operates, First Trial	After Trouble Record Has Been Completed The DIS-1/2 Relays Operate To Initiate Marker Release. Connection Not Completed.
Cross-Detecting Failure After Reg. RL Relay Operates, Second Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.

E. Terminating Class of Call

Type of Failure	Method of Release of Marker
False Cross and Ground, First Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
False Cross and Ground, Second Trial	After Trouble Record Has Been Completed The RAV-1/2 Relays Operate To Initiate a Route Advance To Set The Incoming Trunk To Provide Overflow Tone.
Continuity, First Trial, (Cancelled Second Trial)	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Double Connection, First Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Double Connection, Second Trial	After Trouble Record Has Been Completed The RAV-1/2 Relays Operate to Initiate a Route Advance To Set The Incoming Trunk To Provide Overflow Tone.
Ground, Loop or Receiver-Off-Hook, First Trial	No Trouble Record Will Be Taken. Operation of GT-5 Relay Will Operate TRL-1, TRB and TRL Relays To Initiate Marker Release. Connection Not Completed.
Ground, Loop or Receiver-Off-Hook, Not a PBX or Ground Start Coin Line, Second Trial	After Trouble Record Has Been Completed The CGT Relay is operated and the GT-5 Relay Is Released and Marker Completes The Connection.
Ground, Loop or Receiver-Off-Hook, With PBX or Ground Start Coin Line With Loop Test Not Cancelled, Second Trial	After Trouble Record Has Been Completed The RAV-1/2 Relays Operate To Initiate a Route Advance To Set The Incoming Trunk To Provide Overflow Tone.
Ground, Loop or Receiver-Off-Hook, With PBX or Ground Start Coin Line With Loop Test Cancelled, Second Trial	No Trouble Record Will Be Taken. Operation of GT-5 Relay Will Operate TRB and RAV-1/2 Relays To Initiate A Route Advance To Set The Incoming Trunk To Provide Overflow Tone.
Cross-Detecting, First Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Cross-Detecting, Second Trial	After Trouble Record Has Been Completed. The RAV-1/2 Relays Operate To Initiate a Route Advance To Set The Incoming Trunk To Provide Overflow Tone.

Type of Failure	Method of Release of Marker
F. Tandem Outgoing Class of Call	
False Cross and Ground, First Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
False Cross and Ground, Second Trial	After Trouble Record Has Been Completed The RAV-1/2 Relays Operate To Initiate a Route Advance To Set The Incoming Trunk To Provide Overflow Tone.
Continuity Test, First Trial (Cancelled Second Trial)	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Double Connection, First Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Double Connection, Second Trial	After Trouble Record Has Been Completed The RAV-1/2 Relays Operate To Initiate A Route Advance To Set The Incoming Trunk To Provide Overflow Tone.
Ground, Loop or Receiver-Off-Hook, (Cancelled First and Second Trial)	-
Cross-Detecting, First Trial	After Trouble Record Has Been Completed The TRL Relay Operates To Initiate Marker Release. Connection Not Completed.
Cross-Detecting, Second Trial	After Trouble Record Has Been Completed The RAV-1/2 Relays Operate To Initiate a Route Advance To Set The Incoming Trunk To Provide Overflow Tone.

23.21 Operation of the Cross-Detecting Relays and The Auxiliary Cross-Detecting Relays

The cross-detecting test relays will test for a trouble condition. When, in the progress of a call, a cross-detecting test relay may be operated only momentarily, an auxiliary cross-detecting relay is provided to lock-in the cross-detecting indication. These auxiliary cross-detecting relays will be held operated until a trouble record has been completed and the cut-off COX relay has been operated.

When the marker detects a cross-detecting test failure, the marker will initiate a trouble record.

23.211 The cross-detecting relays and the auxiliary cross-detecting relays and the conditions for which they test for a trouble condition are as follows:

Standing Tests

Test Relay	Auxiliary Relay	Test Conditions
XBT	-	False Ground test on "BT" lead to Mkr. Conn.
XCH	XACH	False Ground Test on "JO-9" or "LHO-9" leads to Trk. Link Frame or "LLO-9" leads to L.L. Frame
XFT	XAFT	False Ground test on "XFT" lead to Trk. Link Frame (All unused FT terminals).
XLC	XALC	False Ground test for simultaneous operation of more than one LC-0/9 relays on Trk. Link Frame.
XLO		False Ground test on "LO", "LOB", "LOK & "G" leads to L.L. Mkr. Conn.
XLS		False Battery test on "SM 0-9" leads to L.L. Frame.
XLV	XALV	False Ground test on "LFK" lead for operation of more than one relay in group of LV 2-9 relays on Trk. Link Frame.
XMRL		False Ground test on "MRL" lead to Mkr. Conn.
XRS1	XARS	False Battery test on leads "RS-0/4" to Trk. Link Frame.
XRS2	XARS	False Battery test on leads "RS-5/9" to Trk. Link Frame.
XT1	XT-5	False Ground test on leads "CRO,1,2,4,7" "CL1-6" "DL1-6" and "AMA" to outgoing sender connector.
XT2	XT-5	False Ground test for leads "CPO,1,2,4,7", "MBO,1,2,4 7", 4DG, 5DG, L5D, LST, NOB, OBS, TVT and SC to outgoing sender connector.
XTB1		False Battery test on "TBO-5" leads to Trk. Link Frame.
XTC		False Ground test on "TC" lead to L.L. Mkr. Conn.
XTC1		False Ground test on "TC1" lead to L.L. Mkr. Conn.
XTG1		False Ground test on "TG 0-19" leads to Trk. Link Frame.
XTRL		False Ground test on "TRL" lead to Mkr. Conn.

Non-Standing Tests

Test Relay	Auxiliary Relay	Test Conditions
XAB	-	False Ground test for simultaneous operation of FAK and FBK relays.
XCKR	-	False Ground test for simultaneous operation of NOC and CLK relays.
XCL	XACL	False Ground test for simultaneous operation of CLP and CLS relays and for more than one CL-0/5 relay.
XCLC	-	False Ground test for operation of more than one relay in group of OR, TAN, TOL, INC and RO relays.
XCP	XACP	False Ground test for simultaneous operation of CPP and CPS relays and for more than one CP-0/4 relay.
XCR	XACR	False Ground test for simultaneous operation of CRP and CRS relays and for more than one CR-0/10 relay.
XCS	-	False Ground test for operation of more than one relay in group of CS0-29.
XDL	XADL	False Ground test for simultaneous operation of DLP and DLS relays and for more than one DL-0/13 relay.
XF	XAF	False Ground test for simultaneous operation of RF and EF relays on Trk. Link Frame.
XFG	-	False Ground test for simultaneous operation of FG0 and FG1 relays.
XFTN	FTTB	False Ground test for operation of more than one relay in group of FTN- relays.
XFUN	FTTB	False Ground test for operation of more than one relay in group of FUN- relays.
XHG	XAHG	False Ground test for simultaneous operation of more than one HG-0/9 relays on Line Link Frame.
XJC	XAJC	False Ground test for simultaneous operation of more than one JC-0/19 relays on Trk. Link Frame.
XJG	XAJG	False Ground test for simultaneous operation of more than one G-0/4 relays on Trk. Link Frame.
XJS	XAJS	False Ground test on operating ckt. of Junctor Sw. Sel. Mag. on lead "JS" to Trk. Link Frame.
XLG	XALG	False Ground test for simultaneous operation of more than one LG-relays on Line Link Frame.
XLR	XALR	False Ground test for simultaneous operation of L and R relays on Trk. Link Frame.
XMB	XAMB	False Ground test for simultaneous operation of MBP and MBS relays and for more than one MB-0/4 relay.
XN		False Ground Test for operation of more than one relay in group of TBIA, RIA, BNA,TRN1 and NE relays, and for simultaneous operation of OAN and OBN relays.
XOB		False Ground test for simultaneous operation of OBS and NOB relays.
XPG		False Ground test for operation of more than one relay in group of PA, PB, PC and PNR relays.
XPT		False Ground test for operation of more than one relay in group of ONN, 1TB, 2MB, 3FB, 4TT, 5MT, 6FT, 7TP, 8MP and 9FP relays.
XPTN	XAPTN	False Ground test for operation of more than one relay in group of PO-9 relays.
XRCT		False Ground test for operation of more than one relay in group of RCT 1-15 relays.
XRL		False Ground test on "RL" lead to Orig. Reg. Mkr. Conn.
XRS3		False Ground test for simultaneous operation of RS0 and RS1 relays.
XRS4		False Ground test for operation of more than one relay in group of RS 2-9 relays.
XS		False Ground test for operation of more than one sender connector S relay in group for same marker.
XSA		False Ground test for operation of more than one sender connector AMA relay in group for same marker.
XSL		False Ground test on "AST" and "BST" leads to Trk. Link Frame.
XSS		False Battery test on leads "SS0-9" to Trk. Link Frame.
XT		False Ground test for operation of more than one relay in group of OA, OB, X11, 11X, TC7, TC6 and TC5 relays.

Test Relay	Auxiliary Relay	Test Conditions
XTAN		False Battery test for operation of more than one TAN-OA/4A relays.
XTB		False Ground test for operation of more than one relay in group of TB 0-5 relays.
XTG		False Ground test for operation of more than one relay in group of TG 0-19 relays.
XTRK		False Ground test on "TRK" lead to Mkr. Conn. on Second Trials.
XTS	XATS	False Battery test on "TSX", "ASM" & "BSM" leads and test for operation of more than one Trk. Sel. Mag.
XTS1		False Ground test on "TSX" lead to Trk. Link Frame during trunk selection.
XTV		False ground test for simultaneous operation of TVA and SCC relays.
XVGA	XAVGA	False Ground test for simultaneous operation of more than one VGA-0/13 relay on Line Link Frame.
XVGB	XAVGB	False Ground test for simultaneous operation of more than one VGB-0/13 relay on Line Link Frame.

23.212 Operation of the MXT and SP Relays

The operation of any cross-detecting test relay or where provided the operation of any auxiliary cross-detecting relay will operate the master cross-detecting MXT relay which in turn will operate the stop-progress SP relay.

23.22 Failure of False Cross; Continuity; Double Connection; Ground, Loop or Receiver-Off-Hook; or Crossed Line Hold Magnet Test

The marker circuit when assisting various calls or connections will perform a false cross and ground test, a continuity test, a double connection test and a ground, loop or receiver-off-hook test as described in paragraphs 7. to 18.

The marker circuit when assisting a dial tone connection will perform a crossed line hold magnet test.

The false cross and ground test, the continuity test, the double connection test, the ground, loop or receiver-off-hook test and the crossed line hold magnet test will be performed under the following conditions:

A. Dial Tone Class of Call

Type of Test	Conditions Under Which Test Is Made
False Cross and Ground	Light Traffic, Marker First or Second Trial.
Continuity	Marker First Trial, Cancelled Second Trial.
Double Connection	Marker First or Second Trial.
Ground, Loop or Receiver-Off-Hook Test	Cancelled Marker First and Second Trial
Crossed Line Hold Magnets	Light Traffic, Marker First or Second Trial.

B. Intra-Office Class of Call, Connection To Called Line

Type of Test	Conditions Under Which Test Is Made
False Cross and Ground	Light Traffic, Marker First and Second Trial.
Continuity	Marker First Trial, Cancelled Second Trial.
Double Connection	Marker First or Second Trial
Ground, Loop or Receiver-Off-Hook Test	Marker First or Second Trial
Crossed Line Hold Magnets	Cancelled Marker First or Second Trial

C. Intra-Office Class of Call, Connection To Calling Line

Type of Test	Conditions Under Which Test Is Made
False Cross and Ground	Light Traffic, Marker First or Second Trial Except Cancelled for PBX With Dial Selected Trunks.
Continuity	Marker First Trial, Cancelled Second Trial.
Double connection	Marker First or Second Trial.

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Type of Test	Conditions Under Which Test Is Made
Ground, Loop or Receiver-Off-Hook Test	Cancelled Marker First or Second Trial.
Crossed Line Hold Magnets	Cancelled Marker First or Second Trial.

D. Subscriber Outgoing Class of Call

False Cross and Ground	Light Traffic, Marker First or Second Trial Except Cancelled for PBX With Dial Selected Trunks.
Continuity	Marker First Trial, Cancelled Second Trial.
Double Connection	Marker First or Second Trial.
Ground, Loop or Receiver-Off-Hook Test	Cancelled Marker First or Second Trial.
Crossed Line Hold Magnets	Cancelled Marker First or Second Trial.

E. Terminating Class of Call

False Cross and Ground	Light Traffic, Marker First or Second Trial.
Continuity	Marker First Trial, Cancelled Second Trial.
Double Connection	Marker First or Second Trial.
Ground, Loop or Receiver-Off-Hook Test	Marker First or Second Trial.
Crossed Line Hold Magnets	Cancelled Marker First or Second Trial.

F. Tandem Outgoing Class of Call

False Cross and Ground	Light Traffic, Marker First or Second Trial.
Continuity	Marker First Trial, Cancelled Second Trial.
Double Connection	Marker First or Second Trial.
Ground, Loop or Receiver-Off-Hook Test	Cancelled Marker First or Second Trial.
Crossed Line Hold Magnets	Cancelled Marker First or Second Trial.

23.221 Failure of False Cross and Ground Test

When the marker in performing the false cross and ground test detects a failure the marker will be prevented from proceeding and the marker work timer circuit will time-out to indicate a trouble condition. To indicate a false cross and ground test failure the FCG relay will be operated, as described in paragraph 7.531, which in turn releases the FCGA relay. The released condition of the FCGA relay will prevent the marker from proceeding with the connection and therefore the work timer circuit will time-out to indicate a trouble condition and the marker will initiate the seizure of the trouble recorder.

23.222 Failure of Continuity Test

When the marker in performing the continuity test detects a failure, the marker will be prevented from proceeding and the marker work timer circuit will time-out to indicate a trouble condition. To indicate a continuity test failure the CON tube will not become conductive and the CON, CON-1 and CON-3 relays will not be operated, as described in paragraph 7.532. The non-operation of the CON, CON-1 and CON-3 relays will prevent the marker from proceeding with the connection and therefore the work timer circuit will time-out to indicate a trouble condition and the marker will initiate the seizure of the trouble recorder.

23.223 Failure of Double Connection Test

When the marker in performing the double connection test detects a failure the marker will be prevented from proceeding and the marker work timer circuit will time-out to indicate a trouble condition. To indicate a double connection test failure the DCT relay will not be operated, as described in paragraph 7.533. The non-operation of the DCT relay will prevent the marker from proceeding with the connection and therefore the work timer circuit will time-out to indicate a trouble condition and the marker will initiate the seizure of the trouble recorder.

23.224 Failure of Ground, Loop or Receiver-Off-Hook Test

When the marker in performing the ground, loop or receiver-off-hook test detects a failure, the marker will initiate the seizure of the trouble recorder will release the marker from this connection or the marker will proceed to establish the connection. To indicate a ground, loop or receiver-off-hook test failure the GT relay will be held operated, as described in paragraph 8.0833. The non-release of the GT relay will operate the GT-5 relay when the GT-3 relay has released. The operation of the GT-5 relay will either initiate the release of this marker or will initiate the seizure of the trouble recorder for intra-office class or terminating class calls for marker first or second trial, as described in paragraph 23.31.

23.225 Failure of Crossed Line Hold Magnet Test

The crossed line hold magnet test will be performed only when the marker is assisting a dial tone connection under a light traffic condition.

The operation of the DT-3 relay, with the HTR relay non-operated, will operate the LHT relay.

The operation of the DT-3, LHT and CKG7 relays, with the XLH relay non-operated, has biased the secondary winding of the XLH relay in the non-operate polarity. When the HMS-1 relay is operated, as described in paragraph 7.521, and the LHT relay is in the operated condition, the "LH-0/4" lead from the line link frame will be extended to one side of the primary winding of the XLH relay. The other side of the primary winding of the XLH relay will be extended to ground potential, for a surge current, thru the XLH condenser when the CGT relay is operated. When the "LH-0/4" lead from the line link frame is extended to the XLH relay, a surge current will flow from the line hold magnet to the marker and thru the primary winding of the XLH relay while the XLH condenser is being charged. If the line hold magnet associated with this connection is not crossed to some other non-operated line hold magnet the surge current in the primary winding of the XLH relay will not be great enough to operate the XLH relay. However, if the line hold magnet associated with this connection is crossed to some other non-operated line hold magnet the surge current in the primary winding of the XLH relay will be great enough to operate the XLH relay. After operating, the XLH relay will be held in the operated position by the current flow in the secondary winding.

The operation of the XLH relay will hold operated the LHT relay which would normally release when the LTR relay is operated. The operation of the XLH and LHT relays will not interfere with the establishment of a dial tone connection. However, when the marker LK-1 relay is operated, the marker will not initiate the release of marker and instead will initiate the seizure of the trouble record by operating the TRR relay.

23.3 Trouble Recording

When a trouble condition is detected by a marker, the marker will immediately stop its circuit operations and request the trouble recorder to make a detailed record of the information which the marker contains and also certain information of the circuits associated with the marker.

23.31 Marker Start for Trouble Recorder

To initiate the seizure of the trouble recorder one of the trouble record TR-1 or TRR relays in the marker will be operated. At the same time the stop progress SP relay in the marker will be operated to stop the marker from progressing beyond the point at which the trouble condition was detected.

23.311 Operation of the TR-1 or TRR Relay

When the marker detects a trouble condition which requires a trouble record the marker will operate either the take trouble record and give normal release TRR relay or will operate the take trouble record and give trouble release TR-1 relay as follows:

A. Dial Tone Class of Call

Type of Failure	Take Trouble Record Relay Operated
Cross Test, Marker First or Second Trial	TR-1
WT, SDT or LDT Time-out, Marker First or Second Trial	TR-1
False Cross and Ground Test, Marker First or Second Trial	TR-1
Continuity Test, Marker First Trial	TR-1
Continuity Test, Marker Second Trial	Test Cancelled

Type of Failure	Take Trouble Record Relay Operated
Ground, Loop or Receiver-Off-Hook Test, Marker First and Second Trial	Test Cancelled
Crossed Line Hold Magnets (XLH), Marker First or Second Trial	TRR
Over-all Timing Time-out, Marker First or Second Trial	No Trouble Record Taken

B. Intra-Office Class of Call, Connection to Called Line

Type of Failure	Take Trouble Record Relay Operated
Cross Test, Marker First or Second Trial	TR-1
WT, SDT or LDT Time-out, Marker First or Second Trial	TR-1
False Cross and Ground Test, Marker First or Second Trial	TR-1
Continuity Test, Marker First Trial	TR-1
Continuity Test, Marker Second Trial	Test Cancelled
Ground, Loop or Receiver-Off-Hook Test, Marker First Trial	No Trouble Record Taken
Ground, Loop or Receiver-Off-Hook Test, Marker Second Trial, Not a PBX or Ground Start Coin Line	TRR
Ground, Loop or Receiver-Off-Hook Test, Marker Second Trial With PBX or Ground Start Coin Line Subscriber Line With Loop Test Not Cancelled	TR-1
Ground, Loop or Receiver-Off-Hook Test, Marker Second Trial With PBX or Ground Start Coin Line With Loop Test Cancelled	No Trouble Record Taken
Crossed Line Hold Magnets, Marker First or Second Trial	Test Cancelled
Over-all Timing Time-out	No Trouble Record Taken

C. Intra-Office Class of Call, Connection to Calling Line

Type of Failure	Take Trouble Record Relay Operated
Cross Test, Marker First or Second Trial, Before Reg. RL Operates	TR-1
Cross Test, Marker First Trial, After Reg. RL Operates	TRR
Cross Test, Marker Second Trial, After Reg. RL Operates	TR-1
WT, SDT or LDT Time-out, Marker First or Second Trial, Before Reg. RL Operates	TR-1
WT, SDT or LDT Time-out, Marker First Trial, After Reg. RL Operates	TRR
WT, SDT or LDT Time-out, Marker Second Trial, After Reg. RL Operates	TR-1
False Cross and Ground Test, Marker First Trial	TRR
False Cross and Ground Test, Marker Second Trial	TR-1
Continuity Test, Marker First Trial	TRR
Continuity Test, Marker Second Trial	Test Cancelled
Ground, Loop or Receiver-Off-Hook Test, Marker First or Second Trial	Test Cancelled
Crossed Line Hold Magnets, First or Second Trial	Test Cancelled
Over-all Timer Time-out	No Trouble Record Taken

Type of Failure	Take Trouble Record Relay Operated
D. Subscriber Outgoing Class of Call	
Cross Test, Marker First or Second Trial, Before Reg. RL Operates	TR-1
Cross Test, Marker First Trial, After Reg. RL operates	TRR
Cross Test, Marker Second Trial, After Reg. RL Operates	TR-1
WT, SDT or LDT Time-out, Marker First or Second Trial, Before Reg. RL Operates	TR-1
WT, SDT or LDT Time-out, Marker First Trial, After Reg. RL Operates	TRR
WT, SDT or LDT Time-out, Marker Second Trial, After Reg. RL Operates	TR-1
False Cross and Ground Test, Marker First Trial	TRR
False Cross and Ground Test, Marker Second Trial	TR-1
Continuity Test, Marker First Trial	TRR
Continuity Test, Marker Second Trial	Test Cancelled
Ground, Loop or Receiver-Off-Hook Test, Marker First or Second Trial	Test Cancelled
Crossed Line Hold Magnets, First or Second Trial	Test Cancelled
Over-all Timer Time-out	No Trouble Record Taken
Sender TG Test, Marker First or Second Trial	TRR
E. Terminating Class of Call	
Cross Test, Marker First or Second Trial	TR-1
WT, SDT or LDT Time-out Marker First or Second Trial	TR-1
False Cross and Ground Test, Marker First or Second Trial	TR-1
Continuity Test, Marker First Trial	TR-1
Continuity Test, Marker Second Trial	Test Cancelled
Ground, Loop or Receiver-Off-Hook Test, Marker First Trial	No Trouble Record Taken
Ground, Loop or Receiver-Off-Hook Test, Marker Second Trial, Not a PBX or Ground Start Coin Line	TRR
Ground, Loop or Receiver-Off-Hook Test, Marker Second Trial, PBX or Ground Start Coin Line with Loop Test Not Cancelled	TR-1
Ground, Loop or Receiver-Off-Hook Test, Marker Second Trial, PBX or Ground Start Coin Line With Loop Test Cancelled	No Record
Crossed Line Hold Magnets, First or Second Trial	Test Cancelled
Over-all Timer Time-out	No Trouble Record Taken
F. Tandem Outgoing Class of Call	
Cross Test, Marker First or Second Trial	TR-1
WT, SDT or LDT Time-out, Marker First or Second Trial	TR-1
False Cross and Ground Test, Marker First or Second Trial	TR-1
Continuity Test, Marker First Trial	TR-1
Continuity Test, Marker Second Trial	Test Cancelled

Type of Failure	Take Trouble Record Relay Operated
Ground, Loop or Receiver-Off-Hook Test, Marker First or Second Trial	Test Cancelled
Crossed Line Hold Magnets, First or Second Trial	Test Cancelled
Over-all Timer Time-out	No Trouble Record Taken
Sender TG Test, Marker First or Second Trial	TR-1

23.312 Operation of TRST and TRSA Relays in the Marker and the MPR-, MKA, MKB and MKB-1 Relays in the Master Test Frame Connector Circuit

The operation of either the TR-1 or TRR relay with the MON-1 relay non-operated will operate the trouble recorder start TRST relay which in turn will operate the trouble recorder start auxiliary TRSA relay.

The operation of the TRSA relay with the TRB relay and the TRTR relay non-operated will extend battery potential over the "TRST" lead from the marker to the master test frame connector circuit to operate in the master test frame connector circuit the marker preference MPR- relay associated with this marker. If this requesting marker has preference over all other circuits requesting the trouble recorder the relay preference circuit in the master test frame connector circuit will extend ground potential over the "CI" lead from the master test frame connector circuit to the marker circuit. In the marker the ground potential on the "CI" lead will be further extended to the "MKA" and "MKB" leads when the TRST relay is operated and the TRB relay is non-operated. The ground potential on the "MKA" and "MKB" leads will be extended from the marker to the master test frame connector circuit to operate the MKA, MKB and MKB-1 relays associated with this marker. The operation of the MKA, MKB and MKB-1 relays in the master test frame connector circuit associated with this marker will seize the trouble recorder for use with this marker and will also operate connector relays to extend a large group of test leads from the marker to the trouble recorder.

The trouble recorder perforator will then examine the group of leads which have been extended from the marker to the trouble recorder perforator and will perforate a trouble record card to indicate the condition present on each of these leads.

23.32 Completion of the Trouble Record and the Release of the Marker

After the trouble recorder perforator has completed the perforation of the trouble record card a signal will be transmitted to the marker to indicate that the marker may release or may proceed with the required operations since the trouble record has been completed.

23.321 Operation of the TRC-1, and RM Relays in the Master Test Frame Connector Circuit and the TRB Relay in the Marker

When the trouble recorder perforator has completed the perforation of the trouble record card the trouble record complete TRC-1 relay will be operated in the trouble recorder circuit which will operate the trouble recorder complete TRC and TRC-1 relays and the RM, relay in the master test frame connector circuit. The operation of the RM relay in the master test frame connector circuit will place ground potential on the "TRB" lead which will be extended to the marker circuit to operate the TRB relay in the marker when the MON-1 relay is non-operated and with either the TRR or TR-1 relay operated. After operating the TRB relay will be held operated with the TRSA relay operated.

The operation of the marker TRB relay will be an indication that the trouble record has been completed and that the marker should be released or should proceed with the required operations. The operation of the marker TRB relay will also remove the battery potential from the "TRST" lead releasing the MPR- relay in the master test frame connector associated with this marker thereby releasing the connecting relays in the master test frame connector circuit required for perforating a trouble record.

23.33 Release of the Marker When Trouble Recorder is Busy

When a marker requires a trouble recorder but determines that the trouble recorder is busy, the marker will not wait until the trouble recorder becomes idle but will immediately be released or will proceed with the required functions.

23.331 Operation of RM or RM-1 Relays in the Master Test Frame Connector Circuit and the TRB Relay in the Marker

When any circuit is connected to the trouble recorder the RM-1 relay in the master test frame connector circuit will be operated or if the trouble recorder has been "plugged busy" the RM relay in the master test frame connector circuit will be operated. The operation of the RM-1 relay will place ground potential on the "TRB" leads associated with all circuits having access to the trouble recorder except the particular circuit which is connected to the trouble recorder.

Also the operation of the RM relay will place ground potential on the "TRB" leads associated with all circuits having access to the trouble recorder.

When a marker requires a trouble record at a time when the trouble record is busy, the "TRB" lead associated with this marker will be grounded, therefore the TRB relay will be immediately operated when the TRR or TR-1 relay is operated. The operation of the TRB relay in this case is an indication to the marker to release or to proceed with the required functions.

23.34 Trouble Recording Timer Operation

The trouble recording timer (TRTR) is used to time the period during which a marker is associated with the trouble recorder in the perforation of a trouble record card and gives a trouble indication if the marker, the master test frame connector circuit, the trouble recorder circuit or the trouble recorder perforator encounters a trouble which prevents the marker from releasing from the connection in about 2.5 seconds.

The operation of the WT, SDT, LDT, TR-1 or TRR relay will operate the trouble recorder timing TRT relay which will initiate the trouble recording timer (TRTR). The operation of the TRT relay removes the TRT-3 resistor shunting the TRTR condenser. The operation of the TRT relay also connects ground, through the TRTR relay winding, to one side of the TRTR condenser. The other side of the TRTR condenser is connected to +130 volts thru the TRT-1 resistance. This causes the TRTR condenser to be slowly charged. As a result, the potential at the control grid of the TRTR electronic tube thru resistor TRT-2 is therefore gradually increased. After an interval of 2.0 to 3.1 seconds the potential on the condenser and therefore on the control anode of the TRTR tube, will be increased to approximately +72 volts at which time the tube will fire, that is, become conductive, causing a current flow which will operate the TRTR relay. When the trouble recorder timer timing interval is to be discontinued the TRT relay will be released. If the TRT relay releases at any time before the TRTR tube fires, the TRTR condenser will be discharged by placing the 2000 ohm TRT-3 resistor across it to recycle the TRTR tube timing.

If the TRTR relay is operated the marker disconnect relays will be operated to disconnect the marker from this connection.

24. SECOND TRIAL FEATURES

When a marker is unable to complete the connection because of a trouble condition on the first trail, the marker will be released and for certain types of trouble conditions the marker will indicate to the marker connector circuit that a second marker should be seized to initiate a second trial.

The second trial marker will attempt to complete the connection in a manner similar to the first trial marker. However, the second trial marker will provide for changing the selection preferences of certain features and changing the method of operation for certain functions and tests.

24.1 Initiating Second Trial

When a marker which is associated with a first trial call or connection encounters a trouble condition and desires to initiate a second trial the TRL and TRLA relays in the marker will be operated and the "TRL" lead to the marker connector will be ground to operate the marker connector TRL relay. After the first trial marker has been released from the connection the marker connector will seize a marker to initiate a second trial.

When a marker which is associated with a first trial call or connection encounters a trouble condition and does not desire to initiate a second trial the "MRL" lead to the marker connector will be grounded to operate the marker connector MRL relay. When the marker releases the marker connector will also be released and no second trial will be initiated.

A second trial will be initiated or will not be initiated for various trouble conditions as follows:

A. Dial Tone Class of Call

Type of Failure	Second Trial Initiated
WT, SDT or LTD Time-out, False Cross and Ground Test, Continuity, Double Connection Test and Cross-Detecting Test	"TRL" Lead Grounded To Initiate Second Trial
Crossed Line Hold Magnet (XLH) Test	No Second Trial Initiated
Ground, Loop or Receiver-Off-Hook Test (Cancelled)	-

B. Intra-Office Class of Call, Connection To Called Line

Type of Failure	Second Trial Initiated
WT, SDT, or LDT Time-out, False Cross and Ground Test, Continuity Test, Double Connection Test, Cross Detecting Test and Ground, Loop or Receiver-Off-Hook Test	"TRL" Lead Grounded To Initiate Second Trial

C. Intra-Office Class of Call, Connection To Calling Line

Type of Failure	Second Trial Initiated
WT, SDT or LDT Time-out Before Reg. RL Relay Operates, Cross Detecting Failure Before Reg. RL Relay Operates	"TRL" Lead Grounded to Initiate Second Trial
WT, SDT or LDT Time-out After Reg. RL Relay Operates, False Cross and Ground Test, Continuity Test, Double Connection Test, Cross-Detecting Failure After Reg. RL Relay Operates	"MRL" Lead Grounded, No Second Trial Initiated
Ground, Loop or Receiver-Off-Hook Test (Cancelled)	-

D.

Type of Failure	Second Trial Initiated
WT, SDT or LDT Time-out Before Reg. RL Relay Operates, Cross-Detecting Before Reg. RL Relay Operates	"TRL" Lead Grounded To Initiate Second Trial
WT, SDT or LDT Time-out After Reg. RL Relay Operates, False Cross and Ground Test, Continuity Test, Double Connection Test, Cross-Detecting After Reg. RL Relay Operates	"MRL" Lead Grounded, No Second Trial Initiated
Ground, Loop or Receiver-Off-Hook Test (Cancelled)	-

E. Terminating Class of Call

Type of Failure	Second Trial Initiated
WT, SDT or LDT Time-out, False Cross and Ground Test, Continuity Test, Double Connection Test, Cross-Detecting Test, Ground, Loop or Receiver-Off-Hook Test	"TRL" Lead Grounded To Initiate Second Trial

F. Tandem Outgoing Class of Call

Type of Failure	Second Trial Initiated
WT, SDT or LDT Time-out, False Cross and Ground Test, Continuity Test, Double Connection Test, Cross-Detecting Test	"TRL" Lead Grounded To Initiate Second Trial
Ground, Loop or Receiver-Off-Hook Test (Cancelled)	-

24.2 Operation of Second Trial Marker

After the first trial marker has been released the marker connector circuit will seize a second trial marker.

24.21 Operation of the Marker Connector TR and TR-1 Relays and the Marker TR2, TR2B, TR2C, TR2D, TR2E and TR2F

When the first trial marker determines that a second trial is required the first trial marker will place ground potential on the "TRL" lead to the marker connector to operate the TRL relay in the marker connector which will in turn operate the TR relay in the marker connector.

After the marker connector has been released from the first trial marker the

TRL relay in the marker connector will be released. The release of the TRL relay will operate the TR-1 relay in the marker connector circuit.

After the marker connector has been released from the first trial marker the marker connector will seize a second trial marker in a manner similar to the seizure of the first trial marker. After the seizure of the second trial marker and after the operation of the marker connector MC and TR-1 relays ground potential will be extended over the "TR-2" lead from the marker connector to the marker. Ground potential on the "TR-2" lead will be extended to operate the second trial TR2 relay in the marker to indicate to the marker that a second trial connection is in progress. The operation of the TR2 relay will operate the auxiliary second trial TR2B, TR2C, TR2E and TR2F relays for all classes of calls and the TR2D relay for a dial tone class of call.

24.22 Marker Operations

The second trial marker will attempt to complete the connection in a manner similar to the first trial marker. However, the second trial marker will provide for changing the selection preferences and the method of operation of the following features.

a. For a dial tone class of call the preference of the selection of a vertical group differs from a first trial.

b. The "TRK" lead to the marker connector is checked for a false ground whereas for a first trial this check was not provided.

c. The preference of selection of the connecting path channel differs from a first trial.

d. The GO relay on the trunk link frame is operated on the secondary winding instead of being operated on the primary winding by placing battery potential on the "GOA" lead instead of the "GO" lead to the trunk link frame.

e. The preference of selection of a PBX line within the PBX tens group is reversed for a second trial.

f. The check of the line link frame lock-out feature is cancelled for a second trial.

g. The service observing registration check is cancelled for a second trial.

h. The trouble detecting tests and trouble recording functions differ from a first trial, as described in paragraph 23.

i. The release of the second trial marker which encounters a trouble condition differs from a first trial, as described in paragraph 23.

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25. TRAFFIC AND PLANT REGISTER OPERATION

The marker circuit is provided with means of initiating the operation of certain traffic and plant registers. The traffic registers will supply information as to the traffic load carried by certain equipment or will supply information as to the traffic load of a certain type of call or connection. The plant registers will supply information as to the number and type of trouble conditions which are encountered.

25.1 Traffic Register Operation

The various traffic registers whose operation the marker initiates are as follows:

a. Line Link Frame Originating Peg Count

One peg count traffic registers is provided for each line link frame and the traffic register associated with the line link frame which is required for completing the call is operated on intra-office, outgoing, tandem or thru intertoll class calls when a connection is established from either the calling line or incoming trunk termination on the line link frame to a trunk group on the trunk line frame. This register will not be operated on dial tone connections. The purpose of these registers is to indicate the traffic which is completed to a trunk termination including line busies, overflow, partial dial, etc.

This register will be operated by the marker placing ground potential on the "LCB" lead to the line link frame.

b. Line Link Frame Terminating Peg Count

One peg count traffic register is provided for each line link frame and the traffic register associated with the line link frame which is required for completing the call is operated on terminating and intra-office class calls when a connection is established to the called line.

This register will be operated by the marker placing ground potential on the "TER" lead to the line link frame.

c. Trunk Link Frame Dial Tone Peg Count

One peg count traffic register is provided for each trunk link frame and the traffic register associated with the trunk link frame which is required for completing the call is operated on dial tone class calls when a connection is established to an originating register for dial tone.

This register will be operated by the marker placing ground potential on the "DT" lead to the trunk link frame.

d. Trunk Link Frame Originating Peg Count

One peg count traffic register is provided for each trunk link frame and the traffic register associated with the trunk link frame which is required for completing the call is operated on intra-office, outgoing, tandem or thru intertoll class calls when a connection is established from either the calling line or incoming trunk termination on the line link frame to a trunk group on the trunk link frame.

This register will be operated by the marker placing ground potential on the "TCB" lead to the trunk link frame.

e. Trunk Link Frame Incoming Peg Count

One peg count traffic register is provided for each trunk link frame and the traffic register associated with the trunk link frame which is required for completing the call is operated on termination class calls completed or encountering line busy or overflow.

This register will be operated by the marker placing ground potential on the "INC" lead to the trunk link frame.

f. Outgoing Trunk Group Peg Count

One or more peg count traffic registers are provided as required for each intra-office, outgoing, inter-marker group tone and common overflow trunk group and the traffic register associated with a certain route will be operated whenever the marker establishes a connection to the associated route.

These registers will be operated by the marker placing ground potential on the associated "PC" lead to the traffic register circuit.

g. Sender Group Peg Count

One peg count traffic register is provided for each group or subgroup of outgoing senders and the traffic register associated with the outgoing sender group or subgroup which is required for completing the call is operated when a call selects a sender for service.

This register will be operated by the marker placing ground potential on the associated "OSG" lead to the traffic register circuit.

h. Marker Class of Service Peg Count

One peg count traffic register is provided for each originating class of service (maximum of ten) and the traffic register associated with the class of service of the calling subscriber will be operated when a connection is established to for an intra-office or outgoing class of call.

This register will be operated by the marker placing ground potential on the associated "S" lead to the traffic register circuit.

i. Intercepting Peg Count

Three peg count registers will be provided for each marker group, one peg count register for blank number registrations, one peg count register for regular intercept registrations and one peg count register for trouble intercept registrations.

Whenever the marker encounters a blank number condition the marker will place ground on the "BNA" lead to the traffic register circuit to operate the traffic register associated with blank numbers.

Whenever the marker encounters a regular intercept condition the marker will place ground on the "RIA" lead to the traffic register circuit to operate the traffic register associated with regular intercepts.

Whenever the marker enounters a trouble intercept condition the marker will place ground on the "TBI" lead to the traffic register circuit to operate the traffic register associated with trouble intercepts.

j. Preroute Peg Count

One peg count traffic register is provided (maximum of twenty for each code which is associated with outgoing trunks which will route the connection thru a tandem office. Whenever the marker establishes a connection of this type the associated traffic register will be operated.

This register will be operated by the marker placing ground potential on the associated "PCT" lead to the traffic register circuit.

k. Marker Pulse Conversion Peg Count

One or more peg count traffic registers are provided as required for each marker group which will assist pulse conversion calls. Whenever the marker is associated with a pulse conversion call the marker will place ground potential on the associated "PLSC" lead to the traffic register circuit to operate the associated traffic register circuit.

l. Pulse Conversion Outgoing Sender Group

One peg count register per outgoing sender group will be provided if more than one outgoing sender group is used for pulse conversion calls. This register scores all offered marker pulse conversion calls except test calls. The scoring is made under control of the route relay used for marker pulse conversion.

This register will be operated by the marker placing ground potential on the associated "PC-" lead to the traffic register circuit.

m. Outgoing Trunk Group Overflow

Overflow traffic registers are provided as required for outgoing and intra-office trunk groups and originating register groups and the traffic register associated with a certain intra-office, outgoing or originating register route will be operated whenever the marker encounters on all trunks busy condition when assisting a call to the associated route.

These registers will be operated by the marker placing ground potential on the associated "OF" lead to the traffic register circuit.

n. Line Link Frame Failure to Match

One overflow traffic register is provided for each line link frame and the traffic register associated with the line link frame which is required for completing the call is operated whenever the marker encounters a failure to match condition.

This register will be operated by the marker placing ground potential on the "OF" lead to the line link frame.

o. Trunk Link Frame Failure to Match

One overflow traffic register is provided for each trunk link frame and the traffic register associated with the trunk link frame which is required for completing the call is operated whenever the marker encounters a failure to match condition.

This register will be operated by the marker placing ground potential on the "OF" lead to the trunk link frame.

p. Originating Matching Loss

One overflow traffic register is provided for each marker group and the traffic register associated with the marker group is operated whenever a marker in the marker group encounters a second failure to match condition on any intra-office, outgoing, tandem or thru intertoll class of call.

This register will be operated by the marker placing ground potential on the "FM" lead to the traffic register circuit.

q. Incoming Matching Loss

One overflow traffic register is provided for each marker group and the traffic register associated with a marker group is operated whenever a marker in the marker group encounters a failure to match condition on any terminating class call.

This register will be operated by the marker placing ground potential on the "IFM" lead to the traffic register circuit.

r. Subscriber Line Overflow

One overflow traffic register is provided as required for each individual subscriber line or PBX group and the traffic register associated with a particular individual subscriber line or PBX group will be operated whenever the marker determines that the individual subscriber line is busy or all of the subscriber lines within a PBX group are busy.

This register will be operated by the marker placing ground potential on the "OOF" lead to the number group circuit.

s. Line Link Frame Load

One load indicating register is provided per line link frame. Whenever the marker attempts to establish an intra-office, outgoing, tandem or thru intertoll class connection and whenever the number of busy line links within the line link group associated with this connection is greater than a specified number the marker will operate the line link frame load traffic register which is associated with the line link frame which is required to complete this call.

This register will be operated when the marker PL relay operates to extend ground potential over the "PL" lead to the line link frame. The marker "REG-1/2" and "R-5/8" cross-connection terminals should be cross-connected in a manner to operate the marker PL relay when the specified number of line links (including the one on this call) within the line link group are busy.

t. Trouble Intercept, Regular Intercept, and Blank Number Intercept.

One register will be operated for trouble intercept calls, one register for regular intercept calls, and one register for blank number calls.

This register will be operated by the marker placing ground potential on the associated lead to the traffic register circuit. Ground on the "TBIA" lead will operate the trouble intercept register, ground or the "RIA" lead will operate the regular intercept register and ground or the "BNA" lead will operate the blank number intercept register.

25.2 Plant Register Operation

The various plant registers whose operation the marker initiates are as follows:

a. Trouble Record Peg Count

One trouble record peg count plant register is provided per marker and the associated trouble record peg count plant register is operated whenever a marker attempts to seise the trouble recorder for a first trial with the exception of the following conditions.

1. Party mismatch.
2. Permanent signal.
3. Ground, loop, receiver-off-hook test failure.
4. Continuity test failure.
5. Marker test calls.

This register will be operated by the marker placing ground potential on the "TR" lead to the plant register circuit.

b. Marker Second Trial Failure Peg Count

One marker second trial failure peg count plant register is provided per marker group and the associated plant register is operated whenever a marker encounters a trouble condition while associated with a second trial with the exception of the following conditions:

1. Party mismatch.
2. Permanent signal.
3. Ground, loop or receiver-off-hook test failure.
4. Continuity test failure.
5. Marker test calls.

This register will be operated by the marker placing ground potential on the "MST" lead to the plant register circuit.

c. Ground Test Failure Peg Count

One ground test failure peg count plant register is provided per marker group and the associated plant register is operated whenever a marker encounters a ground, loop or receiver-off-hook test failure while associated with either a first or second trial with the exception of the following conditions.

1. Marker test calls.
2. Cancel ground test failure is operative.

This register will be operated by the marker placing ground potential on the "GTF" lead to the plant register circuit.

26. ROUTE SERIES RELAYS USED FOR TRUNK CLASS SIGNALS

The route series relays to be used on any particular route are determined by the class signals required in the associated trunks, as shown in the following table:

Route Series Relay Operated	Trunks requiring following class leads "CN" Lead	grounded "TC" Lead
NCCN	✓	-
NCNC	-	-
TCCN	✓	✓
TCNC	-	✓

The "NC", "NN", "TC", and "TN" cross-connection terminals of figure 53 associated with the NCCN, NCNC, TCCN, and TCNC relay windings will be cross-connected to the "R" cross-connection terminals of figure 51, to the "S-" cross-connection terminals of figure 61, or to the "PSA-" or "PSB-" cross-connection terminals of figure 135. The NCCN, NCNC, TCCN or TCNC relay will be operated in series with the selected R- relay.

It will be necessary to provide means for alternate routes to receive the same trunk class signal that was used on the primary route, in order to satisfy the marker checking circuits.

27. TAKING EQUIPMENT OUT OF SERVICE

When necessary, a marker may be taken out of service by inserting a 322A plug into the (MMB), (M-C-MB), or (M-D-MB) jack on the master test frame jack bay associated with the marker to be removed from service. On the master test frame jack bay an (MMB) jack will be equipped for each combined marker, an (M-C-MB) jack will be equipped for each completing marker and an (M-D-MB) jack will be equipped for each dial tone marker.

If the marker is in use when the plug is inserted, the "in use" (M) lamp associated with the particular marker will remain lighted until the marker completes its function, at which time the lamp will be extinguished.

Inserting the 322A plug into the (MMB), (M-C-MB), or (M-D-MB) jack will operate the (MB) relay in the marker. Operation of the (MB) relay will operate the (MCB1/6) relays which will ground the "CB" lead to the marker connectors, causing the marker to appear busy in the connectors, thereby preventing seizure of the marker.

When maintenance is required on the relays involved in the make busy circuit, the marker may be taken out of service by inserting a 322A plug into the (LLMCMB), (ORMCMB), (IRMCMB), and (SCMB) jacks on the master test frame jack bay associated with the particular marker to be taken out of service. This will cause the marker to appear busy at the connectors, thereby preventing seizure of the marker.