CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.01 Added

TK1, TK2 Diodes 533K, Option ZVN, App Fig. 34.

D. Description of Changes

D.01 Option ZVN added on Issue 88B is causing occasional trouble records HMS1 to appear. To correct this, a make-contact of relay RSC is added across relay contacts ORK 1 and 2 as shown on R49-F1. The TK1 and TK2 diodes are added to make a RSC contact available. This change is required on all jobs with option ZVN.

AT&T BELL LABORATORIES

DEPT 55212-RBC

AT&T NETWORK SYSTEMS
DEPT 20610-CAA-RW-JLP

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

D. Description of Changes

D.01 Issue 87A changed the operate path of relay CHA to avoid cross-connect changes when CDT is added. In non-CDT offices marker failure occurs with this change. As a result the operate path of relay CHA is changed back to the path used prior to Issue 87A. The CDT offices will need to have telephone company cross connections provided as required.

AT&T BELL LABORATORIES

DEPT 55212-NAR

AT&T NETWORK SYSTEMS
DEPT 20610-CAA-RW-TRB

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

D. Description of Changes

D.01 Connecting leads TVT and AMA are relocated from EOTT/RTMB circuit to the Mini-ROTL interface circuit. This A change is made to meet original design intent.

D.02 CAD 268 is removed and CAD 266 is modified to reflect the above change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 55212-NAR

WE DEPT 62790-AAA-WEA-MHF

CD-25550-01
ISSUE 5B
APPENDIX 65B
DWG ISSUE 91B
DISTN CODE 3C02

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.01 Added

1 - 185A Network TVA, Option ZUQ,
App Fig. 67

D. Description of Changes

D.01 Contact protection network is added to relay TVA to alleviate induced noise in the EOTT/RTMB circuit.

D.02 Circuit Notes 102 and 104 are modified to reflect the above change.

D.03 Option ZUQ is added to the Option Index Table.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 55212-NAR

WE DEPT 62810-AAA-JCR-MBD

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.01 Removed	Replaced By
1 - AK508 Relay, NRCD/RCDT, App Fig. 212	1 - AJ508 Relay NRCD, App Fig. 212
	1 - AJ508 Relay, RCDT, App Fig. 212

D. Description of Changes

D.01 The AK508 relay (NRCD and RCDT) is removed and replaced by two AJ508 relays. These relays are used as route series relays. Sufficient current was not available to operate the AK508 relays when in series with a 400-ohm route relay. The AJ508 relays will operate satisfactorily.

D.02 A wiring change has been made to correct the circuit arrangement previously shown on Issue 88B for the condition when both the CDT system and the ATA system are associated with the marker. The previous wiring caused failure to complete terminating calls.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 55212-NAR

WE DEPT 62810-ASM-TMO-AJN

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.01 Added

IFLG U1386 Relay, Option ZUP, App Fig. 33

D. Description of Changes

D.01 In App Fig. 33, relay IFLG, option ZUP, is added. This relay will be used to open the OG lead to the traffic register circuit so that the associated register will operate only on the call-back linkage.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 55212-NAR

WE DEPT 68210-ASM-TMO-AJN

607

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

D. Description of Changes

D.01 When markers are in an office arranged for CDT and with ATA, the trouble record which results from identification of mutilated digits differs from the record which is made for a wire spring marker for the same condition. The flat spring marker causes both itself and the CDT to take a record and because the CDT has done so this is identified as a code 29 exception which is misleading. To achieve conformity of trouble records, a wiring change is made to allow the marker to produce a record without proceeding to the point at which the CDT will also identify and try to record it.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 55212-NAR

WE DEPT 45250-ASM-TMO-MBH

Printed in U.S.A.

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

D. Description of Changes

D.01 A failure to perform seize frame timing occurs in markers which are arranged for the 2-out-of 5 check on the A, B, C digits and for ETS. Relay MDC operates at the beginning of a call and removes ground from 5B relay SF. Thus, when SF operates to start the seize frame timing, no timing can occur. To correct this condition, a direct ground is provided for relay SF 5B when ETS is provided.

D.02 Lead SB from the marker to the Mini-ROTL is subject to a back-up condition because the Mini-ROTL does not operate relay MT1. This causes erroneous conditions in the Mini-ROTL. This is corrected by deriving a grounded SB lead from another source.

D.03 When Mini-ROTL is provided test calls from other test circuits cannot make tests using particular trunk selection. A wiring change is made to correct this.

D.04 When CDT is added to an office and the marker routes all LAMA traffic on a non-AMA basis to permit use of relays MBS for toll diversion, marker failures occur. No circuit path was available under some toll diversion conditions to operate relay CHA. The logic circuitry is rewired so that CHA can operate under all toll diversion conditions.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 55212-NAR

WE DEPT 45250-ASM-TMO-MBH

605

MAY 03 1982

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.01	Superseded	Superseded By
	59H Resistors,	KS-8512 L6C, 200 Ohm Resistors,
	DAP, App Fig. 181	DAP, App Fig. 181
	SA, App Fig. 183	SA, App Fig. 183

D. Description of Changes

D.01 Connecting leads are added to the expanded operational trunk test and remote trunk make-busy circuit.

D.02 Option ZUC formerly assigned to contact protection networks in App Fig. 165 is removed and replaced by option ZUB. This is a no-record change.

D.03 The use of the 59H-type resistors is superseded by the use of KS-8512 resistors due to inability to obtain the 59H resistor.

D.04 Cross-connection information notes have been modified to show typical arrangements when screening is used with PBX toll diversion.

D.05 Lead SA is added to the ROTL register when it is provided with improved operational trunk test features.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 55213-ASM-DAJ-AJN

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

D. Description of Changes

D.01 Option ZUG formerly part of option RX is assigned to relay RFA so that this relay can be provided when option ZWQ is provided without additional apparatus also covered by option RX.

D.02 Cross-Connection Notes 400 (Part 64) and 445 are modified to clarify the use of PBX toll diversion when CDT is equipped in the office. Circuit Note 102B (Part 163) is also amended for clarification.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 55213-ASM-DAJ-PG

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.01 Added

1 - 186A Network, INL1, Option ZUB, App Fig. 193

1 - 186A Network, TTP, Option ZUB, App Fig. 193

1 - 186A Network, FAC3, Option ZUC, App Fig. 165

1 - 186A Network, ORA1, Option ZUC, App Fig. 165

D. Description of Changes

D.01 Contact protection networks are added to protect those contacts used on originating calls for local screening of interchangeable codes.

D.02 Note 104 has been corrected to remove references to nonexistent figures and options.

D.03 Lead TTA is added connecting the marker to the ROTL test line register for expanded ROTL operation.

D.04 The sequence charts for ETS distribute operation are modified to include reference to the digit code register and to the AK trouble punch.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5213-ASM-DAJ-MLD

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

D. Description of Changes

D.01 Note 105 is modified to include coordinating information for option ZWQ. Option RX must be provided when option ZWQ is provided.

D.02 A minor wiring change is made to operate relay TSE1 on Mini-ROTL calls.

D.03 A minor wiring change is made to enable markers in an office where all AMA calls are handled by CDT to shift from the AMA mode to a non-AMA mode. This arrangement cannot be used if paper tape or BDT handles part of the LAMA traffic.

D.04 A terminal strip strapping arrangement is added to allow easy access to wiring option when a LAMA office is being equipped with CDT.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5213-ASM-DAJ-MLD

EKC

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.01 Added

App Fig. 216

B.02 Superseded	Superseded By
U1373 Relay - MBK3 - App Fig. 67 - Option ZVZ	U422 Relay - MBK3 - App Fig. 67 - Option ZVA

D. Description of Changes

D.01 Lead NSIG connecting to the DAS-ETS circuit is moved from 1T relay S1K to 3B relay CKG6. This prevents operation of relay NSI when making register test calls which would cause seizure of a trunk link frame and result in a trouble record.

D.02 A minor wiring change has been made to operate relays NOC or CLK on intra-office LLP calls. This will prevent marker blockage.

D.03 A minor wiring change has been made to prevent operation of relay MP in the outsender connector when the OSG- distribute joints are being verified.

D.04 A minor wiring change has been made to release relay CSW when the marker advances to the call back stage on an IAO call. This will prevent blockage of relay CB.

D.05 Contact 3 relay AIS is removed to prevent failure of the marker distribute point diagnostic program when checking the AIS distribute point.

D.06 Apparatus Fig. 216 is added consisting of two GP relays to procure additional contacts for use with the Mini-ROTL feature. Also minor wiring changes are made to extend the trunk busy timer during Mini-ROTL test procedures; to correct functioning of Mini-ROTL with the master test frame for the allotter feature; to add leads MT57 and MT57A to the interface circuit; to add lock circuit for MBK3 relay, the code of which was changed to obtain additional contact.

D.07 The LT2 translation mark is provided to the call data transmitter application circuit to identify prefix "0" calls.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5413-ASM-DAJ-VLF

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.01 Arrangements have been made to operate a tandem route relay for a busy line verification call from a TSP.

A.02 Arrangements have been made to operate with the Mini-ROTL system.

D. Description of Changes

D.01 Cross Connection Note 446 has been added to show typical screening information for operation of a tandem route relay for a busy line verification call from a TSPS.

D.02 Connections are shown for various leads to the Mini-ROTL system. Options ZVW and ZVV have been added in connection with this change.

D.03 The option index has been modified to indicate the status of the options and to include all note references.

D.04 Leads LT, LT1, and X11 are added to the leads being scanned by the CDT application circuit. This is a no-record change to bring the SD into agreement with WE drawings.

D.05 Options ZVX and ZVY are added to allow either 60 IPM or 120 IPM to be returned for the all circuits busy condition on LLP calls.

D.06 A number of minor corrections have been made to bring the schematic into agreement with WE drawings.

D.07 Terminating instructions are clarified for leads CSW and AIS to the MTFC when converting from single sided cards to double sided cards. CADs 107 and 196 have been modified.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5413-ASM-DAJ-SVB

AB

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

JUN 8 1979

CHANGES

A. Changed and Added Functions

A.01 To provide means to change the route series relay on a route advance.

A.02 To provide means to permit taking AMA recording of calls by the call data transmitter.

B. Changes in Apparatus

B.01 Added

App Fig. 211
App Fig. 212
App Fig. 213

D. Description of Changes

D.01 Apparatus Fig. 211 is added to allow the route series relay to be changed on a route advance.

D.02 Apparatus Fig. 212 is added to allow the call data transmitter to take AMA records.

D.03 Wiring changes are made to provide the following peg counts on a per marker basis rather than on a per marker group basis: IML, IFFM, and OML.

D.04 Terminal assignments in CAD 119 have been changed to avoid duplication.

D.05 A number of miscellaneous changes have been made to correct errors and to bring schematic into agreement with WE drawings.

D.06 Apparatus Fig. 213 is added to arrange the marker to eliminate route advance following second trial failures due to mutilated digits on TOG calls. Overflow will be returned instead.

D.07 A diode option ZVS, is added in App Fig. 31. This is used to prevent operation of relay DCT when its primary operate path is open. Option ZVS Standard, replaces option ZVR, Mfr Disc.

D.08 The CAD changes have been made to provide an improved cabling arrangement for leads AR0, 1, 2, 4, 7 and BR0, 1, 2, 4, and 7.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5243-ASM-ABVL-MAF

JUN 8 1979

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.01 Added

1 - U1320 Relay - TOG5 - Option ZWJ - App Fig. 33

D. Description of Changes

D.01 Relay TOG5 is added as option ZWJ in App Fig. 33 to provide additional contacts for this class of call. It is used to allow both marker peg counts feature and ETS to exist in the same office.

D.02 A wiring change is made to prevent false operation of relay BN in ETS offices on intercept calls when automatic intercept (non-LLP) is provided and the marker is operating in the full ETS mode.

D.03 A wiring change is made to permit operation of relay SF in offices with ETS and wired per option YY.

D.04 The LLP lead to the MTFC is redesignated LRA. This will make the trouble punch the same as the wire spring markers.

D.05 To prevent relay XN from operating falsely when the mutilated digit check feature ZYE option is activated. This is accomplished by coordinating option ZZQ with use of option ZYE.

D.06 Minor wiring changes are made for IAO LLP calls in ETS offices:

(a) To provide an operate path for the DCT1 relay.

(b) To block operation of the MDC relay to prevent mutilation of digits passed to the sender.

(c) To prevent premature release of sender check relays when marker advances.

(d) To provide lock path for relay TTK.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5243-ASM-ABVL-MAF

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

SEP 25 1978

CHANGES

B. Changes in Apparatus

B.01 Added

CL3 446F Diode - Option ZXD

RG 426G Diode - Option ZWV

D. Description of Changes

Additional Changes For ETS Operation

D.01 Various wiring changes have been made to provide proper ETS operation.

ETS CAMA With DAC Or Interchangeable Codes

D.02 The CAM, 4DG, LST, CP1, and CP7 leads are added to the MDC when ETS is provided in an office with CAMA and interchangeable codes or with CAMA and directory assistance charging. On CAMA calls, the CAM lead is grounded to the MDC to operate the CAM relay in the MDC. The CAM relay operated connects the CL4, 6, 7, and 8 leads to the 4DG, LST, CP7, and CP1 leads, respectively. On CAMA calls CL4, 6, 7, and 8 indicate the following:

(a) CL4 indicates nondirectory assistance call (4DG lead grounded to sender).

(b) CL6 indicates directory assistance call (LST lead grounded to sender).

(c) CL7 indicates 10 digits have been dialed.

(d) CL8 indicates 10 digits have not been dialed.

Apparatus Fig. 138 Required For Improved Channel Testing Feature

D.03 The coordinating option note (Note 105) is changed to show that App Fig. 138 is required when the improved channel test feature (option CN) is provided. Apparatus Fig. 138 supplies the LP relay which is required to provide isolation between the markers when channel testing is performed. This is a note change only and applies to any office adding option CN where the markers were not previously equipped with App Fig. 138.

Coordinating Options for ROTL

D.04 Note 142 is added to require that options UD and NF be provided in offices equipped with the remove office test line register circuit or the line verification test circuit or with an APTT arranged to test either line link pulsing lines or home office test lines. Option UD is required to remove the MT9 contact in the trunk link frame selection path. The contact will block trunk link selection on test calls that set an incoming connection from the trunk link to the line link. Option NF is required so that the test circuits can receive ground on the RS0/1 lead before the RSK relay is operated in the marker. If options UD and NF are not provided, incoming type test calls setting a linkage from the trunk link to the line link will fail.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5243-TVB-ABVL-PJH

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.01 To provide line link pulsing for offices converted to ETS.

A.02 To provide peg counts per selected incoming trunk classes on through switched calls.

A.03 To allow the trunk busy timer to continue to function after trunk link frame seizure on test calls.

B. Changes in Apparatus

B.01 Added

FAC 446F Diode - App Fig. 210
HON1 446F Diode - App Fig. 207
OR 446F Diode - App Fig. 210

OVA U333 Relay - Option ZWN

App Fig. 208

App Fig. 209

D. Description of Changes

Line Link Pulsing (ETS-LLP)

D.01 Apparatus Fig. 208 and option ZWL are added to provide line link pulsing in offices converted to ETS operation. Option ZWR is also added for automatic intercept service using LLP.

Incoming Trunk Class Peg Count - TOG Calls

D.02 Option ZWJ is added to enable the S0-9 leads to the traffic register circuit to be used for peg counts of through switched calls per incoming trunk class.

TBT Timer Modification for Offices Equipped With Permanent Original Tial Feature

D.03 Wiring associated with the permanent signal test feature (App Fig. 202) is modified to allow the Trunk Busy Timer (TBT) to continue to function after trunk link frame seizure on test calls. This will cause the marker to route advance if a test call attempts to select a service busy permanent original trunk. Prior to this change, the TBT timer was disabled upon trunk link frame seizure, causing the WT timer to function and produce a trouble card if a test call encountered a service busy permanent signal trunk. Option ZWN (Rated Standard) provides this modification.

Prevent SLK2 Trouble Records on Sender Reorder Conditions

D.04 When a failure-to-match condition occurs on SOG type calls the marker can hold the RO relay in the sender after the sender has released. This permits the same sender to be seized which locks the RO relay operated when relay ON1 is reoperated. The RO in being held operated prevents the release of relay SLK which causes an SLK2 marker failure. To correct this condition, a diode is added, under optional App Fig. 207, across the ON1 and RO leads to the outsender connector to hold the sender ON1 relay operated on an RO condition. This will hold sender busy SB relay operated until the marker has properly handled the reorder condition. This prevents the sender from being reseized until all sender relays are released.

IFFM Register Error

D.05 A break contact of relay RCY5 is replaced with a break contact of relay RMA in the IFFM lead circuitry. This is done to allow the Incoming First Failure to Match (IFFM) register to score when a failure to match follows a line busy recycle. The new wiring is shown as option ZWQ, rated Standard and opposed to option ZWP, rated Mfr Disc.

IFM Register (TER Match Loss) Error

D.06 Parallel contacts of relays PBXA and RCY5 are replaced with a make contact of relay Overflow Auxiliary (OVA) in the IFM lead circuitry. This is done so that the IFM register (terminating matching loss) will not be pegged the first time a failure to match occurs on a call incoming to a No. 101 ESS office. The new wiring is shown as option ZWM, rated Standard and opposed to option ZWO, rated Mfr Disc.

Routing Flexibility With TSPS No. 1

D.07 A new class relay (CL10) is added to provide complete routing flexibility when the marker is arranged to control the start pulse signal to TSPS No. 1 with CR-cross connections option FZ. The addition of option FZ eliminated the ability to ground the CL7 lead to the sender, thus prohibiting any routes which required the sender to omit called number outpulsing and outpulse only ANI information. This type of route is required for O-ANI calls to crossbar tandem TSP and calls to some types of automatic number announcement circuits. The new CL10 relay provides a ground on the CL7 lead along with either CL5 (CL10S cross connection) or CL3 and 5 (CL10P cross connection). Apparatus Fig. 209 (rated Standard) provides the new relay.

Expanded Permanent Signal Routing Identified

D.08 Circuit Note 102 is changed to show that the expanded permanent signal routing feature consists of both the overflow link feature (App Fig. 203) and the marker permanent signal test feature (App Fig. 202).

AICK Failure on Recycle of IAO Calls To AIS

D.09 A make contact of relay RYC and a break contact of AIC3 are added to prevent an AICK failure on recycle when an IAO call to an intercepted number encounters a failure to match (FM) condition when the marker is equipped for AIS. This is done with the addition of option ZVA and the removal of option ZWZ. On recycle this permits the marker to release ITR1,2,3 relays which starts release of all connecting paths established on marker first attempt to connect to an idle channel. After recycle the ITR1,2,3 relays reoperate to initiate another start for a completely new connecting including a new AIS sender.

F. Changes in CD Sections

F.01 Add the following under 29.

LINE LINK PULSING FOR NO. 5 ETS OFFICES

29.42 Apparatus Fig. 208 is added to provide Line Link Pulsing (LLP) in No. 5 crossbar ETS offices.

29.43 LLP is an arrangement which provides direct in dialing to satellite PBX customers without using an office code per customer. The LLP station numbers are assigned 7-digit numbers within the subscriber number series while the LLP line circuits to the satellite PBX are assigned numbers outside of the number series. Calls to an LLP customer are identified by the ETS processor. The line equipment number of an idle LLP line circuit is returned to the marker with an LLP indication, the sender group number, and the information to be outpulsed. The marker selects and seizes an idle sender, passes the information to be outpulsed to the sender, and sets the sender link, which associates the sender with the LLP line circuit. The ringing select switch is set to the silent level when answer supervision must be returned for charging. On calls to free numbers the ringing switch is not set. In both cases ringing is returned from the PBX if the line is idle. The sender is advanced after the forward linkage is set on a TER call or after the call back linkage is set on an intraoffice call. Trunk guard test is canceled on intraoffice calls since the line equipment number of the LLP line circuit is no longer registered when the sender is advanced.

29.44 The relays added for line link pulsing and the functions provided by these relays are as follows:

A. Line Link Pulsing - LLP

29.45 Relay LLP is operated by the ETS processor when a call is to be completed to an LLP line circuit. The functions of the LLP relay are:

(a) Operates relay CKR which causes a PBX recycle if the LLP line is found busy at the line link frame.

(b) Operates the SLCK1 relay which grounds the HF trouble punch to provide the hunting indication.

(c) Operates RCT15 relay through FNA relay nonoperated and TC distribute point activated or through FNA relay operated and FNK distribute point activated.

(d) Operates the PTK relay.

(e) Operates the link link control LLC4 relay.

(f) Operates the line sender control LSC1,2 relays.

(g) Locks operated to LTI relay operated to hold various relays operated during the trunk guard test.

B. Plain Old Telephone Service - POTS

29.46 The POTS relay is operated by the processor when a call is to be completed to any line other than an LLP line

circuit. A one up check of the LLP and POTS relays is provided in the operate path of the RNG relay. On forward linkage, seizure of the line link frame is blocked if the POTS relay is not operated on a non-LLP call.

C. Line Link Control - LLC4

29.47 The LLC4 relay is operated by the line link control LLC1 relay on the forward linkage portion of an LLP call. The functions of the LLC4 relay are as follows:

(a) Delays seizure of the line link frame until an idle sender is found (SKA or SKB relay operated).

(b) Cuts through the LF lead to the line link connector for operation of the F relay in the line circuit when the LLF is seized.

(c) Cuts through the BY lead to the line link connector to detect seizure of a 2-way LLP circuit by the PBX.

(d) Cuts through the LTI relay to be operated on TER calls when the DCT1 relay is operated.

(e) Opens the SIK relay operate path through RCK3 operated on intraoffice calls to insure operation of the SIK relay by the operation of the sender link check SLK2 relay.

D. Line Sender Control - LSC1

29.48 The LSC1 relay is operated by the operation of the LLP relay. The functions of the LSC1 relay are as follows:

(a) Prevents trunk guard test on intraoffice calls.

(b) Prevents operation of the TOG1,2 relays through the operated out group OSG and incoming trunk class relays on calls from the IRMC.

(c) Opens the start lead to the automatic monitor when the monitor is not arranged for LLP operation.

(d) Opens NDI operate path on intraoffice calls so the sender is able to outpulse.

(e) Prevents grounding of the OSG- lead to the traffic register circuit during the forward linkage portion of the intraoffice call to prevent double peg counts.

(f) Modifies the DCT1 relay operate path to advance the sender after completion of the forward linkage on TER calls or after completion of the call back linkage on intraoffice calls.

(g) When App Fig. AP is provided, LSC1 operates the CSW relay on calls to free numbers from the local charge area (LCH operated) to prevent the marker from operating the ringing selection switch so that answer supervision will not be returned to the calling party. When App Fig. AO is provided (4 wire ringing select switches only) the LCH and FNA relays operated prevent grounding the TC lead to the trunk to prevent changing on calls to free numbers.

(h) When the LLP line circuit is found busy at the link link frame after a PBX recycle, the LSC1 operated causes the RS0 to be operated rather than RS1 so that 120-IPM tone (overflow) is returned to the calling party.

E. Line Sender Control - LSC2

29.49 The LSC2 relay is operated by the operation of the LLP relay. The functions of the LSC2 relay are as follows:

(a) Steers the all sender busy ground to cross connect terminal LLS0. If only one sender group is provided for LLP then LLS0 is cross connected to LLS1 which operates the PM0 relay to cause the call to be routed to overflow. If more than one sender group is provided for LLP then LLS0 is cross connected to LLS2 which operates the RCY2 relay for a PBX recycle and the call will be set to another line.

(b) On intraoffice calls, steers line-busy at the line link frame after PBX recycle to PM0. The PM0 operated on intraoffice will cause a route advance to a tone trunk.

(c) Checks CKR relay operated and PBXA nonoperated in the operate path of the GT1,2 relays.

(d) Provides an LLP peg count per marker.

(e) Causes the LLS relay to be operated rather than the TLS relay.

(f) Checks LLS operated and TLS nonoperated in OSK relay operate path.

(g) Delays operation of the OSL select magnets until the line link connector is checked operated (LFK1 operated).

(h) On test calls causes the LTA or LTM relay to be operated on the link link frame when OGC relay operates.

F. F Relay Check - FK

29.50 The FK relay is operated in series with the F relay in the LLP line circuit. The FK relay is checked operated on LLP calls in the DCT1 operate path. The FK relay operated also provides an FK trouble punch.

G. F Relay Cross - XLF

29.51 Relay XLF is a marginal relay operated in series with the FK relay when more than one F relay in the LLP line circuit is operated or when the FK lead to the line link connector is falsely grounded.

H. Lock Trunk Identity - LTI

29.52 The LTI relay is operated on TER-LLP calls by the operation of the DCT1 relay. The functions of the LTI relay are as follows:

(a) Lock to SON relay operated.

(b) Holds relay LLI operated to hold the line equipment number relays operated during the trunk guard test interval.

(c) Opens the lock path of the TS- relays.

I. Line Link Frame Check - LFK1

29.53 The LFK1 relay is operated by the connector relay in the line link frame which cuts through the OSL select magnets operate path. The LFK1 relay operated applies battery to operate the OSL select magnet and operates the F relay in the LLP line circuit.

J. Line Link Steering - LLS

29.54 The LLS relay is operated on LLP calls by the operation of the sender select SSA or SSB relays. The LLS relay operated steers the control leads for the OSL to the line link connector.

K. Trunk Link Steering - TLS

29.55 The TLS relay is operated on non-LLP calls by the operation of the sender select SSA or SSB relays. The TLS relay operated steers the control leads for the OSL to the trunk link connector.

L. Terminating - TER6

29.56 The TER6 is operated by the operation of the TER3 relay. The functions of the TER6 relay are as follows:

(a) Modifies the operate path of the SF relay to start seize frame timing for the outsender connector on TER-LLP calls.

(b) Modifies the DCT1 operate path to advance the sender after completion of the forward linkage.

(c) Operates LTI relay on LLP calls after completion of the forward linkage.

(d) Allows LB to operate when line is found busy at the line link frame after a PBX recycle. The ringing selection switch will be set to return 120-IPM tone (overflow).

(e) Opens TOG1,2 operate path on calls from the IRMC.

(f) Permits the operation of the TG relay to enable trunk guard test.

(g) Closes through the OSG- peg count.

(h) Replaces TER3 contact used to operate TER6.

M. Automatic Intercept Service - AIS

29.57 The AIS relay is an optional relay, option ZWR, that is provided when AIS using LLP is provided. The AIS relay is operated by ETS processor when a call is to be completed to an automatic intercept bureau using LLP. The functions of the AIS relay are as follows:

(a) Transfers TCH ground to LCH to prevent charging for the call.

(b) Grounds the RI trouble punch to indicate an AIS call.

(c) Operates the LLP relay to provide the LLP functions.

(d) Transfers the LLP lead from the DAS-ETS to the XRS3 relay to detect false operation of the LLP distribute or a false ground on the LLP lead.

F.02 Add the following under

TERMINATING TO LLP LINE CIRCUIT - SC4

A. Distribution - TER to LLP Line (SC159)

30.57 The data distributed on a TER call to an LLP line circuit are as follows:

(a) Type of Call and Outsender Group

(1) Terminating - TER

(2) Sender Used - SDK

(3) Outsender Group OSG 2/6 (0-9)

(b) Number Translation

(1) Line equipment number of idle LLP line circuit - FTT2/4, FUT2/5, VGT2/6, HGT2/5, VFT1/5

(2) Charge Condition - TC or FNK, FNA

(3) Type of Line - AO

(4) Line Link Pulsing Indication - LLP. If call is to an AIS line circuit using LLP, ais is distributed rather than LLP.

(c) Sender Information

(1) Digits - A2/5-D2/5, E7

(2) Arbitrary Digit - CR2/5 if required

(3) Class - CL1-8

(4) Class Check - CLQ0-2

(d) Miscellaneous - Any of the following may be distributed if required for the call:

(1) Nuisance call trace required - DR0,7

(2) DR2/5 not used on call - DA0

(3) Call is to be switched light traffic - LTR

B. Trunk Link Frame Seizure (SC105B)

30.58 Distribution of the TER indication operates the TER1,2,3,6 relays which causes the marker to bid for the trunk link frame associated with the incoming trunk. Trunk link frame and trunk seizure is described in 29.09 through 29.12 (see Appendix 49A, F.01). The TER- relays operated also operate the forward linkage FLG, FLG1, FLG2 relays which operate the LLI relay in the marker and in the MDC. Operation of the LLI in the MDC recycles the work timer and causes the line link location to be passed to the marker. The LLP relay operated operates the RCT15 relay through TC distribute point operated and FNA relay released or through FNK distribute point and FNA relay operated. The RCT15 operates the RCL and the RCL operated together with the VGL, HGL, VFL, FTL and FUL relays operated and the POTS relay nonoperated, operate the RNG relay and the LLI relay in the MDC is released.

C. Outsender Connector and Line Link Frame Seizure (SC160 and SC108B)

30.59 Distribution of the OSG2/6 (SC160) operate the OSG2/6 relays in the MDC which operate the corresponding outsender group OSG0-9 relay in the marker through a two up check in the MDC. The TER6 operated prevents the operation of the TOG1-3 relays when the OSG- relay operates. Operation of an OSG- relay cuts through the associated sender idle SIO and SIA leads to the sender group. An idle sender in the A or B subgroup will operate the corresponding SIA or SIB relay. If the associated outsender connector is idle, GBA or GBB relays nonoperated, the marker will bid for the outsender connector. Outgoing sender selection and seizure is described in 11.4. If all senders are busy, and more than one LLP sender group is provided the marker does a PBX recycle to return to the ETS processor for a line associated with the other sender group. If only one sender group is provided the PM0 relay is operated and the ringing select switch is set for overflow.

30.60 When the marker gains preference to the trunk link frame (TFK3 relay operated) and the outsender connects (SKA1 or SKB1 relay operated) the bid is made for the line link frame (SC108B). When the marker gains preference to the line link frame, the line link connector relays and the link frame check relay LFK in the marker and MDC are operated. Operation of the LFK in the MDC applies ground to the type of line distribute point to operate the marker type of line relay AO. As the line link connector relays operate the HG- relay in the line link cuts through the LB- and the LL- test leads used for channel testing and closes the SM- test leads to the line link for select magnet operation. The operation of the LG- relay in the link link cuts through the LH- leads to the marker for use in the line idle and line-busy and to operate the line hold magnet if the line is found idle.

D. Transmission of Information to Sender (SC160)

30.61 Relay OSG- operates OGC which in turn closes a ground over the lead KG to the MDC through operated SDK to operate gating relays KN1-4. The KN- relays operate the marker KK relay and apply ground to the called number distribute points and cut through the called number leads to the marker to operate the called number registration relays A45 through M2/5, J7 in the marker and the sender. The LLP senders are arranged for four digits only plus one arbitrary digit. The operation of the outgoing registration check ORK1,2 relays indicate that the proper number of A2/5 through M2/5 relays have operated. If the ORK1,2 remain operated after the gate control KN- relays have released, it indicates that the registration relays in the sender are locked operated.

30.62 The KN- relays also cut through the class and arbitrary digit distribute points. The activated class and arbitrary distribute points operate the class CL- relays in the sender, the class check CLK- relays in the MDC, the arbitrary digit CR- relays in the sender and the arbitrary digit check relays in the MDC. If the class check and arbitrary digit check relays remain operated after the gate control KN- relays have released, it indicates that the information is stored correctly in the sender.

30.63 The outgoing sender registration timing is started when the OSC cut-through relays are operated (TSR lead from the OSC grounded) and the digit check ORK1,2 relays are operated to operate the OST1 relay. The operation of the OST1 starts the OST timer. When the timing interval is reached, the OST relay operates and operates the OST2 relay. The purpose of the OST timing interval is to allow sufficient time for the sender registration relays to operate. The operation of the OST2 relay releases the KN- relays in the MDC which removes the operating grounds for the called number, arbitrary digits, and class leads to the senders. The release of the KK, TGS-, relay releases the OST1 relay. The release of the OST1 relay starts the timed release of the OST relay. The release of the OST1 and OST relays will operate the release sender connector RSC relay provided all required checks are made. The operate path for the RSC relay is from ground through contact 4-5B of the OST2 relay, through OSE, OST1, and OST relays released, OST2, ORK1,2 (called number check) relays operated, to the MDC circuit over the SK1 lead through a two-up check on the CK2/5 (arbitrary digit checks) through a match of the number of CLK- relays operated with the CLO- relays (indicating the number of CL- leads which should be grounded) back to the marker over the SK2 lead, through NDK, NDI (no digit check) to the RSC relay.

E. Outsender Link Control (SC160)

30.64 The marker connects the selected outgoing sender to the selected LLP line circuit through the outgoing sender link. This connection is initiated following the check that the outgoing sender selection has been completed and that the select magnet operate leads are cut through from the marker to the outsender link. Battery potential will be extended through the SMB lamp, through the contacts of the operated TLC1, MDK, LSC2, LFK1 and OSK relays, through the contacts of the one operated OS0-4 relay and the SSA or SSB relay, through the operated LLS relay to an SS0-9 lead. The SS0-9 leads are extended through the operated MB1 relay in the line link connector to the outgoing sender link circuit to operate the SS0-9 select magnets on all sender link switches associated with the selected line link frame.

30.65 The ground for operating the sender link circuit hold magnet is extended through the contacts of the XSS relay nonoperated and the OGC and LLS relays operated, over the SLK lead to the line link connector circuit through the operated contact of the MB1 connector relay through the contact of the operated outsender link select magnet off-normal, through the LLP line circuit operated F relay to the sender link hold magnet and the SLK relay in series. The operation of the SLK relay in series with the hold magnet indicates that a false ground is not present on the SLK lead. The operation of the SLK relay with the SON relay operated and the GOS relay nonoperated will operate the SLK1 relay. The SLK1 relay locks operated to the SON relay operated and the GOS relay nonoperated.

30.66 After the outgoing sender link hold magnet is operate 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 line circuit. With the SL relay operated in the line circuit by the operation of the F relay, ground is cut through to the sender by the operation of the D relay to operate the LR relay in the sender. The LR relay operated grounds the HM lead which is extended to the sender link circuit. The LR relay provides a holding ground from the sender for the sender link hold magnet and shunts down the primary winding of the SLK relay thereby releasing the SLK relay. The release of the SLK relay with the SLK1 and SON relays operated and the GOS relay nonoperated will operate the SLK2 relay to indicate that the holding path for the outgoing sender link hold magnet has been transferred to the outgoing sender.

F. Control For Channel Test (SC120)

30.67 Control for channel test for a terminating call to an LLP line is described in 12.62 through 12.64 of Issue 5B.

G. Channel Select and Hold Magnet Operate (SC121)

30.68 Channel select and hold magnet operate for a terminating call to an LLP line is described in 12.65 through 12.75 in Issue 5B.

H. Ringing Switch Control (SC127)

30.69 In offices with 6-wire ringing switches, the switch is set to the silent level 5 to ground the TC lead to the incoming trunk to cause answer supervision to be returned for charging. Operation of the ringing switch is described in 8.09 of Issue 5B. When the call is to a free LLP line circuit, the FNA relay is operated by the ETS processor. Ground to operate the RS8 relay (for the free level) through FNA and LCH relays operated is transferred from the RS8 relay to the CSW relay. Operation of the CSW relay prevents setting the ringing switch. Contacts of the CSW relay are used to satisfy the ringing switch operation checks.

30.70 In offices with 4-wire ringing switches only, the ringing select switch is set on all calls. When the FNA relay is operated for a free LLP line circuit, the TC lead to the trunk is not grounded to prevent charging.

I. Sender Advance (SC160)

30.71 The sender is advanced after the linkage and ringing selection switch has been set and checked. Ground is applied to the AV lead to outgoing sender connector through break contacts of the PU, GT, CT5 relays nonoperated, through make contacts of the GT2, CKG4, DCT relays operated, through TER3 operated, NCRA nonoperated, through RCK3, RNG relays operated, through DCT3, AIC3 and LK1 relays nonoperated, through LSC1, FK, TER6, SIK, and SLK2 relays operated, through the primary winding of the AVK relay, through PCL3, AMA5 relays nonoperated, through RSC relay operated to the AV lead to sender connector. Though the operated S- relay in the connector to operate the AV relay in the sender. Operation of the AV relay grounds the AV lead to the marker and the AVK relay operates. Operation of the AVK relay operates the AVK1 relay which operates the DCT1 relay through AVK1, TER6, LSC1 relays operated, OTT and TTK relays either both operated or both released, through TER6, LSC1, OGC, AVK1 relays operated to the ground through the linkage check path described in the operate path of the AV relay in the sender.

J. Linkage Check and Disconnect (SC123, 125)

30.72 Linkage check and disconnect for a TER call to a LLP line circuit is similar to a non-LLP TER call as described in 12.9.

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DEPT 5243-TVB-ABVL-PLS

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.01 To provide for releasing originating register on partial dial calls when all trunks are busy.

A.02 To allow ringing switch to be set to overflow on an incoming call if a cross other than XRS- is encountered.

A.03 To provide DT second failure to match peg counts on a per marker basis.

A.04 To provide for ETS operation in offices with CAMA and interchangeable codes.

B. Changes in Apparatus

B.01

Superseded	Superseded By
RS9 U1393 Relay - Option ZXO	RS9 U580 Relay - Option ZXP

B.02 Added

[2] IFM,IFFM 533K Diodes - Option ZWB.

D. Description of Changes

Originating Register Release Insured on Partial Dial Calls

D.01 The marker is modified to provide a ground on the RL lead to the originating register on partial dial calls if all trunks for the partial dial route are busy and the marker route advances to RBT. Previously, only the BT lead was grounded, causing the register to hold the connection and return reorder tone to the customer. If the customer remained off-hook, the register timed out and released the connection. However, if for some reason the parital dial is caused by a continuous TOUCH-TONE® signal or a continuous stream of dial pulses, the register's timing circuit is disabled and the register is held out of service as long as the condition persists. By grounding the RL lead along with the BT lead, the timing interval is eliminated and the register is released and returned to service.

(a) Option ZXG (rated Standard) provides this improvement.

Ringing Selection Switch Set to Overflow Following Cross Detection on Incoming Call

D.02 Certain crosses encountered on incoming calls (XSL, XLV, etc) caused the MXT relay to remain operated and prevented the marker from setting the ringing selection switch to return reorder tone to the calling party. Thus the call was left high and dry. A modification is added to open the MXT circuit after completing a trouble record on all crosses except those related to the ringing selection switch XRS-. A break-contact of the RS9 relay, which selects the tone level on the ringing selection switch following the trouble record, provides the logic to open the MXT circuit.

(a) Option ZXP (rated Standard) provides this feature while option ZXO (rated Mfr Disc.) is assigned to the previous wiring.

Improvement to Prevent Possible False Operation of OSG- Relays during Trunk Guard Test

D.03 An opportunity for false operation of OSG- relays occurs at the end of a call while the marker is waiting for the sender to complete a trunk guard test. If the marker had route advanced and the OSG- for the alternate route is different from the OSG- for the primary route, the primary route OSG- relay may reoperate when the GS- relay associated with the primary route releases prior to completion of the test. With both the alternate route and primary route OSG- relays operated, their associated sender connector start leads are connected together. This may cause the preference circuit for the sender connector to transfer to the emergency chain and bring in a minor alarm. A break contact of the DIS1 relay is added to the OSG- relay operate path to open the circuit during a trunk guard test.

(a) Option ZXS (rated Standard) provides this improvement while options ZXQ and ZXR (rated Mfr Disc.) are assigned to the previous wiring.

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Second Failure to Match Peg Counts Provided on a One Per Marker Basis

D.04 The wiring multiple for the FMP traffic register lead which connected all dial tone and combined markers together is removed to provide individual FMP registers for each marker.

(a) Option ZXZ (rated Standard) provides the FMP lead on a one per marker basis while option ZXY (rated Mfr Disc.) is assigned to the previous "one per marker group" wiring.

Modification to Provide IFFM Traffic Register Information for Markers not Equipped with "PBX Recycle on First to Match"

D.05 As a prerequisite for the incoming first failure to match traffic register IFFM, the marker required the "PBX recycle on first failure to match" feature (option JA). Thus, if IFFM was added to an office containing some markers not equipped with option JA, extensive modifications were required for those markers to add option JA. A new method of obtaining IFFM traffic information is provided which does not require option JA. Two diodes are added to extract the information from the existing IFM traffic register lead. Therefore, both the IFM and IFFM registers will score when an incoming failure to match is encountered on either a POTS call or a PBX call.

Note: There is no second attempt on a PBX call when the marker is not equipped with option JA!

(a) For those markers equipped with option JA, the IFFM circuitry remains unchanged and the IFM and IFFM registers score as follows: Both IFM and IFFM score when an incoming failure to match is encountered on a POTS call. The IFFM alone scores on an incoming first failure to match to a PBX line at which time a PBX recycle is initiated. The IFM alone scores if, following a PBX recycle, a failure to match is again encountered. In either case, markers with or without option JA, IFFM scores on the initial encounter of an incoming failure to match condition. The IFM scores on any incoming failure to match encountered during the final attempt to establish a call, resulting in reorder tone being returned to the calling party.

(b) Option ZWB (rated Standard) provides this feature while option ZWA (rated Standard) is assigned to the previous wiring.

Link Release (LR) Indication Provided to the Interface and Control Circuit

D.06 A new LR lead is added from the marker to the interface and control circuit to provide a signal to the centralized maintenance facility that a link release has occurred.

(a) Option ZWC (rated Standard) provides this lead.

CSACS Diodes Rated A&M Only

D.07 This change rerates the wiring for diodes MJ and MN, option ZZK, A&M Only for Centralized Status, Alarm and Control System (CSACS). The MJ and MN diodes will now be provided in the MTF jack lamp and key circuit. Also, reference is added to Note 102, 19J, for the interface and control circuit which will now provide a parallel operation of alarm sending and SCACS or TASC.

ETS Operations in Marker Group with CAMA and Interchangeable Codes

D.08 When the interchangeable code feature is provided, the marker is provided, the marker is wired to make a code pattern check an CAMA calls. Option ZWD is added to maintain this check for ETS-AMA only operations and to remove it for full ETS operation when the code pattern information is not used. This option provides the SK3 level to the MDC circuit. When the transition relays are operated in the MDC the code pattern check is unchanged, when they are released, for full ETS operation, the SK3 lead is connected to the SK1 lead in the MDC which shorts out the check contacts.

Optional Features, Apparatus, and Cross Connections Required in Non-ETS Offices Only are Identified

D.09 Note 136C is added to indicate which optional features are required in non-ETS markers only. Note 138 is added for the removal of the PBX allotter frame when transition to ETS operation is completed. Note 139 is added for the removal of unused marker frames when transition to ETS operation is completed. The frames which may be removed are:

(a) Marker Trunk Frame Test Lead Connector Frame (TFTLC).

(b) Class-of-Service Frame (CLS).

(c) Supplementary Route Relay Frame for Two Markers (SRR).

(d) Supplementary Route Relay Frame for One Marker (SRR).

(e) Tandem Code Screening Frame for Five to Eight Markers (TCS).

(f) Code Conversion and Route Relay Frame (CC and RR).

(g) Supplementary Class-of-Service Frame (SCLS).

Cross connections Note 439 is added to identify cross-connections which are required in non-ETS markers only.

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.01 Added

TMK 446F Diode - Option ZXU

RBT 446F Diode - Option ZXD

PSG 18AJ Resistor - App Fig. 202

LT 426G Diode - App Fig. 206

TT 426G Diode - App Fig. 206

D. Description of Changes

CORRECTION TO PROVIDE PROPER SIGNALS TO THE COMMON OVERFLOW TRUNK WHEN THE PERMANENT SIGNAL TEST FEATURE IS PROVIDED

D.01 When the permanent signal test feature is provided (App Fig. 202), the marker determines if a permanent signal is a receiver off-hook (ROH) or a trouble condition (PSG). The ROH permanents are routed to permanent signal holding trunks while PSG permanents are routed to common overflow trunks. In order to inform the common overflow trunk that a permanent signal is being corrected, the marker must ground the TC lead to the trunk. This requires that one of the permanent signal route series relays (PCN/PNC/PPX) be operated along with the regular common overflow route series relay CAA. When App Fig. 202 is provided, the routing cross-connections are such that there is no way to operate one of the permanent signal route series relays. Therefore, a correction is applied to the permanent signal test feature to provide an operate path for the PCN relay on PSG permanents so the PLN along with CAA will ground the TC lead to the common overflow trunk.

N7 LEAD TO DAS OMITTED

D.02 The N7 lead to the DAS circuit, which was inadvertently omitted on Issue 70D, is added for offices having IDDD (TSPS Arr) and LAMA-C/SCC.

D.03 Additional Changes for ETS Operation - Various wiring changes have been made to provide proper ETS marker operation. A circuit description of marker operation for ETS is provided in the F Section.

F. Changes in CD Sections

F.01 Add the following under DETAILED METHOD OF OPERATION:

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28. ELECTRONIC TRANSLATION SYSTEM (ETS) - GENERAL

28.01 When arranged for ETS operation the marker can function in one of three modes: non-ETS, ETS-AMA only, and full-ETS. Operation in the non-ETS mode is the same as when ETS is not provided. In the ETS-AMA only mode, AMA functions are provided by the ETS processor. Marker actions remain unchanged but the processor has the ability to stop marker progress, prior to the operation of the CHA relay, if the trunk selected by the marker cannot be identified by the processor.

28.02 In the full-ETS mode, route and line translation, screening, routing, call recording, trunk selection, and hunting line selection functions are provided by the ETS processor. Upon detection of marker seizure, the processor signals the scanner to scan the marker, retrieves scanned information for processing and passes information required to complete the call to the distributor for distribution to the marker via the MDC circuit. When an alternate action is required, the marker will signal the processor and the processor will again have the marker scanned to obtain information to determine what action is required. The previously distributed information is removed and a new distribute is made to enable the marker to complete the call.

28.03 Initially, when the Marker Distributor Circuit (MDC) is added, option R is provided and the transition relays are blocked operated which cause the marker to operate in the non-ETS mode. Control of marker mode of operation can be passed to the ETS Power and Data Interface (PDI) Circuit by removing option R and unblocking the transition relays in the MDC. When the processor is not operational the transition relays are held operated and the CHA relay is operated in the PDI which closes the markers CHA relay operate path and the marker operates in the non-ETS mode. When the processor becomes operational the CHA relay in the PDI is released and the marker operates in the ETS-AMA only mode. To provide full-ETS operation the ETS relay in the PDI circuit must be manually operated by depressing the associated ETS key. Operation of the ETS key releases the transition relays associated with that marker, causing that marker to operate in the full-ETS mode.

28.04 If for any reason the processor should become nonoperational, all markers are automatically restored to the non-ETS mode. When the processor becomes operational again, the markers are automatically changed to ETS-AMA only operation. However, each marker must manually be changed to full-ETS operation by the operation of the associated ETS key in the PDI.

28.05 When transition to ETS operation is completed, the mode control feature in the PDI circuit is disabled and the marker functions only in the full-ETS mode. Any transition apparatus in the MDC circuit may be removed and marker cross-connections required for non-ETS operation need no longer be maintained.

ETS-AMA ONLY OPERATION

28.06 When the marker is seized, the DR scan point is grounded which causes the processor to scan the marker for input data to be used for billing. The marker proceeds with the call as for non-ETS operation. When the LCK relay operates, the LCK scan point is grounded which causes the processor to scan the marker to identify the trunk selected for the call. After this information is obtained and checked, the processor activates the CHA distribute point which operates the CHA relay in the MDC circuit which allows the CHA relay in the marker to operate when a channel is selected. At the end of the call, when the marker disconnects, ground is removed from the DR scan and the processor deactivates the CHA distribute point. Failure of the CHA distribute to deactivate or failure of the CHA relay in the MDC to release at the end of the call will hold FTCK operated which operates MXT which will cause the marker to request a trouble record. If the trunk cannot be identified by the processor, the CHA is not distributed causing the marker work timer to operate and the marker will take a trouble record.

28.07 If the processor should become nonoperational, the CHA relay in the PDI circuit is operated to change the marker to the non-ETS mode of operation.

FULL-ETS OPERATION

28.08 Operating in the full-ETS mode the marker translators are disabled. When the marker is seized the overall and work timers are started and the data ready (DR) status scan point is activated by the operation of the CKG6 relay. This causes the processor to scan the data scan points. The information is processed and distribute points are activated to cause the marker to complete the call. The following paragraphs define all scan and distribute points; then a detailed description of full-ETS marker operation on a functional and on a call basis is provided.

A. Scan Points

28.09 Marker scan points are divided into two groups: status scan points which are scanned periodically, and data scan points which are scanned when a change from non-activated to activated (lead grounded by marker) is detected on any status scan point.

Status Scan Points

28.10 Marker status information is passed to the processor via the following status scan points:

(a) Data Ready (DR) - Grounded on marker seizure by the operation of the CKG5 relay. Ground is removed on disconnect by the operation of the DIS1 relay on regular release, by the DISA on trouble release, or by the release of the CKG5.

(b) Observe (OBS) - Grounded when ground is applied to operate the OBS relay. Indicates that call is being serviced observed. Ground is removed on route advance or recycle.

(c) Link Connector Check (LCK) - Grounded when LC relay TLF operates. Indicates that outgoing trunk identification is available or that information received through the trunk link connector is available. Ground is removed when TLF or trunk is released on route advance or recycle except on TER, PC, or CMF calls.

(d) Overflow Hold (OFH) - Grounded when ground is applied to operate the OFH relay. Indicates that marker is setting the ringing selection switch to overflow or line-busy. Once grounded, will remain grounded until end of call.

(e) Recycle (RCY) - Grounded by the operation of either PU1, TNR, or LLB relay on marker recycle. Remains grounded until release of RCY relay. Marker recycle results from the following conditions:

(1) First FM on TOG call.

(2) Plugged Up Line (PUL) on TER or IAO call - FLG linkage.

(3) LLF maintenance busy on TOG calls serving TOL class incoming trunks and NGP1 relay is not operated.

(f) Route Advance (RAV) - Grounded by the operate ground of route advance relays RAV1,2. Remains grounded until release of RAV1 relay. Route advance results from the following conditions:

(1) When marker cannot seize trunk selected by processor (ATB).

(2) When all senders are busy (ASB).

(3) When LB or OV tones must be returned to calling customer on ITR call.

(4) LLF maintenance busy on TOG calls serving TAN class trunks or TOL class trunks when NGP1 relay is operated.

(5) On ITR call when calling and called line equipment locations match (RV).

(6) On first FM for ITR call - CB linkage or SOG call.

(7) On second FM on all but TER calls.

(8) On third or more FM on TOG calls.

(9) After trouble record is taken on various calls from IRMC.

(g) PBX Recycle (RCY2) - Grounded by the operation of the RCY2 relay. Ground removed when RCY4 operates. The PBX recycle results from the following conditions:

(1) Line test busy at the line link frame and call is to a hunt line (CKR relay operated) and there has been no previous PBX recycle (RCY4 not operated).

(2) Call is direct access to 101 ESS PBX (DAC operated) and there has been no previous PBX recycle (RCY4 not operated).

(h) Trouble Recorder Start (TRST) - Grounded when ground is applied to the TRST relay. Ground is removed when the trouble record is complete.

(i) Data Check (DK) - Grounded on ITNP test by the operation of the K1, 2 relays in the MTC circuit. Indicates that data is available for ITNP test call.

Data Scan Points

28.11 The following information is supplied to the processor via the data scan points for call processing:

Information	Data Scan Points
Called Number	A2/5-H2/5, J2/5-M2/5, N7
Type of Information	11, 2DT, X11, FVD, LT, LT1-2, TT, PHC, THC, OA, OB
Type of Call	OR, FAC SCK, SCN, CR PK, PS, PD RO LR TRK, TR2
Alternate Action Conditions	ATB, ASB, RV, OV, LB, PUL, NPU, PS1, ROH, PSG
Call Not Observed	NOB
Start CB Linkage	SCB
Sender Idle Indication	SIA 0-9, SIB 0-9
Outgoing Trunk Identification	FS0-19, TB0-9, TBX, TS0-19
Free Number Indication	FN, FNA, FNB
Transition Relays Not Operated	NTR
Transition Relays Operated	TR
Calling Party Indication	TP, RP
Type of Dialing Reg Received	DP, MF
Line Equipment Number From Originating	FT0-3, FU2/5, VG2/6, HG2/5, VF1/5
Incoming Trunk Class Via TLF	INC, TOL, TAN, TAN1-4, PCR, PCD, PCD1, TCA, TCB
Incoming Trunk Class via TLC	RN0-9
Trunk Number	THT0,1, HT2/5, TT2/5, UT2/5
Odd or Even Connector	OCN, ECN

Information (Cont)	Data Scan Points
Special Call Indicator	SPL, SPK
Special Call Type	NT, NH, NN
Test Call	MT, MTK
ITNP Test	TST
Register Test Set Test	ORT, IRT
Automatic Monitor	MON, RTST

B. Distribute Points

28.12 The following information is distributed to the MDC circuit where the information is decoded and gated to the marker when the information is required.

Type of Call and Outsender Group

28.13 The marker determines the type of call being handled from the following distributes:

Distribute Points	Lead Ground To Marker	Meaning
OSG2/6(0-9)	OSG0-9	Outsender group number. This information combined with source of call determines type of call.
OSG2,10	NS0	No Sender Outgoing
OSG4,10	NSR,RGT	Call Set to Ringer Test Trunk
OSG7,10	NSR	Call Set to Revertive Trunk
NSI	NSI	Intraoffice Call
TER	TER	Terminating Call
DR0,4	RBT	Register Return Busy - Used on calls from ORMC when all trunks, including common overflow trunks, are busy.
DR1,4	TOA	TOG call when all alternate trunk groups are all busy - Used only on TOG calls when marker returns to processor for alternate routing.
DR2,4	RR	Register return coin - Used on calls to free trunks not arranged for coin control and coin must be returned.
XTRK	XTRK	Processor input data check failure. Returned alone on calls from ORMC or returned with TER on calls from IRMC.
PM0	PM0	Permanent overflow. Returned with TER, NGK, HUTK on calls from the IRMC when marker must set ringing selection switch to overflow. Which is required for any of the following conditions: 1. Called number arranged to return overflow. 2. All lines in a hunt group are busy and overflow rather than line-busy must be returned. 3. On CMF or pulse conversion calls when all senders are busy. 4. When all outgoing tandem trunks are busy (only when trunk has not already been distributed, see TOA).

Trunk Select

28.14 Outgoing trunk selection is done by the processor. The distribute points activated to cause the marker to seize the trunk are:

Distribute Points	Lead Ground To Marker	Meaning
TLG0-2,TLF2/5	FS0-19	Trunk Link Frame Number
TB2/6	TB0-9, TBX	Trunk Block
TS2/5,ODT,EVT	TS0-19, ETS,OTS	Trunk Select

Route Series Control

28.15 The route series relays are operated by the processor via the distributor to control the class signals to the outgoing trunks and to control information passed to the sender on ANI or CAMA calls for calling customer identification. The distribute points are divided into three groups:

(a) NCNC, TCNC, NCCN, TCCN, NCTD, TOS

(b) KPT, NTP

(c) ANIS, CMJ, CMF, RB

28.16 One distribute point in each group is activated when a trunk is selected. The association of distribute points activated and leads grounded to the trunks is shown below:

Distribute Point	Leads Ground To Trunk	Leads Ground To Register	Leads Ground To Line Circuit
NCNC	None	None	None
TCNC	TC	None	None
NCCN	CN	None	None
TCCN	TC,CN	None	None
NCTD	None	RV1	None
TOS	RC	None	None
KTP	TP	None	None
NTP	None	None	None
ANIS	None	None	None
CMJ	None	None	None
CMF	None	None	None
RB	None	None	None

Outgoing Sender Information

28.17 The digits to be outpulsed, sender class, and arbitrary digits, if required, are provided by the processor. Delete information is not passed to the sender; deletion or digit shifting is provided by the processor before the information is distributed. Gating of the sender information to the senders is provided by the KN_ relays in the MDC. The sender class and arbitrary digits transmission to the sender is checked by the MDC while the marker checks the transmission of the digits.

28.18 The distribute points for outgoing sender information are listed below:

Distribute Point	Meaning
SDK	Sender Used on Call
A2/5-H2/5, J2/5-M2/5, N7	Dialed Digits
CL1-8	Sender Class
CLQ0-2	Number (Binary) of Class Leads Grounded
CR2/5	Arbitrary C Digit
BR2/5	Arbitrary B Digit (Optional)
AR2/5	Arbitrary A Digit (Optional)
ND	Signals Sender Not to Outpulse

Number Translation

28.19 Translation of the called number or of the trunk number to line equipment number and type of line information is provided by the processor. The information is distributed to the MDC and gated to the marker when required. The information returned for number translation is as follows:

INFORMATION	DISTRIBUTE POINTS	LEADS GROUNDED TO MARKER
Line Equipment Number	FTT2/4	FTN1/4
	FUT2/5	FUN1/10
	VGT2/6	VGT1/12
	HGT2/5	HGT1/10
	VFT1/5	VFT1/5
Ringing Combination	RCT1-9	RCT1-9
	RCT	RCT
	RCT11-15	RCT11-15
Charge Condition		
Charge	TC	
Free	FNA,FNK	FNA
Line in Hunting Group		
Loop Test	CKR,HF,LGT	CKR,HF, LGT,PBX
No Loop Test	CKT,HF,PBX	CKR,HF
Permanent Overflow Number	PMO,HTUK	PMO,HTUK
Permanent Busy Number	PBN,HTUK	PBN,HTUK
Automatic Intercept Without Using LLP	RI,BN,TBI HTUK	RN,BN,TBI HTUK
Called Number	APN,ATN, AEN	APN,ATN, AEN
	BPN,BTN, BEN	BPN,BTN, BEN
Direct Access to 101 ESS		
Bell System Call	BSN,	BSN
CCSA Call	NBS,	NBS
Trunk Number Translation	TOG	RCL,POTS
Nuisance Call Trace	DR0-7	NCRA

Type of Line		
All Others	AO	AO
Coin	CN	CN

All Other Distribute Points

28.20 The following miscellaneous distribute points are not covered in the preceding paragraphs:

Meaning	Distribute Point	Lead Grounded To Marker
Call Enable	CHA	CHA
Outgoing Trunk Requires Long Loop Signal	DR4,7	LOLD
Intermarker Group Call		
Not 10 Digits	DR2,7	IMG
10 Digits	DR1,7	IMG,DL1
Call Set to Tone Trunk for Paths Busy Condition	DR0,1	PBY,PN
Call Set to Trunk Apparatus Circuit	DR7,10	PST
DR2/5 Distribute Points		
Not Used	DAO	
Distribute Point Interpret		
Sender Used on Call	SDK	-
Call is Direct Access to 101 ESS or is AIS Without Using LLP	GK	-
All Others (No Sender Used)	NGK	-
Calling Line is		
Coin Line	CNS	CNS
PBX Line	HTR	HTR
Not to be Monitored	MTR	MTR
Light Traffic Call	LTR	LTR
Distribute Point Testing	DST,DSTA	-

29. MARKER OPERATION ON A FUNCTIONAL BASIS

MARKER SEIZURE - SC101

29.01 The marker is seized when the marker start (MS) relay operates in the marker connector. Operation of the MS relay releases the connector check relays MAK, MCK, and MSK and operate connector relays MA, MD, and ME. Release of the connector check relays operates the TM relay which starts the work timer by operating the TMS relay. Operation of the connector relay MA operates

marker connector busy (MCB0-2) relays which makes the marker busy to all marker connectors by operating the associated CB relay in the marker connectors. Operation of the connector relay MA also starts the marker overall timer by operating the OAT relay. The CKG1-2 relays are operated from the connector relay MC_ (or MG_ if provided) which is the last connector relay to operate. Operation of the CKG5 relay, the last CKG_ relay to operate, activates the data ready (DR) status scan points after all connector relays are operated. Activation of the DR scan point causes the processor to scan all data scan points. The information is processed and distribute points are activated by the processor to cause the marker to complete the call.

SEIZURE OF TRUNK LINK FRAME AND TRUNK - SC105B

29.02 The trunk link frame seized by the marker is determined by information recieved from the processor, when a trunk is selected, or by information received from the incoming register when a trunk is not selected. The trunk seized is also determined by information received from the processor, when a trunk is selected, or by steering of the F lead through register marker connector (IRMC) and register link (IRL) to the trunk, when a trunk is not selected.

A. Trunk Link Frame Seizure - Trunk Selected

29.03 The trunk link frame to be seized is identified by the TLG1/2 and the TLF2/5 distributes. The trunk link frame number is passed from the distributor to operate relays TLF_2/5 on a 2-out-of-5 code basis in the MDC. The MDC translates this code into a 1-out-of-10 indication which operates the frame select relay FS_ in the marker. The trunk link group number is passed from the distributor to the MDC to operate relays TLG0,1 on a 1-out-of-2 basis. These relays control the operate path of marker FS0-19 relays. Operated TLG0,1 relay is also in the operate path of the marker preference relay MP_ in the trunk link connector. The trunk block number is distributed to the MDC to operate relays TB_2/6 on a 2-out-of-6 code basis. The MDC translates the code into a 1-out-of-11 trunk block indication and passes it to the marker for operation of relay TB0-9 or TBX. The FCK operates through a TB_ relay check matrix to insure that two TB_ relays operate in the MDC. The FCK in operating operates relays FTCK and FTCK1 which cuts through the operate path to operate the TB0-9 or TBX relay. With the FTCK relay operated the seize frame (SF) timer is started and battery is applied to the trunk link frame start (ST0-19) lead through the following relay contacts: The FS- and FTCK operated; a one-up check of the TLG0-1 relays in the MDC; NSI or NSO, when a sender is not required, or SKA1 or SKB1 (idle sender available) when a sender is required; SP nonoperated and TLC1 operated. When the marker gains preference to the trunk link frame (MP_ relay operated), the TFK1,2 relays are operated which stop the seize frame timer. The M relay in the TL connector is operated when the MP_ relay operates. Battery supply leads BS0-4 are extended from the marker through the operated connector M relay to operate TL connector (MCA, MCB, MCC, and MCD) cut-through relays. Operation of the MC_ relays is checked in the marker by operation of relay MAK1 and MDK connector check relays.

B. Trunk Seizure - Trunk Selected

29.04 The trunk select number is distributed to the MDC to operate relays TS_2/5 on a 2-out-of-5 code basis. The MDC translates this code into a 1-out-of-10 indication. An odd trunk selection indication (ODT) or an even trunk selection indication (EVT) is distributed to the MDC to operate relay ODT or EVT. Either of these relays will operate auxiliary relay TSC. With the ODT or EVT operated, the trunk selection indication is passed to the marker on a 1-out-of-20 basis to operate relay TS0-19. If more than one TS_ relay operates MDC cross detection relay XTS will operate. This will cause cross detection relay XTG1 to operate over lead XTS stopping marker progress and a trouble record to be requested. The XTG1 will also operate through a back contact of relay TSC in the MDC if any false ground is present on lead TSG back through the trunk link.

29.05 When TL connector M relay operates a path is closed through the operated trunk block TB_ relay to operate a TB_ relay in the TL connector. The TB_ in turn operates relay TBK in the TL connector. Either TBK or TB_ closes a path to operate marker trunk block check relay TBK. Operation of TBK starts the trunk busy timer TBT by operating relay TBTB. If the marker cannot seize the trunk, either because of an open BT- lead or because the trunk is 2-way trunk and it has been seized from the distant end; the TBT timer operates and the marker will route advance. The operate path for the TBTB relay (FS32) is from the TBTB winding through TBT nonoperated, through FTCK, FTCK1, HMT1 relays operated, LCK nonoperated, to the MDC circuit

over lead TMS, through the transition relay nonoperated to the marker over lead TMG, through MAK1, TBK, relays operated to the MDC over lead FCK, through FCK relay operated to the marker over lead TBG through FTCK operated.

29.06 The operate path for the F relay in the trunk (FS33) is as follows: Relay TSC operated in the MDC circuit removes the XTG1 cross detection relay and applies ground to the multiple of TG- contacts over lead TSG. Since the TG- relays are not operated on full-ETS operation, the ground is applied to all TG(0-19) leads to the trunk link connector, which grounds all idle F relays on the trunk link frame. Twenty (maximum) F relays of the trunks associated with the operated trunk block TB- relay are connected to the marker over the busy test BT0-19 leads. One of the twenty busy test leads is cut through the operated trunk select TS- relay to the MDC circuit over the TF2 lead. The TF2 lead is returned to the marker over the TF1 lead through the operated TSC relay in the MDC. The TF2 lead is connected through an operated MAK1 and CKG4 contact through unoperated linkage check relays DCT1 and DCTA in parallel, back to the MDC circuit over lead TS through operated TSC, then back to the marker over the TSB lead through a 90 ohms resistance to battery, operating the F relay in the trunk.

29.07 The F relay operated in the trunk operates the LC- and LV- relays on the trunk link frame. The LV- relay cuts through the FAK and FBK leads to the marker and the markers FAK or FBK relay operates. The LC- relay operates the markers LCK relay and activates the LCK status scan point.

29.08 The LCK relay operated releases the TBTB relay which stops the trunk busy timer. The LCK status scan point being activated causes the provision to scan the marker for a trunk identification check.

C. Trunk Link Frame Seizure - Trunk Not Selected

29.09 On terminating, pulse conversion, CAMA first, (calls on which a trunk is not selected) the marker is directed to the trunk link frame containing the incoming trunk. The trunk link frame number is passed to the marker from the incoming register via the register marker connector and is registered on the FG0-2 and TF2/5 relays. When the type of call relay TER1, operates, the seize frame (SF) timer is started and battery is applied to the trunk link frame start leads ST0-29 through the FG0-2, TF2/5 relays operated. If the type of call relay PCL1 operates, indicating a pulse conversion or CAMA first call requiring a sender, the battery is not cut through until the SKA1 or SKB1 relay operates, indicating an idle available sender has been found. When the marker gains preference to the trunk link frame (MP- relay operated) the TFK3 relay is operated which stops the seize frame timer.

29.10 The M relay in the TL connector is operated when the MP- relay operates. Battery supply leads BS0-4 are extended from the marker through the operated connector M relay to operate the trunk link connector relays. As the connector relays operate the connector check relays MDK and MAK1 are operated.

D. Trunk Seizure - Trunk Not Selected

29.11 As shown on FS4, when preference to the trunk link frame is obtained, relay TFK3 operated, a 90-ohm -48 volt battery is applied to the F lead to the register marker connector, through the connector and through the register link to operate the F relay in the trunk.

29.12 The F relay operated in the trunk operates the LC- and LV- relays on the trunk link frame. The LV- relay cuts through the FAK and FBK leads to the marker and the markers FAK or FBK relay operates. The LC- relay operates the markers LCK relay and activates the LCK status scan point which causes the processor to scan the marker for information which the marker received through the trunk link connector.

LINE LINK FRAME SEIZURE AND CONTROL - SC108B

29.13 A LL frame seizure is necessary whenever a connection to a calling or called line or a tandem trunk is required. Line link frame seizure and control is as described in 8.6 except the processor rather than the number group translates the called number. The translation is distributed and passed to the MDC circuit where it is gated to the marker when needed. Also, the type of line relays are no longer operated from the class-of-service received from the line link frame. The processor causes distribution of the type of line on calls completing to a called number. On calls completing to an outgoing type trunk SOG or TOG the AO relay is operated from the MDC circuit.

A. Call-Back Linkage - SC108B

29.14 A call-back linkage connects the trunk on the TL to the calling line. Any call that is handled by a marker is distinguished by signals indicating the type of call and the kind of linkage. A call-back linkage occurs on only two types of calls, ITR and SOG.

29.15 The call-back usage is as described in 8.10 for an intraoffice call and 11.35 for a SOG call, and SC107. The call-back CB relay will be operated when the SCB2 and SCB relays operate. The operation of relay CB operates marker distributor control relay CB. The CB opens the operate path of MDC relay LFK. The CB also grounds the AO lead to the marker to operate marker relay AO. Relay AO extends the operate path for marker class check relay CLK.

B. Call Forward Linkage - SC108B

29.16 On a FLG linkage the processor translates the called customers number into the line location on the line link. This information is then distributed to the MDC where it is registered, translated and checked whereby it is transmitted to the marker at the proper time. The call forward linkage relays (FLG, FLG1, and FLG2) are operated by the TER1, ITR1, or TOG1 type of call relays. Relay FLG1 operated operates the lock line identity relays LLI and LLIA. Relay FLG operated operates the FLGA relay and grounds the NGS lead to the MDC circuit which operates the LLI relay in the MDC to cause the line equipment number and other information concerning the called number or tandem trunk number to be passed to the marker.

29.17 The LLI relay operated in the MDC causes the following information to be passed to the marker:

(a) Line equipment number which is registered on the FTT-, FUT-, HGT-, VGT-, and VFT- relays in the marker. These relays lock to the LLI relay operated in the marker. These relays in turn operate FUL, FTL, VGL, HGL, and VFL relays. The operation of the FTL, FUL, VGL, HGL, VFL, and RCL relays with LLI operated will operate relay RNG causing operate number release relay NR, and MDC relay LLI to release. The LLI in releasing will release marker relays FUN_ and FTN_.

(b) Ringing combination and charge condition. The RCT- relays are operated through the operated gate number group GNG- relay in the MDC, through the activated ringing combination distribute point in the DAS-ETS, through the operated LLI relay in the MDC, to ground through either the activated TC distribute point and the non-operated FNA relay in the marker or the activated FNK distribute point and the operated FNA relay in the marker.

(c) Hunting line indications, when the called number is associated with a hunting group, CKR, SLCK, and if a loop test is to be made, the LGT and PBXA relays.

29.18 The LLI relay operated in the MDC also recycles the marker work timer by operating RYT relay and if the immediate ring feature is provided the LLI operates the brush gate relay BRG to determine which brush is in use on the ringing switch. When the line equipment location and ringing combination relays are operated and locked in the marker the release number group RNG relay is operated and the LLI relay in the MDC is released.

29.19 The seize frame timer SF is started and battery is applied to the line link frame start leads STO-39 through the operated FTT_ and FUT- relays after the marker has gained preference to the trunk link frame, TFK3 operated. When the marker gains preference to the line link frame, the line link connector relays are operated and the link frame check relay LFK in the marker and MDC and operated. Operation of the LFK in the MDC circuit applies ground to the type of line distribute points to operate the marker type of line relay AO or CN associated with the activated distribute point.

29.20 As the line link connector relays operate the HG_ relay in the line link cuts through the LB_ and LL_ test leads used for channel testing and closes the SM_ test leads to the line link for select magnet operation. The operation of the LG_ relay in the line link cuts through the LH_ leads to the marker for use in the line idle and line-busy test and to operate the line hold magnet if the line is found idle.

OUTGOING SENDER SELECTION AND CONTROL - SC110B

29.21 When it is required to supply information to a connecting office when a call is to be routed through or completed in the connecting office an outgoing sender is required. When operating in the full-ETS mode, sender selection and control is generally as described in 11.4, however, any information provided by the route relay is provided by the processor. The digits passed to the sender are also provided by the processor; deletion or digit shifting is done by the processor before distribution.

A. Identification of Outgoing Sender Group

29.22 The outsender group number is distributed on a 2-out-of-6 basis. The MDC circuit translates this to a 1-out-of-10 and operates the corresponding outsender group OSG0-9 relay in the marker.

29.23 Operation of a sender group relay operates marker off-normal relay OGC, OSC, and SON. These relays prime the marker to function with an outgoing sender.

29.24 The outgoing class OGC relay operates relays that are used to transmit grounds to operate relays in the sender. The OGC relay also starts functions that transmit the called number to the sender.

29.25 The sender off-normal SON relay closes through leads for marker functions used on calls with senders. The SON relay is also used to identify the type of call. When the SON1 operates if the call is from the ORMC, relays OR or FAC operated, the subscriber outgoing SOG1,2,3 relays are operated, if the call is from the IRMC (INC, TOL, or TAN operated) the tandem outgoing TOG1,2,3 relays are operated through OSG-. On CAMA first calls relays CMC- are operated through OSG- (CMF2 operated).

B. Sender Idle Test

29.26 The operation of the OSG- relay extends test leads from the marker to the selected group of outgoing senders to determine which subgroup has idle senders. Ground extended to the marker over the SIE and SIO leads indicates idle senders within the subgroup. The operation of the SIA, sender idle in subgroup A, and the operation of SIB, sender idle in subgroup B, indicates the subgroup with idle senders.

29.27 It is also necessary to determine if the outsender connector associated with the subgroup is busy. The operation of the OSG0-9 relay extends the GBE and GBO leads from the associated outsender connector to the marker. The presence of ground on either of these leads indicates that the associated outsender connector is busy. Relay GBA or GBB operated indicates the busy subgroup sender connector.

C. Seizure of the Outgoing Sender Connector and Sender

29.28 Seizure of the outgoing sender connector and sender is described in 11.4.

D. Transmission of Information to Sender

29.29 The following information is passed to the sender either from the marker or from the MDC via the marker.

(a) Called Number

(b) Arbitrary Digits (if required)

(c) Class

(d) Service Observed Mark (SOB/NOB)

(e) Service or Test Call (SC/TVT)

(f) Calling Line Equipment Number (ANI Calls)

(g) Recorder Number (CAMA Junctor or CAMA First Calls)

(h) Originating Rate Class (CAMA Junctor or CAMA First Calls)

Operation of the Called Number Registration and Check Relays

29.30 Relay OSG_ operates OGC which in turn closes a ground over lead KG to the MDC through operated SDK to operate gating relays KN1-4. The KN- relays operate the marker KK relay and apply ground to the called number distribute points and cut through the called number leads to the marker to operate the called number registration (A2/5 - M2/5, J7) in the marker and the sender.

29.31 The operation of the outgoing registration check ORK1,2 relays indicate that the proper number of A2/5 through M2/5 relays have operated. If the ORK1,2 relays remain operated after the gate control KN- relays have released, it indicates that the registration relays in the sender are locked operated.

Operation of the Sender Class and Arbitrary Digit Relays

29.32 The KN- relays also cut through the class and arbitrary digit distribute points. The activated class and arbitrary distribute points operate the class CL- relays in the sender, the class check CLK- relays in the MDC, the arbitrary digit AR-, BR-, CR- relays in the sender and the arbitrary digit check relays in the MDC. If the class check and arbitrary digit check relays remain operated after the gate control KN- relays have released, it indicates that the information is stored correctly in the sender. On CAMA first calls arbitrary digits are not distributed. However, the arbitrary digit leads are used to transmit the incoming CAMA trunk number to the CAMA sender under control of CMC_ relays.

Outgoing Sender Registration and Release Timing

29.33 The outgoing sender registration timing is started when the OSC cut-through relays are operated (TSR lead from the OSC grounded) and the digit check ORK1,2 relays are operated to operate the OST1 relay.

29.34 The operation of the OST1 starts the OST timer. When the timing interval is reached, the OST relay operates and operates the OST2 relay. The purpose of the OST timing interval is to allow sufficient time for the sender registration relays to operated.

Release of the Transmitting Ground Relays

29.35 The operation of the OST2 relay releases the KN- relays in the MDC which removes the operating grounds for the called number, arbitrary digits, and class leads to the senders. The OST2 also releases the GTL-GTL4 relays which remove the operating grounds from the calling line location FT0-3, FU2/5, HG2/5, VF0-4, and VG2/6 relays in the marker and the associated leads to the OSC. The release of the KK, TGS_, and (on ANI calls) the GTL relays releases the OST1 relay. The release of the OST1 relay starts the timed release of the OST relay. The release of the OST1 and OST relays will operate the release sender connector RSC relay or on ANI calls will reoperate the GTL, or GTL2 relays which operate the RSC relay provided all required checks are made. The operate path for the RSC relay is from ground through contact 4-5B of the OST2 relay, through OSE, OST1, and OST relays released, OST2, ORK1,2 (called number check) relays operated, to the MDC circuit over the SK1 lead through a two-up check on the CK2/5, BK2/5, and AK2/5 relays (arbitrary digit checks) through a match of the number of CLK- relays operated with the CLO- relays (indicating the number of CL- leads which should be grounded) back to the marker over the SK2 lead, through NDK, NDI (no digit check) to the RSC relay. Or if the AMA4 relay is operated (ANI call) from the NDI through the RPK, TPS relays (party check) through the RK1,2 relays operated (line equipment number check) to the GTL2-4 relays. When the GTL2-4 operate, the RSC is operated from ground through OGC, OST2 operated, OST1 nonoperated, GTL2-4 (ANI call) operated, CLK and OGC operated through RSC to battery. Operation of the RSC relay starts the release of the sender connector which is described in 11.4451 to 11.4457. Outgoing sender link control is described in 11.45.

E. Alternate Actions - SC128B

29.36 On any type of call the marker may receive a signal or detect a condition indicating that the call cannot be completed in a normal manner and that an alternative action must be initiated. The alternative action taken depends on the type of call and the reason the call could not be completed. A list of the alternative actions is as follows:

(a) Line-Busy Test (LBT)

(1) Intraoffice, no-hunt lines - route advance to tone trunk.

(2) Terminating call, no-hunt lines - set ringing selection switch (RSS) to busy tone.

(3) Intraoffice, hunt lines - PBX recycle, if second hunt line is busy, route advance to connect to tone trunk.

(4) Terminating call, hunt lines - PBX recycle, if second hunt line is busy set ringing selection switch (RSS) to busy tone.

(b) All Trunks Busy (TBTA) - Route Advance

(c) All Senders Busy (ASB) - Route advance to select an alternate circuit.

(d) Failure to Match (FM).

(1) Terminating calls - set ringing select switch (RSS) to overflow.

(2) Tandem or intertoll call

(a) First failure to match - trunk number recycle,

(b) Subsequent failure to match - route advance.

(3) Intraoffice (FLG) or terminating calls to a PBX

(a) First failure to match - PBX recycle.

(b) Second failure to match.

(1) Terminating call - set ringing select switch (RSS).

(2) Intraoffice call - route advance.

(c) Third failure to match

(1) Intraoffice call - operate BT relay in the originating register.

(4) Intraoffice (CB) or subscriber outgoing call.

(a) First or second failure to match - route advance,

(b) Third failure to match - operate BT relay in the originating register to return overflow.

(e) Line Link Frame Busy (LLB)

(1) Intraoffice Call

(a) Called line - route advance to tone trunk.

(b) Calling line - operate BT relay in originating register to return overflow.

(2) Subscriber outgoing call - operate BT relay in the originating register to return overflow.

(3) Terminating call - set ringing selection switch (RSS) to overflow.

(4) Toll or tandem call

(a) Tandem call - route advance to set ringing selection switch (RSS) to overflow.

(b) Intertoll nonlocal completion

(1) First LLB - trunk number recycle.

(2) Second LLB - route advance to overflow.

(f) Plugged-Up Lines - recycle to intercept trunk if AIS is not provided. If AIS is provided call connected to AIS.

(g) No Test Calls

(1) Failure to determine channel - set ringing selection switch (RSS) to busy tone.

(2) Junctor Busy - set ringing selection switch (RSS) to overflow.

Trunk Number Recycle - SC132B

29.37 There are two conditions in which a trunk number recycle is initiated. One condition is when the marker is assisting a tandem TOG call and a first failure to match FM occurs. The other is when the marker is assisting an intertoll call and the line link frame associated with the intertoll trunk appearance is plugged-busy.

29.38 Operation of relay LLB (TOG1 and TOL operated) or relay FM (TOG3 and NGP1 operated) operates relay TNR which operates RCY and RCY1 which starts release of forward linkage control relays. The TNR also activates the RCY scan point to the processor as a signal to release all distribute points. When all appropriate functions have released selections normal check SNK relay releases which deactivates the RCY scan point as a distribute signal and releases relays RCY and RCY1. This releases relay RNG which operates relay LLI in the marker and MDC. The call will be connected as described under the appropriate call via an alternate route.

Route Advance - SC130B

29.39 In general, a route advance occurs if a marker cannot connect to a trunk, sender or channel.

29.40 When a route advance is initiated relays RAV1,2 are operated and RAV scan point is activated to the processor as a signal to release all distribute RAV2 operates relay RYT to recycle work timer. When all of the appropriate functions have released, the selections normal check SNK relay will release which deactivates the RAV scan point and releases relays RAV1,2. The processor will cause distribution of information to connect call via an alternate route.

PBX Recycle - SC118B

29.41 When circuit conditions cause a PBX recycle to occur relay RCY2 is operated which activates RCY2 scan point to the processor and operates relay RCY3 which starts release of forward linkage FLG relays which release relay LLI in the marker and MDC which releases relay RNG. When the appropriate functions have released, relay RCY4 is operated which reoperates forward linkage relays which operate relay LLI in the marker and MDC. The LLI operates relay RYT which recycles marker work timer. The RCY4 relay in operating also deactivates the RCY2 scan point as a signal for the processor to cause distribution of information to connect call to another line within the hunting group.

30. MARKER OPERATION ON A CALL BASIS

30.01 As described in 29.01 the DR status scan point is activated upon marker seizure causing the processor to signal the scanner to scan the data scan points. The information is retrieved by the processor, is processed and, when required, data is distributed to cause the marker to complete the call. The typical distribute points activated on the various calls and the marker functions required after distribution are listed in the following paragraphs.

SUBSCRIBER OUTGOING CALL

30.02 A subscriber outgoing call requires the calling line to be connected to an outgoing type trunk. A sender may be attached to the trunk for outpulsing to a distant office. If the marker cannot set the linkage, a status scan point will be activated to signal the processor that an alternate action is required. The processor will remove the data previously distributed and will distribute alternate data to enable the marker to complete the call.

A. SOG Call With Sender - SC3B

30.03 The data distributed on a SOG call with a sender (SC145) is as follows:

(a) Type of Call and Outsender Group:

(1) Outsender Group - OSG2/6(0-9)

(2) Sender Used - SDK

(b) Trunk Select

(1) Trunk Link Frame - TLG1/2, TLF2/5

(2) Trunk Block - TB2/6

(3) Trunk Select - TS2/5, ODT or EVT

(c) Trunk Class Control

(1) Any one of the following - NCNC,TCNC, NCCN,TCCN, or NCTD

(2) Any one of the following - KTP or NTP

(3) Any one of the following - RB, ANI, CMJ

(d) Sender Information

(1) Digits - A2/5-M2/5,N7

(2) Arbitrary Digits - CR2/5,BR2/5,AR2/5

(3) Class - CL1-8

(4) Class Check (Binary Code - CLQ0-2

(5) Signals Sender Not to Outpulse - ND

(e) Miscellaneous - Any of the following may be distributed if required for the call:

(1) Calling line is:

(a) Coin - CNS

(b) PBX Line - HTR

(c) Not to be monitored - MTR

(2) Call is to be switched light traffic - LTR

(3) Call to trunk which requires long loop signal - DR4,7

(4) Call to Intermarker Group trunk and:

(a) 10 digits not received - DR2,7

(b) 10 digits received - DR1,7

(5) DR2/5 code not used on call - DAO

30.04 Distribution of the OSG2/6 operate the OSG2/6 relays in the MDC circuit which operate the corresponding outsender group OSG0-9 relay in the marker through a two-up check in the MDC. Any OSG- relay operated in the marker operates the sender off-normal SON relay which operates the subscriber outgoing call SOG1-3 relays on calls from the ORMC (relay OR or FAC operated). The operation of the OSG- relay cuts through the

associated sender idle SIO or SIE leads for the sender group. An idle sender in the A or B subgroup will operate the corresponding SIA or SIB relay. If the associated outsender connector is idle, GBA, GBB relays nonoperated, the marker will bid for the outsender connector. Outgoing sender selection and control is described in 29.21.

30.04 When the marker gains preference to the sender connector (SKA1 or SKB1 relay operated) the bid is made for the trunk link frame. Seizure of the trunk link frame and the selected trunk is described in 29.03.

30.05 When the marker gains preference to the trunk link frame (TFK1,2 relays operated) the line link frame associated with the calling line is seized as described in 29.14. All other marker functions for this call, which are listed below, are not changed for ETS operation.

(a) Trunk Class Information - SC113

(b) Control for Channel Test - SC120

(c) Channel Selection and Hold Magnet Operation - SC121

(d) Linkage Checks - SC123

(e) Disconnect - SC125

B. SOG Call Without a Sender - SC2B

30.06 The data distributed on a SOG call without a sender SC144 is as follows:

(a) Type of Call

(1) No Sender Outgoing - OSG2,10

(2) Sender not used - NGK

(b) Trunk Select

(1) Trunk Link Frame - TLG1/2, TLF2/5

(2) Trunk Block - TB2/5

(3) Trunk Select - TS2/5, ODT or EVT

(c) Trunk Class Control

(1) Any one of the following - NCCN, NCNC,TCNC,TCCN, or NCTD

(2) Any one of the following - NTP or KTP

(3) RB

(d) Miscellaneous - Any of the following may be distributed if required for the call.

(1) Calling line is:

(a) Coin - CNS

(b) PBX line - HTR

(c) Not to be monitored - MTR

(2) Call is to be switched light traffic - LTR

(3) Call to trunk which requires long loop signal - DR4,7

(4) Call to tone trunk for all paths busy - DR0,7

(5) DR2/5 code not used on call - DA0

30.07 Distribution of the OSG2 and 10 operate the corresponding OSG- relays in the MDC which operates the no sender outgoing NSO relay in the marker through a two-up check in the MDC. The NSO operated on a call from the ORMC (OR or FAC operated) operates the type of call relays SOG1-3. With NSO operated the marker bids for the trunk link frame. Seizure of the trunk link frame and the selected trunk is described in 29.03.

30.08 When the marker gains preference to the trunk link frame, TFK1,2 relays operated, the line link frame associated with the calling line is seized as described in 29.14.

30.09 All other marker functions for this call, which are listed below, are not changed for ETS operation.

(a) Trunk Class Information - SC113

(b) Control for Channel Test - SC120

(c) Channel Selection and Hold Magnet Operation - SC121

(d) Linkage Checks - SC123

(e) Disconnect - SC125

C. Ringer Test Call - SC8

30.10 The data distributed on a ringer test call (SC150) is as follows:

(a) Type of Call

(1) No Sender Outgoing - OSG4,10

(2) Sender not used - NGK

(b) Trunk Select

(1) Trunk Link Frame - TLG1/2,TLF2/5

(2) Trunk Block - TB2/6

(3) Trunk Select - TS2/5,ODT or EVT

(c) Trunk Class Control - NCNC,NTP,RB

(d) Ringing Combination - RCT-, TC

(e) Miscellaneous - Any of the following may be distributed if required for the call:

(1) Calling line is

(a) Coin - CNS

(2) Call is to be switched light traffic - LTR

(3) Call to trunk which requires long loop signal - DR4,7

(4) DR2/5 code not used on call - DAO

30.11 Outsender group relays OSG4,10 are operated in the MDC on a 2-out-of-6 code basis from the distributor. The code is translated to a 1-out-of-10 indication and passed to the marker where it operates relay RGT. The RGT operates NGC which in turn operates relay RGTA. The RGTA provides a ground to operate gate relay LLI in the MDC. Operation of the LLI recycles the marker work timer by operating the RYT relay in the marker and causes the ringing combination RCT- relay in the marker to operate. The RCT- operated operates the RCL relay which operates the markers RV3 and RV relays and activates the RV data scan point. Operation of the RV relay operates the RNG relay which releases the LLI relay in the MDC. Relay RV3 operated operates relay NSO which operates the marker type of call relays SOG1-3 which control the call-back linkage CB- relays. The NSO relay also cause the marker to bid for the trunk link frame associated with the selected ringer test trunk. Seizure of the trunk link frame and selected trunk is described in 29.03.

30.12 When the marker gains preference to the trunk link frame, TFK1,2 relays operated, the line link frame associated with the calling line is seized as described in 29.14.

30.13 All other marker functions for the call, which are listed below, are not changed for ETS operation.

(a) Trunk Class Information - SC113

(b) Control for Channel Test - SC120

(c) Channel Selection and Hold Magnet Operation - SC121

(d) Ringing Switch Control - SC127

(e) Linkage Checks - SC123

(f) Disconnect - SC125

D. Reverting Call - SC9

30.14 A reverting call begins as an intra-office call. The processor translates the called number, selects an intraoffice trunk and distributes the information to the marker. When the information is recieved (SC151) and the line equipment number of the called line matches the line equipment number of the calling line the RV1,2 relays are operated which operates the RV relay and activates the RV data scan point. Relay RV operated causes the marker route advance (RAV1,2) relays to operate which activates the RAV status scan point. The processor removes the data previously distributed and all the information in the marker except the ringing combination RCT- is released. When the information is all released the SNK relay releases which releases the RAV1,2 relays and deactivates the RAV status scan point. The processor then makes the following distribution (SC152):

(a) Type of Call

(1) Type of Call - OSG7,10

(2) Sender not used - NGK

(b) Trunk Select

(1) Trunk Link Frame - TLG1/2,TLF2/5

(2) Trunk Block - TB2/6

(3) Trunk Select - TS2/5,ODT or EVT

(c) Trunk Class Control - NCNC, NTP, RB

(d) Miscellaneous - Any of the following may be distributed if required for the call.

(1) Call is to be switched light traffic - LTR

(2) Call Set to Trunk Apparatus Circuit - DR7,10

30.15 Distribution of the OSG7 and 10 operate the corresponding OSG- relays in the MDC which operates the RV3 relay which operates the NSO relay in the marker. The NSO operated operates the type of call relays SOG1-3 which operate the call-back linkage CB- relays. Relay NSO operated also causes the marker to bid for the trunk link frame associated with the reverting trunk. Seizure of the trunk link frame and the selected trunk is described in 29.03.

30.16 When the marker gains preference to the trunk link frame, TFK1,2 relays operated, the line link frame is seized as described in 29.14. All other marker functions for this call, which are listed below, are not changed for ETS operation.

(a) Trunk Class Information - SC113

(b) Control for Channel Test - SC120

(c) Channel Selection and Hold Magnet Operation - SC121

(d) Ringing Switch Control - SC127

(e) Linkage Checks - SC123

(f) Disconnect - SC125

TERMINATING CALL

30.17 A terminating call requires the incoming trunk to be connected to a line associated with the called number. If the call cannot be completed because of line-busy or failure to match and the called number is associated with a hunting group, a status scan point will be activated to signal the processor that another line within the hunting group is needed. If the line is not associated with a hunting group, the ringing selection switch is set to return overflow or line-busy tone to the calling party.

30.18 If the called number is arranged for intercept, the processor will distribute the line location of the proper intercept trunk if automatic intercept service (AIS) is not provided. If AIS is provided the line location of the AIS trunk will be distributed along with the information to be outpulsed to the AIS office.

A. Terminating Call - SC4B

30.19 The data distributed on a TER call (SC146) is as follows:

(a) Type of Call

(1) Terminating - TER

(2) Sender Not Used - NGK

(b) Number Translation

(1) Line Equipment Number - FTT2/4, FUT2/5, VGT2/6, HGT2/5, VFT1/5

(2) Ringing Combination - RCT1/15

(3) Charge Condition - TC or FNK, FNA

(4) Type of Line

(a) Coin - CN

(b) All Others - AO

*(5) Permanent Overflow Number - PMO,HTUK

*(6) Permanent Busy Number or All Hunt Lines-Busy - PBN,HTUK

*If PMO or PBN is distributed, the line equipment number, ringing combination, charge condition and type of line are not distributed. The PBN is distributed when the called number is arranged as a permanent busy number or when the processor finds all lines in a hunt group busy. The PMO is distributed for any of the following conditions:

(a) Calling number arranged to return overflow

(b) All lines in a hunt group are busy and overflow rather than line-busy must be returned.

(c) On CMF or pulse conversion calls when all senders are busy.

(d) When all outgoing tandem trunks are busy (only when trunk has not already been distributed).

When PMO or PBN is distribured the marker sets the ringing selection switch to the proper level and disconnects (SC125).

(c) Miscellaneous - Any of the following may be distributed if required for the call:

(1) Called line is in hunt group CKR, HF, LGT, and requires loop test - LGT.

Does not require loop test - PBX

(2) Nuisance call trace required - DR0,7

(3) Call is to be switched light traffic - LTR

(4) DR2/5 code not used on call - DAO

30.20 Distribution of the TER operates the TER1-3 relays in the marker which causes the marker to bid for the trunk link frame associated with the incoming trunk. Trunk link frame and trunk seizure is described in 29.09 through 29.12. The TER- relays operated also operate the forward linkage (FLG, FLG1, FLGA) relays which operate the LLI relay in the marker and in the MDC. Operation of the LLI in the MDC recycles the work timer and causes the line location, and ringing combination to be passed to the marker. When the information is locked operated in the marker, the RNG relay is operated and the LLI relay in the MDC is released.

30.21 When the marker gains preference to the trunk link frame (TFK3 operated) the line link frame is seized if a line location has been distributed. Line link frame seizure is described in 29.16 through 29.20.

30.22 All other marker functions for this call, which are listed below, are not changed for ETS operation.

(a) Control for Channel Test - SC120

(1) Channel Selection and Hold Magnet Operation - SC121

(2) Ringing Switch Control - SC127

(3) Linkage Check - SC123

(4) Disconnect - SC125

Loop Test

30.23 Distribution of LGT and CKR operates relay PBX in the MDC and relay CKR in the marker. The PBX in turn operates marker relays LGT and PBXA. Relays GT1 and GT2 are operated from ground through LCC1, CON1 to the MDC and back to the marker and CKR operated and back to the MDC through a one-up check of operated PBX, back through operated marker relays LGT and PBXA, back through the MDC to the marker through CON1 operated and windings of GT1 and GT2 to battery. Subsequent action is same as described in 8.0833.

TER- Special - SC13

30.24 Two distributes are required for special calls. The first distribute TER (SC157) enables the marker to seize the trunk link frame associated with the incoming trunk (see 29.09 through 29.12) so that the type of special call (NT, NH, or NN) can be determined. When the trunk link frame and trunk are seized, the LCK in the marker operates and the LCK status scan point is activated. The processor scans the data scan points, processes the information and the following distribution is made:

(a) Type of Call

(1) Terminating - TER

(2) Sender Not Used - NGK

(b) Number Translation

(1) Line Equipment Number - FTT2/4,FUT2/5, VGT2/6,HGT2/5,VFT1/5

(2) Ringing Combination - RCT1/15

(3) Charge Condition - TC or FNK,FNA

(4) Type of Line

(a) Coin - CN

(b) All Others - AO

(5) Permanent Overflow Number - PMO, HTUK

(6) Permanent Busy Number or all hunt lines-busy (only on NH or NN) - PBN, HTUK

(c) Miscellaneous - See terminating call 30.24 for miscellaneous distribution. Distribution of the line equipment number will cause the marker to seize the line link frame as described in 29.16 through 29.21.

30.25 All other functions, for this call, listed below, are not changed for ETS operation.

(a) Control for Channel Test - SC120

(b) Channel Selection and Hold Magnet Operation - SC121

(c) No Test Train - SC135

(d) Ringing Selection Switch Operate - SC127

(e) Linkage Check - SC123

(f) Disconnect - SC125

B. Terminating - Direct Access to 101 ESS - SC10

30.26 Direct inward dialing may be provided for stations of a 101 ESS satellite via the No. 5 crossbar office. When direct access to 101 ESS is provided, the data distributed on a direct access to 101 ESS call (SC153) is as follows:

(a) Type of Call

(1) Terminating - TER

(2) Gate Check - GK

(3) Bell System Number - BSN

(b) Called Number

(1) Office Code - APN/BPN/ATN/BTN/AEN/BEN

(2) Station Digits - A2/5-D2/5

(c) Type of Line

(1) All Others - AO

(d) Miscellaneous - Any of the following may be distributed if required for the call.

(1) Call is to be Switched Light Traffic - LTR

(2) Nuisance Call Trace Required - DR0,7

(3) DR2/5 Code Not Used on Call - DA0

30.27 Distribution of the TER indication operates the TER1,2,3 relays in the marker which causes the marker to bid for a trunk link frame associated with the incoming trunk. Trunk link frame and trunk seizure is as described in 29.09 through 29.12. The TER- relays operated also operate the forward linkage (FLG) relays which operates the LLI relay in the marker and in the MDC. Operation of the LLI in the MDC recycles the work timer by operating the RYT relay in the marker.

30.28 Distribution of GK operates relay GK in the MDC which operates gate relays GNG1 and KN5. The KN5 causes the dialed numerics to be passed to the marker and hence to the DAP circuit. The GNG1 along with LLI causes operation of Bell System Number (BSN) relay to operate which causes marker relays SNG1,2 to operate. The SNG2 along with relays TH-, NSS0-5, and TFK3 cause marker to bid for a DAPC over STA-09 leads (SC154). When DAPC is seized marker relay DAC is operated which indicates that the call is to a 101 ESS satellite and operates relay RYT which recycles the work timer. After translation relay TLK operates which indicates a good translation and operates relay RCL and ringing select RS0-9 relays. Ringing and busy tones are controlled at the satellite and therefore the ringing switch is set to a silent level, either five or seven. After checks are made relay LA is operated which operates relay RNG which releases relays SNG1,2 in the marker and LLI in the MDC.

30.29 After line location has been received and relay RCL operated a bid for line link seizure is started as described in 29.16 through 29.20.

30.30 If all line circuits are found busy and call is a terminating call relays TLT and PMO are operated to operate overflow OV relay to have overflow returned to the customer.

30.31 All other marker functions for this call which are listed below, are not changed for ETS operation.

(a) Control for Channel Test - SC120

(b) Channel Selection and Hold Magnet Operation - SC121

(c) Ringing Switch Control - SC127

(d) Linkage Check - SC123

(e) Disconnect - SC125

C. Automatic Intercept Service (AIS) Without Using LLP - SC11

30.32 The data distributed on an (AIS) call (SC154) is as follows:

(a) Type of Call

(1) Terminating - TER

(2) Gate Check - GK

(3) Type of Intercept - BN, RI, or TBI

(b) Type of Line

(1) All Others - AO

(b) AIS Sender Information

(1) Office Code - APN/BPN/ATN/BTN/AEN/BEN

(2) Station Digits - A2/5-D2/5

(d) Miscellaneous - Any of the following may be distributed if required for the call.

(1) Nuisance Call Trace Required - DR0,7

(2) Call is to be Switched Light Traffic - LTR

(3) DR2/5 Code not Used on Call - DAO

30.33 Distribution of the TER indication operates the TER1,2,3 relays in the marker which causes the marker to bid for a trunk link frame associated with the incoming trunk. Trunk link frame and trunk seizure is as described in 29.09 through 29.12. The TER- relays also operate the forward linkage (FLG) relays which operates the LLI relay in the marker and the MDC. The LLI in the MDC operates marker relay RYT to recycle work timer.

AIS Recycle

30.34 Distribution of GK operates relay GK in the MDC which operates relays GNG1 and KN5. When TYM timer functions GNG1 operates relay BN/RI/TBI which operates automatic intercept relays AIC which start recycle of the marker and activate the RCY2 scan point. Relay RNG is also operated which releases the TYM timer and releases the LLI relay in the marker and MDC. Upon completion of recycle and check is completed relays RCY4,5 operate which deactivates the RCY2 scan point and releases RNG relay. The RNG releasing operates relay LLI in the MDC which causes the work timer to recycle by operating relay RYT and passes the office code (APN/ ATN, etc) to the marker. It also operates relay KN5 in the MDC which passes the digits to the marker and hence to the AIS sender.

AIS Sender Seizure

30.35 Relay RNG in releasing operates relays SNG1,2 which extends a bid for an AIS sender (SC137) through marker preference circuit. After transmission of information to the AIS serder and a check is completed relay UK operates and the AIS sender bids for an idle AIS line circuit. If an idle line circuit is obtained the AIS sender provides the line equipment number of the selected line. A ringing combination is also returned to operate RCT- relays which operate relays RCL and RCLA. These cause a seizure of a line link frame as described in 29.16 through 29.20.

30.36 When no AIS senders or line circuits are available relay PMO will be operated to set intercept call to overflow or reorder. All other marker functions for this call which are listed below are not changed for ETS operation.

(a) Automatic Intercept - SC137

(b) Control for Channel Test - SC120

(c) Channel Selection and Hold Magnet Control - SC121

(d) Ringing Switch Control - SC127

(e) Linkage Check - SC123

(f) Disconnect - SC125

INTRAOFFICE CALL - SC5B

30.37 An intraoffice call is one between two customers in the same marker group. This type of connection requires a double ended trunk. One connection is established between the called customers line appearance and the trunk link appearance of one end of the trunk; another connection is established between the calling customers line appearance and the trunk link appearance of the other end of the trunk. The data distributed on an ITR call (SC147) is as follows:

(a) Type of Call

(1) No Sender Intraoffice - NSI

(2) Sender Not Used Check - NGK

(b) Trunk Select

(1) Trunk Link Frame - TLG1/3,TLF2/5

(2) Trunk Block - TB2/6

(3) Trunk Select - TS2/5, DDT or EVT

(c) Trunk Class Control

(1) Any One of the Following - NCCN, NCNC, TCNC, TCCN, or NCTD

(2) Any one of the two: NTP or KTP

(3) RB

(d) Number Translation

(1) Line Equipment Number - FTT2/4,FUT2/5, FGT2/6, HGT2/5, VFT1/5

(2) Ringing Combination - RCT1/15

(3) Charge Condition - TC or FNK, FNA

(4) Type of Line

(a) Coin - CN

(b) All Others - AO

(e) Miscellaneous - Any one of the following may be distributed if required for the call:

(1) Calling Line is:

(a) Coin - CNS

(b) PBX Line - HTR

(c) Not to be Monitored - MTR

(2) Call to Trunk Which Requires Long Loop Signal - DR4,7

(3) Called Line is in Hunt Group - CKR,HF

Requires Loop Test - LGT
Does Not Require Loop Test - PBX

(4) Call is to be Switched Light Traffic - LTR

(5) DR45 Code Not Used on Call - DAO

30.38 Distribution of the NSI operates the NSI relay in the marker which causes the marker to bid for the trunk link frame associated with the selected trunk. Trunk link frame and trunk seizure is described in 29.03 and 29.04 through 29.08. Relay NSI operated also operates the ITR- relays which operate the froward linkage (FLG, FLG1, and FLGA) relays. Relay FLG operated operates the LLI relay in the MDC which recycles the marker work timer by operating the RYT relay and causes the line location, and ringing combination, to be passed to the marker. When the information is locked operated in the marker the RNG relay is operated which releases the LLI relay in the MDC.

30.39 When the marker gains preference to the trunk link frame (TFK1,2 operated) the line link frame associated with the called line is seized as described in 29.16 through 29.20.

30.40 All other marker functions for this call, which are listed below, are not changed for ETS operation.

(a) Control for Channel Test - SC120

(b) Channel Selection and Hold Magnet Operation - SC121

(c) Ringing Switch Control - SC127

(d) Call Forward Linkage Checks - SC123

(e) Intraoffice Advance to Call-Back Linkage - SC109

(f) Line Link Frame Seizure and Control - SC108

(g) Channel Selection and Hold Magnet Operation - SC121

(h) Trunk Class Information - SC113

(i) Call-Back Linkage Check - SC123

(j) Disconnect - SC125

TOLL OR TANDEM INCOMING TRUNK TO OUTGOING TRUNK (TOG) - SC6B

30.41 A tandem (TAN) call is a type of incoming call whose destination requires it to be switched through to a subsequent office. In this case this office becomes an intermediate switching point. The trunks used for handling tandem traffic may also be used for handling terminating call for local completion in this office.

30.42 The data distributed on a (TOG) call (SC148) is as follows:

(a) Type of Call and Outsender Group

(1) Outsender Group - OSG2/6(0-9)

(2) Sender Used Check - SDK

(3) Type of Call - TOG

(b) Number Translation

(1) Line Equipment Number - FTT2/4, FUT2/5, VGT2/6, HGT2/5, VFT1/5

(c) Trunk Select

(1) Trunk Link Frame - TLG1/2, TLF2/5

(2) Trunk Block - TB2/6

(3) Trunk Select - TS2/5, ODT or EVT

(d) Trunk Class Control

(1) Any One of the Following - NCNC or TOS

(2) Any One of the Two - KTP or NTP

(3) - RB

(e) Sender Information

(1) Digits - A2/5-M2/5, N7

(2) Arbitrary Digits - CR2/5, BR2/5, AR2/5

(3) Class - CL1-8

(4) Class Check - CLQ0-2

(f) Miscellaneous - Any of the following may be distributed if required for the call:

(1) Call is to be Switched Light Traffic - LTR

(2) DR2/5 Code Not Used on Call - DAO

30.43 Distribution of the OSG2/6 operate the OSG2/6 relays in the MDC circuit which operate the corresponding outsender group OSG0-9 relay in the marker through a two-up check in the MDC. Any OSG- relay operated in the marker operates tandem outgoing call TOG1,2,3 relays on calls from the IRMC (relay TAN/TAN1/TOL/CMS0/CMS1/CMF2/INC operated). The operation of TOG- relays operate the F relay in the incoming tandem trunk and the forward linkage relays in the marker which operates the LLI relay in the marker and in the MDC. Operation of LLI in the MDC recycles the work timer by operating the RYT relay in the marker and causes the line link frame location of the incoming tandem or toll trunk, ringing combination lock to be passed to marker. When the information is locked operated in the marker the RNG relay is operated and the LLI relay in the MDC is released.

30.44 The operation of the OSG- relay cuts through the associated sender idle (SIO or SIE) leads for the sender group. An idle sender in the A or B subgroup will operate the corresponding SIA or SIB relay. If the associated outsender connector is idle (GBA, GBB relays nonoperated) the marker will bid for the outsender connector. Outgoing sender selection and control is described in 29.21 through 29.41.

30.45 When the marker gains preference to the sender connector (SKA1 or SKB1 relay operated) the bid is made for the trunk link frame. Seizure of the trunk link frame and the selected trunk is described in 29.03. When the marker gains preference to the trunk link frame (TFK1,2 relays operated) the line link frame associated with the calling line is seized as described in 29.14 and 29.15.

30.46 All other marker functions on this call, which are listed below, are not changed for ETS operation.

(a) Trunk Class Information - SC113

(b) Control for Channel Test - SC120

(c) Channel Selection and Hold Magnet Operation - SC121

(d) Linkage Checks - SC123

(e) Disconnect - SC125

PULSE CONVERSION - SC7B

30.47 Pulse conversion is the action of converting MF pulsing received from a switchboard keyset to either dial or revertive pulsing and is required on a call from an operator to a type of connecting office using dial or revertive pulsing.

30.48 The data distributed on a PCR/PCD0/PCD1 (SC149) type call is as follows:

(a) Type of Call and Outsender Group:

(1) Outsender Group - OSG2/6(0-9)

(2) Sender Used Check - SDK

(b) Sender Information

(1) Digits - A2/5-M2/5, N7

(2) Arbitrary Digits - CR2/5, BR2/5, AR2/5

(3) Class Check - CLQ0

(4) Class - None

(c) Miscellaneous - Any of the following may be distributed if required for the call:

(1) DR2/5 Not Used on Call - DAO

30.49 Distribution of the OSG2/6 operate the OSG2/6 relays in the MDC which operate the corresponding outsender group OSG0-9 relay in the marker through a two-up check in the MDC. Any OSG- relay operated in the marker operates the sender off-normal SON and SON1 relays which operate the pulse conversion call PCL1,2,3 relays on calls from the IRMC (PCR/PCD0/PCD1 operated). The operation of the OSG- relay cuts through the associated sender idle (SIO or SIE) leads for the sender group. An idle sender in the A or B subgroup will operate the corresponding SIA or SIB relay. If the associated outsender connector is idle (GBA, GBB relays nonoperated) the marker will bid for the outsender connector. Outgoing sender selection and control is described in 29.21 through 29.35.

30.50 When the marker gains preference to the sender connector (SKA1 or SKB1 relay operated) the bid is made for the trunk link frame associated with the outgoing trunk frame. Seizure of the trunk link frame and the selected pulse conversion trunk is described in 29.09 through 29.12.

30.51 All other marker functions for this call, which are listed below, are not changed for ETS operation.

(a) Linkage Check Circuits - SC123

(b) Disconnect - SC125

CAMA FIRST (CAMF) - SC12B

30.52 In CAMA offices, functions are performed to make a connection between the non-AMA customer in the No. 5 crossbar office or from a distant office and the ETS equipment to record the calling customers number and the called number for accounting purposes. If the marker cannot set the linkage, a status scan point will be activated to signal the processor that an alternate action is required. The processor will remove the data previously distributed and will cause distribution of alternate data to enable the marker to complete the call.

30.53 The data distributed on a CAMF (SC156) call is as follows:

(a) Type of Call and Outsender Group:

(1) Outsender Group - OSG2/6(0-9)

(2) Sender Used Check - SDK

(b) Trunk Class Control - NCNC, NTP, CMF

(c) Sender Information

(1) Digits - A2/5-M2/5, N7

(2) Class - CL1-8

(3) Class Check - CLQ0,1

(d) Miscellaneous - Any of the following may be distributed if required for the call.

(1) DR2/5 Code Not Used on Call - DAO

30.54 Distribution of the OSG2/6 operate the OSG2/6 relays in the MDC circuit which operate the corresponding outsender group OSG0-9 relay in the marker through a two-up check in the MDC. Any OSG- relay operated in the marker operates the sender off-normal SON, SON1 relays and CAMA CMC- relays on calls from the IRMC (relay CMF2 operated). The operation of the OSG- relay cuts through the associated sender idle (SIO or SIE) leads for the sender group. An idle sender in the A or B subgroup will operate the corresponding SIA or SIB relay. If the associated outsender connector is idle (GBA, GBB relays nonoperated), the marker will bid for the outsender connector. Outgoing sender selection and control is described in 29.21 through 29.41.

30.55 When the marker gains preference to the sender connector (SKA1 or SKB1 relay operated) the bid is made for the trunk link frame. Seizure of the trunk link frame and the selected CAMA incoming trunk is described in 29.09 through 29.12.

30.56 All other marker functions on this call, which are listed below, are not changed for ETS operation.

(a) Linkage Checks - SC123

(b) Disconnect - SC125

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5243-TVB-ABVL-SRE

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

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CHANGES

A. Changed and Added Functions

A.01 To provide the reduction of second trial trouble cards and high and dry conditions on incoming calls.

A.02 To block 7-digit calls with 0 or 1 in the B digit position.

A.03 To provide test desk access to originating only lines without using number group SC relays.

A.04 The marker is arranged for ETS operation.

A.05 To allow use of standard ringing combinations for Unigauge lines 74A, 72X.

A.06 Several marker features are modified for operation in a LAMA-C office.

B. Changes in Apparatus

B.01 Added

[1] ATOA, ATE - AK30 Relay

[2] ATOA, ATE - 185A Network

[3] HMS2, U422 Relay - Fig. 205

D. Description of Changes

Reduction of Second Trial Trouble Cards on Incoming Calls

D.01 Option ZYI is added to provide the reduction of second trial trouble cards and high and dry conditions on incoming calls. This option adds the ATOA and the ATE relays. The ATOA relay is operated after a trouble record has been taken on a TOG call, second trial, after a route has occurred. Operation of the ATOA operates the TOA relay to cause the marker to set the ringing switch to overflow rather than route advance to another route. The ATE relay is operated after a trouble record has been taken on second trial calls from the IRMC when the type of call information, such as TER or TOG cannot be derived from the information received from the incoming register. Operation of the ATE relay operates the TEA relay to cause the marker to set the ringing switch to overflow rather than grounding the BT lead to the register which would result in the call going high and dry.

Seven Digit Calls with 0 or 1 in the B Digit Position

D.02 Option ZYL is added to cause a trouble record to be taken when seven digits with a 0 or 1 in the B digit position is received from the originating register. A cross connection, terminal J to H, is provided to disable the feature when N0X or N1X type codes are added to the home numbering plan area. This change is made to cause the marker to detect a trouble condition, usually in the pretranslator or originating register, in which the call is recognized as a 7-digit call when in fact it is a 10-digit call. Prior to this change the fault was not detected until the transverter failed, which was too late to identify the originating register causing the problem.

Test Desk Access to Originating Only Lines

D.03 Options ZYU, ZYT, and ZYS are added to provide test desk access to originating only lines without using SC relays. With this feature the TNK mark from the number group can be used for outgoing only lines. Any service calls are routed to BN intercept, while SPL calls will complete.

TCO Traffic Register Circuit Opened on Test Calls

D.04 The operate path for the TCO traffic register peg count is modified to prevent the register from scoring on test calls. The PBY make-contact is removed from ground and connected to a break contact of the MT13 relay. Option ZXJ provides the new wiring while option ZXI is assigned to the previous wiring.

Unigauge Standard Ringing Combinations

D.05 In order to ring a long-loop customers phone, the voltage drop resulting from the extended loop must be compensated for by a higher voltage ringing supply. This supply (105 Volts) is connected to level 4 of the ringing selection switch and is selected by the marker whenever it establishes a call to a Unigauge customer. Previously, this selection was controlled by the ringing combination assignment in the number group. One- and two-party customers were assigned RC4 or RC14 and PBX customers were given a special LLPX assignment which caused the LOLC relay in the marker to operate. This new feature will allow use of standard ringing combination assignments. The marker will use the long-loop signal from line link (LOLA) to select level 4 on the ringing selection switch. Upon receiving the number group translation, the marker begins to set the standard level (level 6) or the ringing selection switch. The call proceeds to the point where the line link indicates whether the line is long-loop or not. If not, the NOLA relay operates and the call completes with level 6 set on the switch. However, if LOLA operates, the marker will release level 6 and prepare to set the switch to level 4. When LOLA operates, the RS6 and RS0/1 relays are released which in turn releases the select magnets on the ringing selection switch. This opens the select off-normal contacts which releases the marker RSK relay and it, in turn, releases the SRK. With RSK and SRK released, the LOLC relay operates, operating RS4 and reoperating RS0/1. The LOLC also closes through the HMS1 operate path and the call proceeds with the ringing selection switch now set to level 4. Option FH provides this feature while options FG, FI, and FJ are assigned to the previous wiring.

Operation with ETS

D.06 The marker is arranged for ETS operation. When a dial tone marker is arranged for ETS, options ZXC and ZXE should be added. Option ZXE is required for transition only and may be removed after transition is complete. When a completing marker is arranged for ETS operation, option ZXB should be removed and option ZXD added to all completing markers, option ZXH should be added to special markers 0 and 1 only, and option ZXF should be added for transition only. After transition is complete, option ZXF may be removed.

Eliminate Nonproductive Trouble Cards

D.07 False nonproductive trouble cards can be caused by the completing marker seizing the line link frame connector at a critical time when a dial tone marker is serving the same frame through the LLMC. When this occurs, the GK relay releases falsely and blocks further selection. This is corrected by shorting contact 11-12B of relay HGG. The nonproductive trouble cards can also be caused by an abandoned call just before relay HMT1 releases. If the interval is just right, it will cause partial operation of the DIS1 and DIS2 relays that permits the back contacts to open but not front contact closure. The back contacts in opening release operated relays which block marker progress and cause cross detection relays to operate. This condition is improved by shorting contact 11-12T of relay DIS1.

Detection of Falsely Operated TNK Relay

D.08 An operated TNK relay is normally an indication that the marker is switching a tandem call. If TNK operates on a terminating or intraoffice call, this indicates that a customer dialed a trunk number and the call is routed to blank number intercept. A permanently operated TNK (most likely caused by striking contacts of the TRC relay, option BF) will cause all terminating and intraoffice calls to be routed to blank number intercept without producing any kind of trouble indication. A check circuit is added to provide a trouble card if TNK is operated while the marker is idle. A break contact of the OAT relay is added between the secondary winding of the XRS3 relay and a TNK relay make-contact. While the marker is busy with a call, the OAT is operated and the check circuit is open. However, when the marker is idle, the circuit is closed and, if TNK is falsely operated, the XRS3 relay will operate and produce an XRS1 trouble record. Option FK provides this feature.

One up Check for ORD and ORM Relays

D.09 In marker groups equipped with the TOUCH-TONE® dialing feature, the total originating traffic register lead is routed through contacts of the ORD and ORM relays. One of these relays is operated by the originating register on each customer originated call and it in turn closes through the TOR or TMOR traffic register lead. If for some reason neither relay operates, the call will complete without scoring a total originating traffic register. A one up-check is added to insure that one of these relays operates on all originating calls. Contacts of the ORD and ORM relays are added between the EXA relay and the circuitry which controls the total originating peg count. If neither relay or both relays are operated at the time the marker attempts to score a total originating traffic register, the EXA relay will operate and cause the marker to produce a trouble record at the end of the call. Option ZYQ provides this feature.

Channel Peg Counts Delayed

D.10 The total channel (TCH) and sample channel (PLSC) peg counts are delayed until the marker is committed to actually setting the channel (HMS1 operated). This will prevent possible unwanted counts on these registers if the marker selects a channel then later encounters a line busy which prevents the channel from being used. To provide this delay in completing markers, the TCH and PCSC circuits are routed through a contact of the HMS1 relay. In combined markers, the circuits are routed through a contact of a new HMS2 relay. For offices equipped with the traffic data processor, a TCD relay is provided to stagger the TCH peg from the PCSC peg. Option ZXL provides this feature in completing markers, Fig. 205 is required in combined numbers, while markers equipped with the traffic data processor (Fig. 180) require option ZXN, those markers not so equipped require ZXM. Option ZXK is assigned to the previous wiring.

Modifications for LAMA-C

D.11 The marker is arranged to allow service observing, traffic sampling, and PBX-AIOD features to be provided in a LAMA-C office.

D.11.1 The service observing feature is arranged to permit the use of existing apparatus in markers being arranged for LAMA-C operation with only a minor wiring change. Option ZXA provides the new arrangement.

D.11.2 The traffic sampling feature in a LAMA-C office will be performed by the LAMA-C equipment. The marker changes are required to disable the traffic sampling functions, if provided, in the marker. Existing option GX is specified for markers in LAMA-C offices.

D.11.3 The PBX-AIOD feature in the marker is not required in a LAMA-C office. If provided, this marker feature must be disabled in offices converting to LAMA-C operation. This feature can be disabled by cross connection changes as specified in the SD cross connection notes. Disabling this marker feature does not prevent PBX-AIOD operation in a LAMA-C office.

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.1 Added

JSB - 221A Resistor - Option FF - Fig. 91

XJSA - KS-19150-L1 Resistor - Fig. 191
XJSB - KS-19150-L1 Resistor - Fig. 191

XJSA - 186A Network - Fig. 191
XJSB - 186A Network - Fig. 191

B.2 Superseded	Superseded By
JSA - 18BU Resistor - Fig. 191	JSA - 186K Resistor - Fig. 191

D. Description of Changes

Failure to Prevent ANI Transverter Seizure on Test Calls

D.1 Option KR was provided (on Issue 47D) to block the CL3 indication to the sender to prevent the seizure of an ANI transverter on marker test calls. A part of option KD wiring (provided in markers not equipped for person to person operation) provides a shunt path around the blocking circuit in the CL3 lead to the sender which allows the ANI transverter to be seized. To prevent this shunt path from allowing ANI transverter seizures on marker test calls, a part of option KD (now option ZYV) is removed from markers equipped with both options KR and KD, (ie, ANI features without person to person capability).

Incorrect Sequence of Marker Operation on Permanent Signal Calls

D.2 A problem in the sequence of marker operations when the expanded permanent signal feature is being used and all of the dummy trunks are busy. Under this condition the call should be route advanced to common overflow without any further permanent signal tests being performed. However, the existing circuitry attempts to repeat these tests. This problem is corrected by making wiring changes in the operate path for the GT5 and GTA relays.

CAD Correction for Toll Diversion

D.3 Where toll diversion is not required it is possible to have different vintages of originating register marker connectors ORMCs, ie, equipped with or without toll diversion capability, operating in the same marker group. As a result, leads FRG and RV1 from different ORMCs were terminated on the same punching in the marker. When toll diversion is required for a marker group, all ORMCs must be equipped with lead RV1 only. However, no means was provided to remove lead FRG from the same punching when toll diversion is added. Consequently, a ground from lead FRG would falsely operate relays applicable to toll diversion with resultant failures. A change is made to shift lead RV1 to a separate punching to avoid circuit failure.

Marginal Conditions Eliminated for XJS and XJS1 Cross Detection Circuits

D.4 Under certain marginal conditions, the XJS relay can operate falsely or, conversely, the XJS1 may not operate when it should. These conditions are caused by the combination of a feedback path between the SBA1 and SBA2 leads in the trunk link circuit and an extra current drain created by the JS2-9 bleeder resistors in the marker. The bleeder resistor current is eliminated by removing ground from the resistors and connecting them to -48 Volt battery. To compensate for the feed back,

the bias currents in the secondary windings of the XJS and XJS1 relays are changed. The XJS is made less sensitive by increasing the secondary current. This is accomplished by paralleling the existing 1000 ohm JS resistor with a 4990 ohm JSB resistor. The sensitivity of the XJS1 relay is increased by replacing the 300 ohm JSA resistor with a 422 ohms resistor, thereby decreasing the bias current. Additional contact protection is provided by the XJSA and XJSB contact protection networks and bleeder resistors. This will ensure protection of contact 9, 10B of the ONX relay when the marker is working with a 12 level junctor trunk link circuit.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5243-JRS-ABVL-JAY

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

MAY 15 1975

CHANGES

A. Changed and Added Functions

A.1 The marker is equipped with additional start leads for increased flexibility in the use of the foreign area translator.

A.2 The marker is arranged for hotel/motel multimessage unit operation.

B. Changes in Apparatus

B.1 Added

MDC - U1396 Relay - Option ZYE - Fig. 3

NMD - U1364 Relay - Option ZYE - Fig. 17

INTA - 186A Network - Option ZYP - Fig. 43

MDC - 185A Network - Option ZYE - Fig. 3

NMD - 185A Network - Option ZYE - Fig. 17

TLO - 186A Network - Option ZYM - Fig. 43

TNTA - 186A Network - Option ZYM - Fig. 43

TNTI - 186A Network - Option ZYO - Fig. 153

TNX - 186A Network - Option ZYN - Fig. 145

D. Description of Changes

Increased Flexibility for FAT

D.1 The marker is arranged to provide two groups of three new start leads (FAT(E)1-3) to the foreign area translator connector. These leads will permit increased flexibility in the use of the foreign area translator circuit area translators. Option ZZZ provides the new wiring.

Identify PBX Line on IAO Nuisance Call

D.2 Option ZZS is added to provide identification of PBX lines on intraoffice nuisance call trouble cards. This change will cause the nuisance call record to be made on the forward linkage portion of the intraoffice call to provide identification of the called-line location. This information can be used to associate nuisance call records with lines in a PBX hunting group.

AIS Sender Usage Count

D.3 Option ZZT is added to provide an AIS sender usage plant register count. The AI lead to the plant register circuit is grounded on service calls and test calls other than marker test calls when the linkage is set to the AIS line circuit.

Calls to Unequipped Number Groups

D.4 Option ZZV is added to prevent marker blockage on calls to unequipped number groups when AIS is provided and blank number intercept is not routed to the AIS center. This change insures the release of the BNTH relay before the reoperation of the LLI relay on BN intercept. If the LLI relay should reoperate before BNTH is released, BNTH is lock operated and the marker will block when attempting to route the call locally.

Channel Selection Preference

D.5 The channel selector cross-connection Note, Part 10 of Note 400, is rewritten to stress the importance of connecting all markers in the same way and to stress the reasons for periodically alternating the preference settings, which aid in detecting channel troubles and to equalize apparatus usage.

Hotel/Motel - Multimessage Unit Operation

D.6 Options MI, MK, MP, KP, and apparatus figures 156, 158, and 47 are coordinated to hotel/motel - multimessage unit operation. Cross-connection Note 400, Part 53 is changed and Note 438 is

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added to show typical cross-connections for this feature.

Two-Out-of-Five Check for ABC Digits

D.7 A 2-out-of-5 check is provided for the ABC digits to prevent the possibility of mutilated office code information causing sender connector transfers and blowing fuses on the flat spring trunks link frame. The existing 2-out-of-5 circuitry associated with the sender storage check relays A-, B-, and C-, is used to obtain the check.

(a) When an originating register seizes the marker, ground is applied to the PK lead, operating the marker PK relay and the mutilated digit check MDC relay. The MDC then operates the digit cut-in relays, KA and KBC, to extend the dialed number information from the register to the sender storage check relays A-, B-, and C-. Contacts of these relays form a 2-out-of-5 check circuit, and if the check is satisfactory, the no mutilated digits NMD relay operates. The NMD closes through the sender group selection circuit to allow the marker to proceed with sender and trunk link selection. The MDC remains operated until the marker selects a sender group and progresses to the point where the RK3 relay operates. The RK3 in operating releases the MDC relay which in turn will allow the marker KK relay to control the KA and KBC digit cut-in relays for sender storage and checking. Option ZYE (rated Standard) provides this feature.

Incoming Trunk Class Information to AIS Sender from Markers not Equipped with NSS - Relays

D.8 On 4-digit incoming calls to intercepted numbers, the AIS sender must reconstruct the called office code in order to outpulse the entire 7-digit intercepted number to the AIS center. If the marker group is associated with only two office codes, then the sender can use the OA and OB office indications from the marker to generate the office code. However, if either OA or OB is associated with more than one office code, the sender requires incoming trunk class information (physical, theoretical, or extra theoretical) to determine the office code. This change replaces the OA and OB relays of figure BM with the OA and OB relays of figure BN in order to separate the incoming trunk classes from the OA and OB offices and provides a means of transmitting this information to the AIS sender. Option ZZY (rated Standard) is added to recombine these six indications, OA (PN, TN, EN) and OB (PN, TN, EN), to operate the two number series relays, OAN and OBN, in the marker.

CSW Trouble Punch

D.9 The CSW lead is added from the marker to the master test frame connector to provide the CSW trouble punch. This lead is provided by option ZZW (rated Standard).

DL- Cross-Connection for TSPS No. 1 Routes Changed to DLOP or DL1P

D.10 Cross-connect information for TSPS No. 1 routes (Note 400 Part 89) is changed to show DLOP or DL1P instead of DLOS or DL1S. The DL- information, in addition to providing sender delete instructions, provides number structure information to the sender. With the "-S" cross-connection, the 5 DG lead is grounded to the sender; the "-P" grounds the 4 DG lead. On calls to TSPS No. 1 most senders will function properly with either lead grounded. However, some flat spring senders are not equipped with the 4 DG and 5 DG relays. These senders have a permanent ground wired to the 4 DG lead. In order to accommodate these senders the marker DL- cross-connection must be DLOP or DL1P to avoid an XT5 cross indication.

Channel Selection Sequence Chart Correction

D.11 The channel selection sequence chart, SC121, is corrected to show that the JCK progress punch will be missing from trouble cards produced after selection of either channel 0 or 1. The CH0 or 1 relay in operating shuts down the JCK0 or 1 relay and operates the CHA

relay. The operated CHA causes the CHE relay to release and with JCKO or 1 released, ground is removed from the JCK lead to the master test frame connector.

Contact Protection for Contacts Operating S- Relays on Incoming Calls

D.12 Contact protections is added for contacts which operate service treatment (S-) relays on incoming calls. This will prevent contact erosion on the contacts associated with the SWTA, SWTI, SWTO, and SWTX cross-connection terminals. Options ZYM, ZYN, ZYO (rated Standard) and ZYP (rated A&M only) provide this feature.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5243-JBS-ABVL-BT

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

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CHANGES

B. Changes in Apparatus

B.1 Added

PBX3 - 1/2AK501 Relay - App Fig. 202

B.2

Superseded	Superseded By
OLO-9 - AK46 Relay - App Fig. 203	OLO-9 - AK508 Relay - App Fig. 203

D. Description of Changes

False Operation of OL- Relays

D.1 A problem exists in markers arranged for both permanent signal test features and overflow link features. When routing a permanent signal call that requires an overflow link, a resistance battery backup path exists through the CH- relay windings that allows all OL- relays to operate, and thereby blocks the marker. The problem is corrected by changing the code of the OL- relays and by providing their battery circuit through the CHA relay.

Loss of Level 0 in Calls-Waiting Link on Permanent Signal Calls

D.2 A problem exists in markers arranged for permanent signal test features when a calls-waiting customer is being served. On a permanent signal call the marker will route advance after setting up to the trunk appearance circuit. This action causes the VFT- relay to release which results in the release of the hold magnet for level 0 in the calls-waiting link. The problem is corrected by providing the PBX3 relay and minor wiring changes.

Automatic Intercept Problem

D.3 When AIS, App Fig. 192, is provided contact 6M (NAIC) relay, wiring option ZYA, prevents the operation of the FAC1 relay on 10-digit originating calls. The FAC1 relay is required on 10-digit originating calls for the "intercept of unauthorized customer 10-digit DDD dialing" feature, App Fig. 161. To correct this problem, option ZYA is replaced by option ZYB in offices with both App Fig. 161 and 192.

Additional Marker Controls for Nuisance Call Circuitry

D.4 The marker is changed to prevent the possibility of disabling the marker because of a trouble in the called number detector circuit. A make-contact of the KK relay is added to the NCRA operate path to prevent any false "trap call" indication, whether it be a false ground on an M- lead or a falsely operated detector in the called number detector circuit, from locking up the marker NCRA relay. Option ZYD (rated Standard) provides this contact while option ZYC (rated Mfr Disc.) is assigned to the previous portion of figure 187 wiring.

Correct Inaccurate TCO and PTCO Traffic Register Counts

D.5 The TCO and PTCO traffic register circuits are changed to correct inaccurate counts. The new circuit will provide a TCO count each time the PBY relay operates. If the marker is handling a call in which a paired line link frame is involved, the PTCO register will also be scored.

Test Circuit Control of Sender Delete Information

D.6 Circuit Note 132 is added to provide a listing of the various test circuit arrangements which require direct control of the sender delete information. Option KT provides this control (MT-25 and 26 relays).

Additional Leads to DAS for LAMA-C

D.7 The FN, FNA and FNB levels are added to the distributor and scanner circuit for proper processing of intraoffice calls to free numbers.

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CSACS Cabling Problem

D.8 Circuit notes previously specified that option GD or GE be provided whenever CSACS option ZZL or ZZM is equipped. However, some of the wiring provided by options GD and GE can only be terminated at the plant register cabinet. A cabling problem occurs when trying to apply option GD or GE in offices not equipped with the plant register cabinet. Options ZZL and ZZM have been modified so that neither option GD or GE is now required for CSACS operation.

Allotted Numbers and PBX Recycle on First Failure to Match

D.9 Option ZYF is added to provide an operate path for the allotter number recycle relay NAR1 on first failure to match to an allotted number when the PBX recycle on first failure to match feature is provided. The allotter number recycle relay must be operated on PBX recycles to recycle the allotter select relays.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5243-JBS-CJV-JCM

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.01 The marker is arranged to request AMA records of directory assistance calls.

A.02 The circuit is arranged for operation with the Centralized Status, Alarm and Control System (CSACS) for alarm sending to a remote location.

A.03 An improved cross check is provided on the FTNO-5 relays.

A.04 Connecting information is added for operation with the computer line verification access circuit and the distributor and scanner circuit for LAMA-C operation.

A.05 To provide full access for the fifth and sixth dial tone markers.

A.06 To provide ringer test call routing to TSPS operators.

A.07 To increase the maximum outsender link select magnet operate to ten.

A.08 The marker is arranged to test permanent signal calls to determine if the call is due to a receiver off-hook or a trouble on the line, and to route the call accordingly.

B. Changes in Apparatus

B.01 Added

MJ - 426F Diode - App Fig. 30, 103 - Option ZZK

MN - 462F Diode - App Fig. 30, 103 - Option ZZK

XSSA - 316B Relay - App Fig. 204

D. Description of Changes

D.01 Directory Assistance Charging - Provision is made for charging customers for calls to directory assistance operators. The marker is arranged to request either a bulk-billed or detailed-billed AMA record on directory assistance route. Calls for local information (411) will be bulk-billed, calls for home NPA information (555-1212) may be either bulk-billed or detail-billed, and calls for foreign NPA information (NPA+555-1212) will be detail-billed. The type of AMA billing required on directory assistance calls is indicated to the sender by the CP1, CP2, and LST leads on bulk-billed calls. Detail-billed calls are indicated by the CP2, CP7, and 4DG leads to the sender.

D.02 CSACS Operation - Circuit arrangements have been made for operation with the Centralized Status, Alarm and Control System (CSACS). The changes provide leads to the interface and control circuit that allows marker usage, first and second trial failures, and "made busy" conditions to be monitored from some distant location. If a marker failure is detected, the monitoring station has the capability of taking the marker out of service.

(a) Options ZZK, ZZL, and ZZM provides the arrangement for CSACS. Option ZZJ represents the original wiring.

D.03 Improved Cross Check on FTN- Relays - An improved check on the FTNO-5 relays is provided such that shorted contacts on a FTN- relay are detected by the marker. A shorted FTN- relay contact will operate the XFTN relay which in turn operates the FTTB relay. Operation of the FTTB relay stops marker progress and initiates a trouble record. Option ZZG provides the minor wiring changes required for this improvement.

ac

D.04 LAMA-C/SCC - First Application Initial - Connecting information for the computer line verification access circuit and for the distributor and scanner circuit for LAMA-C operation is added.

D.05 Full Access for Fifth and Sixth Dial Tone Markers - The marker is arranged to provide full access for the fifth and sixth dial tone markers. All reference to markers with graded access, and option AF, which provided wiring for graded access, is removed on a D no-record basis.

D.06 Ringer Test Calls - TSPS Operator Routing - The false option ZZQ is added to remove option ZZP which allows both the NE and KK relays to operate without operating the cross relay XN. The NE and KK relays will operate when a ringer test call for a 2-party message rate line is routed to an operator served by TSPS.

D.07 Outsender Link Select Magnet Operate Maximum Increase - Apparatus Fig. 204 is added to increase the maximum number of outgoing sender link select magnet operation from eight to ten. Apparatus Fig. 204 provides a high resistance 316-type relay (XSSA) for cross detection. The XSSA relay when operated opens the operate path for the outsender link hold magnets and operates the cross relay XSS which locks to the ONX relay operated. Relay XSS operated will stop marker progress and will cause a trouble record to be taken.

D.08 Permanent Signal Test Feature -

(a) General - When the permanent signal test feature is provided, the line on which a permanent signal call is detected is connected by the marker to a special trunk appearance. This special trunk gives the marker access to the tip and ring, which are tested to determine whether the permanent signal is due to a receiver-off-hook or a trouble on the line. The call is then switched via route advance to an appropriate termination depending on the outcome of the test. This feature may or may not be used in conjunction with overflow links.

The frame memory is frozen throughout the permanent signal call except on a recycle. This is done to reduce the markers tendency to prefer only certain trunk link frames when routing the call after the test is completed. Memory advancement is allowed on a recycle so that a different trunk link frame, if available, may be chosen in the event of a failure to match.

The test itself consists of two parts. The first part is a ground test and the second part is either a short test or another form of ground test, depending on the class of service. If the line fails the first test, the second test is not performed.

D.81 All Lines Except Coin and Two-Party

(a) Ground Test - When the completing marker is seized on a permanent signal call, no line except coin and 2-party lines should be grounded on either the tip or ring. Consequently, a test employing the GT relay is made to detect trouble grounds on noncoin and non-2-party lines. The test is performed much like the usual ground test on the called line, as described in SECTION 8.08332, except that different biasing circuitry is used. Shortly after the marker is seized, the GT3 relay (and its slave, GT3A) is operated by the CKG2, and the TLC1 relay negatively biases the GT relay by energizing its tertiary winding. The negative bias on the GT relay is increased when the PST preroute relay energizes the GT secondary through the PG1 and PG2 bias resistors. The PST relay also energizes the GT primary, which develops enough current to overcome the combined negative bias of the secondary and tertiary windings, causing the GT to operate. The primary of the GT relay is connected to the ring by the GLH and GLH1 relays over the ART or BRT leads to the TLF.

After the channel hold magnets to the special trunk are operated, the GT2 relay operates. This relay removes power from the GT3 slow-release relay, and operates the GT2A which removes the ground applied

to the GP primary by the PST relay. If there are 4500 ohms or more to ground on the ring, the GT relay releases and re-energizes the GT3 relay. The marker then proceeds with the short test. If there are less than 3000 ohms to ground on the ring, the GT does not release. Consequently, the GT3 eventually releases and causes the PSG relay to operate and lock which indicates that the permanent signal is due to a trouble ground on the line.

(b) Short Test - The purpose of this test is to detect excessively low-resistance between the tip and ring (such as a short in or near the office). The resistance is measured by a bridge network composed of resistor ST1, 2, and 3, the line, and the ST relay. When the GT relay releases in the previous test, it operates the PS1 relay, which prevents the GT3 relay from releasing. The PS1 relay also operates the ST relay by applying ground to the line side of the bridge. The ST relay operates a slave relay, STA, which diverts the hold ground for the PS1 through the PS2 relay, causing the PS2 to operate. The PS1 also connects the tip to ground and transfers the ring from the GI primary to the grounded side of the bridge.

The PS2 relay removes the operate ground applied to the bridge by the PS1 and it also removes power from the slow-release GT3 relay. If the resistance between the tip and ring is greater than 150 ohms, the ST and STA relays will release. Upon releasing, the STA reapplies power to the GT3 relay and operates the ROH relay, which locks up. If the line resistance is less than 100 ohms, the ST and STA will hold operated. In this case, the GT3 will eventually release, causing the PSG relay to operate and lock.

Operation of either the ROH or PSG causes the PSX to operate. The PSX initiates a route advance by operating the RAV1-3 relays, and the RAV3 causes the PSX1 to operate and lock. The marker then route advances to set up the linkage to an appropriate trunk. During the route advance, the line link connector is held by the PSL relay, which is operated by the PSX. The PSX2 relay, which operates and locks when the RAV3 releases at the end of the route advance, prevents duplicate peg counts during the permanent signal test call.

D.82 Coin Lines

(a) Although coin lines may or may not be grounded, depending on the presence of a coin, the marker treats coin line permanent signals the same as in D.81 for noncoin lines. When an originating register recognizes a permanent signal on a coin line, it attempts to return the coin. If the coin is successfully returned and there are no trouble grounds on the line, the marker concludes that the permanent signal is due to a receiver off-hook. If the coin return is unsuccessful or if a trouble ground is present, the marker considers the permanent signal to be due to trouble.

D.83 Two-Party Lines

(a) Ground Test - On 2-party lines, the tip party station set applies ground to the tip when its receiver is off-hook in order that it might be distinguished from the ring customer. The originating register tests for the presence of this ground on all 2-party calls, and it operates the TPT relay in the marker if the ground is present. Since this ground is intentional and should not be treated as a trouble, the ground test in D.81 (a) is modified by the TPT relay such that the GT relay will release when the GT2 operates only if there is approximately the same resistance to ground on both the tip and ring. The TPT relay accomplishes this by connecting the tip through the PG3 bias resistor to the GT relay secondary and the ring directly to the GT primary. If the ground is due to a receiver off-hook, the current will be the same in the primary and secondary and will cancel since the coil polarities are reversed, causing the GT relay to release when the GT2 operates. The marker will then proceed to the second test. If the ground is due to a trouble, it probably will be unbalanced, causing the GT relay to remain operated. As in D.81 (a), the GT3 relay will eventually release, causing the PSG to operate. All steps in the GT sequence are the same as for a non-2-party call. The only difference is the way in which the tip and ring are connected to the GT relay. Bias resistors PG1 and 2 are not used. Since no ground is applied by the ring party, the TPT relay does not operate and the call is treated as a non-2-party call.

(b) Second Ground Test - If no fault on the line is found in the previous test, a second test is made to determine if the balanced ground is of the proper resistance. Since the ground applied at the station set is through at least 1000 ohms, this test will cause the PSG to operate if the resistance on either the tip or ring is less than 800 ohms to ground. This test is nearly identical to that of D.81 (a) except that both the tip and ring are connected to the GT primary, a different amount of negative bias is applied to the GT secondary, and the controlling circuitry is like that of D.81 (b).

(c) The release of the GT relay in D.83 (a) operates the PS1 relay, which connects the PG2 bias resistor to the GT secondary, ties the tip and ring together, and operates the GT by applying direct ground to the primary coil. When the GT operates, the PS1 hold current is diverted through the PS2 relay, which operates. The PS2 relay removes the operate ground from the GT relay. If the GT releases, the ground on the line is of reasonable resistance and the ROH relay operates. If the GT relay does not release, the ground resistance is too low. The GT3 relay eventually releases and operates the PSG relay. The PSX, RAV3, and PSX1 relays are operated and a connection is set up to an appropriate termination as in D.81 (b).

D.84 Operation With Overflow Links

When overflow links are provided, overflow may be connected directly to any of 20 selected links (10 left and 10 right) of a trunk link frame. The connection of overflow to the links is established by the operation of a relay in the trunk link, S- relay, associated with each of the 20 overflow links. This S- relay connects an auxiliary overflow circuit directly to the link to provide tone and supervision, requiring no trunk to be used.

Selection of an overflow link is initiated in the marker by the operation of a route relay that is cross connected to operate relays TBX and NSO. Since no trunk is to be selected, the TC- cross connection is omitted. The FTC- leads associated with the route relay are tested to select a trunk link frame with an idle overflow link. Relay NSO sets up a normal SOG-NSO type call, but trunk selection is bypassed by relay TBX.

Relay TBX in the marker operates the TBA relay, which grounds the TBK lead to the trunk link and causes the TBX in that circuit to operate when the trunk link connector operates. The TBX in the trunk link connects the S- relays of the overflow links to the BT- leads to the marker and operates the overflow link choice OLC relay in the trunk link frame. The OLC relay closes the 20 overflow link hold magnets through the L and R relays and over the LH- leads to the marker, and it grounds the LCK lead to operate the marker LCK relay.

At the same time, relay TBX closes the LKA and RKA relay windings to the LK and RK leads from the trunk link frame to operate the LKA or RKA relay in parallel with relay LK or RK. Operation of either the LKA or RKA releases the TSE1-2 relays, closes BT leads 0-9 LKA or 10-19 RKA to contacts of the OL- relays, and bypasses the FAK and FBK contacts to operate relay TK.

Operation of the TK permits normal channel selection utilizing an idle overflow link of the trunk link. In order for completion of the channel tests to occur without a trunk link FA- or FB- relay, the TBX relay cancels the continuity tests and causes the SLA relay to operate from the JXP1 to allow the DCT relay to operate. The TBX also bypasses contacts of the CLK to permit the DCT to operate the DCT1 relay, which in turn operates the DCT4.

The CH- relay hold ground is extended by the DCT4 to a corresponding OL- relay, which operates. The OL- relay closes ground through an LKA or RKA contact to a BT- lead to operate the trunk link S- relay associated with the selected overflow link. The trunk link S- relay cuts the tip and ring of the overflow link through to the auxiliary overflow circuit and applies a 10-ohm ground to the sleeve lead. The grounded sleeve shunts down the DCT to operate the LKD relay, which extends its operate ground

to operate the LK1 followed by the DIS1. The LKD relay is inserted in the operate path of the LK1 by the TBA relay to allow time for detection of crossed trunk link S-relays by the XCHS relay. The XCHS grounds the XCH punch lead and operates the TRR relay directly to produce a trouble record and normal release in the case of a cross.

D.09 Prevent False Trouble Cards on Unassigned Line - Line Test - A new lead is provided from the marker to the master test frame connector to give the master test control circuits additional control of the UKA marker relay. This new control will prevent unnecessary trouble records from being made when unassigned line line tests are being made in offices with calling line identification features.

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(a) Options ZZO and ZZN provides the new arrangement.

D.10 Miscellaneous Changes - Miscellaneous changes are made to correct information notes and minor drawing errors.

D.11 Incoming First Failure to Match Traffic Count Provided as Separate Feature - The marker notes pertaining to the IFFM traffic register lead (option BC) are changed so that this lead can be added independent of previous marker features. Paragraph 193 of Note 102 is added to show option BC as a separate feature.

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

D. Description of Changes

D.1 Race Condition in Dial Tone Overload Announcement Features - A marker failure can occur due to a race condition between the RCY and FCRO-3 relays in U and Y markers using the dial tone overload announcement features. The premature operation of an FCR- relay during the recycle function causes the marker to disconnect without setting the call to an announcement trunk.

(a) A minor wiring change is made to correct this problem.

D.2 Prevent Linkage Release Following Nuisance Call Trouble Record on Terminating Call - Option CY, which was added on Issue 62D to permit taking a trouble record after a nuisance call record and to assure work timer recycle, introduced a condition which may result in the linkage being released after completing the record. On terminating nuisance calls, the marker progress is stopped just before relay DCT1 operates. The record is taken and immediately following the record, control is returned to the DCT1 path to allow the marker to complete the call. However, completion of the record also provides an operate path for the DIS1 and 2 relays. This causes the marker to release prematurely which could cause the linkage to release.

(a) This trouble is corrected by preventing the DIS1 and 2 relays from operating until the marker has completed its functions. Break-contacts of the NCRA and VFL relays are added to the DIS1 and 2 relay operate path to prevent these relays from operating when the TRB, TRSA, and TRR relays are operated.

D.3 Prevent False Nuisance Call Indication (LVM) on Originating Calls With Mutilated Digits - An originating call containing mutilated digits may result in both the call-back (CB-) relays and forward linkage (FLG-) relays operating. This causes the VFL and SNG- relays to operate which will operate the NCRA relay, resulting in a false LVM punch on the mutilated digit trouble cards.

(a) This is corrected by operating the UKA relay each time the CB- relays operate. The UKA operated will open the operate path for the NCRA relay and prevent it from operating.

D.4 "NAMA" Lead to MTFC Required for Trunk Test Register Circuit - The "NAMA" lead from the marker to the master test frame connector is required whenever an office is equipped with a trunk test register circuit and AMA or ANI features. Previously, this lead was provided by option TF (APTT or ROTL testing provided). The lead is now provided by both option TF and option KT (trunk test register provided).

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed or Added Functions

A.1 The marker is equipped for switching test calls initiated by CAROT-ROTL circuits. (Centralized Arrangement for Remote Office Testing with Remote Office Test Line Circuits).

A.2 A new translator is provided for translating area codes.

A.3 The AMA recording of 3-digit calls with no outpulsing.

B. Changes in Apparatus

B.1 Added

Fig. 201

NDO - Diode - Option AZ - Fig. 33

ND1 - Diode - Option AZ - Fig. 33

D. Description of Changes

D.01 CAROT-ROTL Operation - The marker is equipped to switch test calls initiated by test circuits which allows trunks in several connecting offices to be tested on a remote basis (ROTL). This arrangement allows some of the trunk testing equipment to be centralized and provides more centralized results of routine and trunk trouble testing and test results analysis.

D.02 In general the marker is accessed via the MTFC. However, several new leads are provided to the remote office test line register circuit for class of service functions and trunk selection.

D.03 Area Code Translator (Fig. 201 - FS117) - Apparatus Fig. 201 provides a translator for translating NO/1X area codes. In addition, option AS may be provided for translating NNO codes. The translator provides for translation of all 160 NO/1X codes and all 64 NNO codes.

D.04 Operation of the ACT relay connects the A, B, and C digit information to the translator. When the translator is used for DDD only, the ELT relay operates the ACT relay. When DDD and PPCS are required, screening relays are operated, causing ACT to operate (see typical cross-connection Note 434).

D.05 Operation of the ACT relay causes the XOX, X1X, or XNX relay to operate, depending on whether the B digit is 0, 1, or N (2-9), respectively. Operation of XOX or X1X connects the 20X - 90X or the 21X - 91X relays to the A digit leads A2-9. The 20X - 90X or 21X - 91X relay corresponding to the A digit will operate. Thus the first two digits of the designation of the operated relay correspond to the A and B digits dialed. Ground on one of the C0-9 leads is connected through a contact of the operated relay to the code point AC--- associated with the 3-digit area code. The code point is cross-connected via ACG-- and ACR-- terminals to a route relay, the foreign area translator or to vacant code treatment.

D.06 If the B digit is not 0 or 1, ground on one of the B2-9 leads operates the XNX relay after ACT operates. If translation for NNO codes (option AS) is not provided, operation of XNX applies the ground on the A- lead to the ACV terminal. The ACV terminal is cross-connected for vacant code treatment.

D.07 If option AS is provided and the B digit is not 0 or 1, the XNX relay operates and the XX0 relay should operate indicating that the C digit is 0. These two relays operated connect the A2-9 leads to the 2N0-9N0 relays. The first digit of the designation of the operated 2N0-9N0 relay corresponds to the A digit dialed. Ground on the B digit lead B- is connected through a contact of whichever 2N0-9N0 relay is operated to the associated code point C---.

D.08 If the XXN relay operates, indicating that the C digit is not 0, and XNX

operates, indicating that the B digit is not 0 or 1, the ground on the A- lead is applied to the ACV terminal for vacant code treatment. The C--- terminals corresponding to unused area codes should also be cross-connected for vacant code treatment.

D.09 Route Information For the Remote Office Test Line Trunk Make-Busy Circuit - Two leads are added and the OF- leads are rerouted from the traffic register circuit to the remote office test line trunk make-busy circuit in order to provide route information.

D.10 AMA Recording of 3-Digit Calls with No Outpulsing - A cross-connection terminal, ND0, is provided to permit indications to the outgoing sender that outpulsing is not required on certain 3-digit calls that require AMA records to be made.

D.11 Ringer Test Calls to 101 ESS Numbers - Option ZZC is added to route ringer test calls directed to 101 ESS numbers to RBT. On a ringer test call, RGTA relay operated, when the translation is received from the direct access pretranslator control, DAC and TLK relays operated, the RBT relay is operated to cause the marker to ground the BT lead to the originating register.

D.12 Miscellaneous Changes and Corrections - Miscellaneous changes are made to clarify circuit notes, make minor CAD changes, and correct minor drafting errors. Minor changes also are made to bring the schematic drawing into agreement with WE manufacturing information which is correct.

F. Changes in CD Sections

F.1 Change the first paragraph of 19.41447 to read:

19.41447 Indication for Sender not to Outpulse to Called Office

To indicate that the outgoing sender should not outpulse, the ND-1 relay will be operated in the marker. The DL cross-connection terminal of Fig. 51 associated with this call will be cross-connected to the ND-0 or ND-1 terminal of Fig. 33 to operate the ND-1 relay when the route R- relay is operated. The ND-0 terminal is used for 3-digit calls requiring AMA and provides an LST indication to the sender. Terminal ND-1 is used for all other calls.

F.2 In Appendix 21D remove KY Option from B.1 Added Relays and Added Networks.

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CHANGES

D. Description of Changes

D.1 The DST- terminals and STA- leads to the direct access pretranslator control are corrected to read 0-9 rather than 0-2. Three sets of STA0-9 leads are provided, one set per direct access pretranslator control. This change effects the FS drawing only, wiring is not involved.

D.2 Automatic Intercept in Offices With Message Register Lines - When a call is routed to automatic intercept, the ringing select switch is not set (CSW relay operated). If the calling line has a message register (TCNC route series) the class check relay (CLK) will not operate since ground can be returned on the TC lead only when the ringing switch is operated. To provide for the operation of the CLK relay on these calls, option ZZD is added. With this option, the free number relay FNA is operated by the automatic intercept relay AIC3. The FNA operated bypasses the TC check in the CLK operate path. Option ZZD is added to all offices with both automatic intercept and lines with message register operation.

D.3 Nuisance Call Records on Marker Second Trial - The marker is changed to allow a nuisance call record to be taken regardless of whether the call is being handled on a first trial or second trial basis. The operate path for the TRS relay through the NCRA relay make-contact is changed so that a ground is always available to operate the TRS on either first or second trial.

D.4 Unigauge Corrections - The LLTA relay is added to prevent a relay race which caused the LLT relay to buzz. The LLT relay would operate the CIC- relay in the line link, which in turn opened the operate path for the LLT relay. The LULB relay did not have sufficient time to operate and hold the CIC- relay operated, resulting in a buzzing action between the line link CIC- relay and the marker LLT relay. The LLT relay now operates the LLTA which locks operated and provides the ground to operate the line link CIC- relay. The DCTK resistor is added to prevent the DCTK relay from operating on the charging current of the DCT network. The DCTK resistor provides a charging circuit for the DCT network so that the network is charged to battery before the DCTK relay operate path is closed.

D.5 Note change to separate certain paired line link peg counts and the traffic data processor feature. Option AT is added as a supplement to option AK so that the traffic data processor feature can be added without providing the PTCO and PTOG traffic register leads. These leads are now under control of option AT.

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CHANGES

D. Description of Changes

D.1 Provision has been made for the removal of leads to the VGO-7 and HGO-7 relays in completing markers which are arranged for full access to more than ten AMA recorders.

D.2 The marker is changed to provide a new option to be coordinated to the ANI features. Previously, option MB, rated A&M Only, had to be provided in markers equipped for ANI. The new option AR, rated Standard, is a replacement for option MB with respect to ANI features.

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CROSSBAR SYSTEMS
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MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.1 Provision is made for testing the calls-waiting no-test functions.

D. Description of Changes

D.1 The marker is changed so that the cancellation of AMA operations on trunk tests can be applied only in LAMA offices and not on ANI test calls. The MT57 contact was removed from the CL3 lead to the outgoing sender. The MT57 relay opens the AMA lead to the sender on AMA calls only.

D.2 Option AQ is provided for completing markers to allow operation of the ORM and ORD relays from the master test frame. This arrangement permits test calls to be made to TOUCH-TONE® revertive call trunks. It also provides for peg count registrations on test calls for those peg count leads wired through ORD and ORM contacts.

D.3 The circuit notes are changed to provide option FT (RMF relay) when flat spring dial tone markers are being equipped for a second originating register group.

D.4 When automatic intercept is provided, the BNTH relay is locked operated to provide a BNTH signal to the AIS sender. The BNTH relay also recycles the work-timer. Since the BNTH relay is locked operated, the work-timer cannot be recycled for the rest of the call, thereby causing WT operation when any delays are encountered. To prevent this condition the recycle ground for the work-timer through the BNTH is opened by a contact on the AIC2 relay.

Calls-Waiting Corrections

Prevent False XAVGB Trouble Cards

D.5 A make-contact of the CWF relay is added to provide an operate path for the COX relay on calls-waiting marker failures. Relay COX will operate after the trouble record to allow the XAVGB relay to be released. Also, make-contacts of CWF provide new lock paths for the TRR and CWF relays to insure that TRR remains operated until COX has operated and locked.

Prevent Race Between CWS Releasing and RCY2 Operating

D.6 Contact 2 of CWR is removed from the CWS operate path to prevent CWS from releasing before RCY2 has operated. This contact is placed in the CWS lead to the calls-waiting link circuit to release the circuit when CWR operates. A CWC2 contact is added to the CWS operate path to take the place of the CWR contact which blocked the marker if a selected calls-waiting line circuit tested busy.

Prevent Grounding XCW Lead

D.7 Marker circuitry is changed to prevent grounding the XCW lead to the call-waiting link on completing marker usages when the marker requests a trouble record, TBL operated. This lead will still be grounded on dial tone marker troubles to instruct the call-waiting link to release the level zero connection.

Testing Facilities for Calls-Waiting No-Test

D.8 The NTCW and NTVB leads are added to the master test frame connector to provide test access to the marker for testing the calls-waiting no-test functions.

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.01 Features providing range extension with unigauge cabling is made available for the dial tone and completing markers.

A.02 An improved ground test detection circuit is made available for combined and completing marker operation.

A.03 The marker is arranged for expanded route transfer capability.

A.04 Circuitry is made available to allow cancellation of AMA operation on test calls.

A.05 A feature is provided to make the transition to paired line link frame operation easier.

A.06 Provision is made for adding a fifth dial tone marker in flat spring marker groups.

A.07 Provision is made for the maximum number of AMA recorders serving the marker to be increased from 10 to 20.

A.08 To provide cross-connect information for separate coin and noncoin trunk groups to TSPS No. 1.

A.09 To provide improved paired line link testing.

A.10 To provide the proper sequence for the TOPR peg count.

A.11 To improve provision of options and wiring associated with paired line link peg count leads.

B. Changes in Apparatus

B.1 Added

Relays

ADA, 1/2AK501, AC Option - Fig. 200
LLPX, 276A, BN Option - Fig. 8
ODA, 1/2AK501, AC Option - Fig. 200
RNA, AJ501 - Fig. 200
RTN, 1/2AK501 - Fig. 200
RTNA, AJ12 - Fig. 200
RUN, 1/2AK501 - Fig. 200
RUNA, AJ12 - Fig. 200

Component Assembly

PDL, AI Option, Fig. 180

Networks

ADA, 185A, AC Option - Fig. 200
LLPX, 185A, BN Option - Fig. 8
ODA, 185A, AC Option - Fig. 200
RNA, 185A - Fig. 200
RTN, 185A - Fig. 200
RTNA, 185A - Fig. 200
RUN, 185A - Fig. 200
RUNA, 185A - Fig. 200

Apparatus Figures

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B.2

Superseded	Superseded By
NH Relay U293, BR Option - Fig. 78	NH Relay U1375, BO Option - Fig. 78
OBS1 Relay U1360, BI Option - Fig. 103	OBS1 Relay U869, BJ Option - Fig. 103

C. Changes in Circuit Requirements Other Than Those Caused by Changes in Apparatus

C.1 Circuit requirement information for the XLH relay is changed to include:

(a) insulate contact 1 and 2B of relay TRSA.

D. Description of Changes

Range Extension for Unigauge Lines

General Operation

D.01 Arrangements are provided in the No. 5 crossbar office to allow the use of uniform 26-gauge wire lines, referred to as Unigauge lines, for all PBX customer loops, and one or two party loops, up to 30,000 feet in length and 2500-ohms resistance. In order to provide Unigauge, the long-loop lines must be provided with range extender amplifiers and a 105-volt ringing supply.

D.02 A range extender is an amplifier which is provided for each line link of a particular horizontal group on the LL frame. Long-loop customers, requiring range extension, must be assigned to verticals in this, or similar horizontal groups. The range extender is located at the point in a channel where the line link connects to the junctor, and is enabled by the completing marker if the associated line is a long-loop line.

Dial Tone Marker Operation (FS115)

D.03 If an originating line is in a horizontal group provided with range extenders, the line link frame grounds the LOL lead to operate the LOLF relay in the dial tone marker. When LOLF operates, either the LOLA relay or the NOLA relay must be operated to indicate whether the particular line group within the horizontal group requires range extension. If LOLA operates, indicating range extension, it operates the LOLP relay and grounds the LOLP lead to the originating register to indicate range extension. The register must hold the LOLP relay operated over the LOLP lead to satisfy the RK1,2 check as described in 7.2741.

D.04 The RK1,2 check may be satisfied by one of three means:

(a) LOLF, LOLP, LOLA, and NOLA all unoperated, indicating no range extenders associated with the horizontal group,

(b) LOLF and NOLA operated, and LOLA and LOLP unoperated, indicating range extenders associated with the horizontal group, but not with the particular line group, and

(c) LOLF, LOLA, and LOLP operated, and NOLA unoperated, indicating range extenders associated with the line group.

Completing Marker Operation (FS116)

D.05 The marker receives an indication from the LL frame to determine if a line is, or is not, a long-loop line. In addition, on calls to PBX lines, the NG operates the LLPX relay over the LLPX lead. Ringing select magnet RS4 is used for one and two party, and PBX lines that require range extension features. All other one and two party, and PBX lines, use RS6. The number group provides separate ringing combination numbers to distinguish one and two party long-loop lines from nonlong-loop lines. However, the number group provides only one ringing combination number for calls using PBX lines. On calls using PBX long-loop lines the LOLC marker relay is operated to transfer the selection of ringing select magnets from RS6 to RS4.

D.06 After the horizontal group on the line link frame is identified, the LOLF relay along with either the LOLA or NOLA relay is operated in the marker whenever the horizontal group is equipped with range extenders. The LOLA or NOLA relay indicates whether the customers line requires long-loop or nonlong-loop operation. The marker proceeds to set up the call until the marker tests have been completed. At this point the GT5 relay would normally be released and the linkage check would complete. However, for range extension, the range extender is cut in and checked before the linkage check is complete.

D.07 After the marker tests are completed, the GT2 and DCT relays are operated which allows the DCTK relay to operate. The DCTK relay operation is the beginning of Unigauge operations in the marker. The DCTK relay operates an auxiliary DCTA relay which switches in the LLT relay to test for ground on the selected channels line link junctor switch crosspoints. With the closure of the LL junctor switch crosspoints verified, LLT relay operated closes through the operate path for the LOLB marker relay and CIC- (range extender connectors) line link relays. Operating the CIC- relays releases the LLT marker relay and allows LOLE relay to operate. The LOLE relay verifies that the LOLB relays has operated, and closes through the 178-volt capacitor discharge circuit to operate the LOLK marker relay and a CI- (range extender cut-in) line link relay. The operated CI- relay returns a ground which releases the LOLK relay. The operation and release of the LOLK relay is checked with the LLKA and LLKB relays. With LLKB operated, the linkage check is complete and the marker then releases in the usual manner.

Improved Ground Test Detection

D.08 The marker is equipped with option BM to provide an improved holding circuit on ground test failures. This change improves circuit operation to insure proper marker disconnect sequence when a first trial ground test failure occurs.

Expanded Route Transfer Capability

D.09 The marker is arranged to provide up to 20 additional route transfer relays. These relays are made available to facilitate providing dynamic overload control features for large metropolitan areas. Apparatus Fig. 197 provides the additional relays. In addition, options BH and FA must be provided when peg counts are required for route transfer.

Cancellation of AMA Operations on Test Calls

D.10 A new marker test relay is provided by option BV. Its function is as follows:

(a) MT57 - Operates on marker test calls and certain trunk tests where the marker is required to cancel AMA. It opens the AMA lead to the sender on AMA calls and the CL3 lead to the sender on ANI calls.

Transition to Paired Line Link Frames

D.11 Option BY is added to provide a better arrangement for transition to paired line link frame operation.

D.12 The previous arrangement required that the markers be cross-connected for a 10 trunk link frame junctor pattern prior to implementation (or installation) of the paired line link feature. Due to the 10TLF pattern, only 10 channels were available between a line link frame and a trunk link frame until the markers were changed to paired operation. Consequently, the call carrying capacity of the office was limited during transition. This was necessary because the G1 relay of the trunk link connector was used for selection of mate frame junctors.

D.13 With both the old arrangement (option BX) and the new arrangement (option BY) relay JG1 is operated when the junctors of the mate line link frame are to be used. However, with option BY, battery is applied to the G0 lead to the trunk link connector instead of the G1 lead. Thus, the G1 lead may be used by markers which have not yet been converted in order to gain access to a second junctor subgroup. That is, junctor patterns other than 10TLF may be maintained during the transition.

D.14 Before converting the markers to paired operation, the line link connector circuits must be arranged to give a paired or non-paired indication over the LFK lead. (Anywhere from none to all of the frames may be paired at this time.) Then one marker at a time may be converted. When a marker is converted the SZD terminal should be cross-connected to SZ10.

Dial Tone Marker Expansion

D.15 Provision is made for adding a fifth or sixth dial tone marker in marker groups containing flat spring markers and/or connectors. When five markers are provided, three must be "full access" markers and two must be "limited access." When six markers are provided, two must be "full access" and four must be "limited access." Each limited access marker has access to approximately half of the line link and trunk link frames. Half of the limited access markers have access to the higher numbered frames and the other half has access to the lower numbered frames.

D.16 The limited access markers serving the higher numbered frames must be of the same type (wire spring or flat spring) as those serving the lower numbered frames.

Incoming Screening by Translation Marks

D.17 An LS5 cross-connection is provided to be used for screening by translation marks on incoming calls.

AMA Expansion

D.18 This feature provided under App Fig. 200, allows the maximum number of AMA recorders to be increased from 10 to 20 with full access - any trunk assigned to any recorder. It may be provided only in offices arranged for size 10 junctor operation (pattern relays), and may not be used in combined markers.

D.19 Marker recorder number capacity is increased by the addition of ten extra recorder leads (RN10-19) from the trunk link frame, making a total of 20. When the TLC2 relay is operated, a ground on one of these leads operates either the RUN (units) or the RTN (tens) digit relay, which locks operated. This relay also operates a corresponding RUNA or RTNA slave relay which cuts the appropriate set of leads through to the ONN-9FP/9NP relays. From there the recorder number information is checked and transmitted to the sender as before for ten recorders.

D.20 When both the RNA and AMA6 relays are operated, either the AID or OID sender relay operates along with the corresponding AD or OD marker relay if a CAMA office, or the corresponding ADA or ODA relay if not a CAMA office. A one-up check is provided to ensure that only one of the sender relays operate and remains operated.

Test Control for PBX Block Selection

D.21 Option AB is added to provide selection of a particular tens block in a block select hunting group from the master test frame. Option BZ must also be provided when the PBX allotter feature is provided.

Separate Trunk Groups to TSPS No. 1

D.22 A note change is made to show cross-connect information for separate coin and noncoin trunk groups to TSPS No. 1. Note 400 part 59 was changed to show information for either a coin or a noncoin trunk group which may handle combinations of 0+, 0-, and 1+ traffic. This is in addition to the existing information for a super combined trunk group which may handle both coin and noncoin combinations of 0+, 0-, and 1+ traffic.

D.23 The above mentioned trunk groups are considered to be the standard arrangement for routing calls to TSPS No. 1. Note 400 part 59 also shows an A&M arrangement for TSPS No. 1 routes which is compatible with the previous types of trunk groups used to route calls to a crossbar tandem TSP or a CAMA center or both.

D.24 Note 105 part 101 is added to coordinate the coin zone feature to the TSPS No. 1 standard arrangement. This provides a means of operating both the ANIS and the NCCN route series relays.

Improved Paired Line Link Testing

D.25 A new method of simulating a "mate frame early busy" condition is added to provide positive control from the master test control circuit (MTC). The MTC will be able to directly control the marker MFK relay, instead of controlling it indirectly via the line link frame. This will prevent a possible race condition which allowed the marker STPA relay to operate on a test call designed to verify marker actions when mate frame operation is attempted and the mate frame is busy.

D.26 Option AM (rated Standard) provides this improvement. Option AL (rated Mfr Disc.) is assigned the previous wiring.

Paired Line Link Peg Counts

D.27 The marker notes are changed so that the options assigned to the various paired line link peg counts are always provided when the paired line link feature is provided. This will insure that the marker wiring for the paired pegs is always provided in an office regardless of whether the office is partially paired or completely paired.

Proper Sequence for TOPR Peg Count

D.28 The TOPR peg count is delayed by the operate time of the PDL relay to insure that both the TOPR and TOR peg counts are registered by the traffic data processor. The PDL relay is one of the spare reed relays provided with the traffic data processor feature. Option AI provides the PDL relay in the TOPR lead when both the paired line link and traffic data processor features are provided and option AH provides the previous wiring.

Miscellaneous Changes and Corrections

D.29 Miscellaneous changes are made to clarify notes, correct minor drafting errors, and circuit requirements tables. Minor changes also are made to bring the schematic drawing into agreement with WECo Manufacturing information which is correct.

D.30 A new appearance of the BWD and GWD X-conn terminals is made available on the T&RR frame.

F. Changes in CD Sections

F.01 Add the following designations to the existing list in 5. FUNCTIONAL DESIGNATIONS AND LOCATIONS OF APPARATUS

DESIGNATION	FUNCTIONAL MEANING
LOLA	LONG LOOP LINE GROUP
NOLA	NONLONG LOOP LINE GROUP WITHIN A HORIZONTAL GROUP EQUIPPED WITH RANGE EXTENDERS
DCTK	DCT RELAY CHECK
DCTA	DCTK AUXILIARY

DESIGNATION	FUNCTIONAL MEANING
LOLK	LONG LOOP RANGE EXTENDER OPERATED CHECK
NTL	NO-TEST ON LONG LOOP PBX LINES IN HUNTING GROUP
LOLD	OUTGOING TRUNK ROUTES REQUIRING LONG LOOP SIGNAL BUT NOT USING RANGE EXTENDER AMPLIFIER
LLPX	LONG LOOP PBX LINES
LOLP	LONG LOOP INDICATION TO ORIGINATING REGISTER OR TRUNK
LOLF	LONG LOOP RANGE EXTENDER IN SELECTED LINE LINK HORIZONTAL GROUP
LLKA	LONG LOOP RANGE EXTENDER OPERATED CHECK
LLKB	LONG LOOP RANGE EXTENDER LOCKED UP CHECK
SPL4	SPECIAL MARKER RELAY FOR UNIGAUGE USE
LOLB	LONG LOOP CUT-IN RELAYS OPERATED
LOLC	LONG LOOP HIGH VOLTAGE RINGING SELECT ON PBX LONG LOOP LINES
LLT	LONG LOOP RANGE EXTENDER CUT-IN TEST
LOLE	LONG LOOP RANGE EXTENDER CUT-IN RELAY OPERATED (CUTS IN AMPLIFIER)

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

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CHANGES

B. Changes in Apparatus

B.1 Added

Relays

CWNT, AJ15, Option BQ - Fig. 195
NT6, AJ15, Option BQ - Fig. 195
SPL3, AJ12, Option BQ - Fig. 195
CWK1/NTB, AK6, Option BQ - Fig. 195
CWL1/NCW1, AK6, Option BQ - Fig. 195

Networks

CWNT, 185A, Option BQ - Fig. 195
CWL1, 185A, Option BQ - Fig. 195
CWK1, 185A, Option BQ - Fig. 195
SPL3, 185A, Option BQ - Fig. 195

D. Description of Changes

Automatic Intercept Service - Failure of Intraoffice Calls to Trouble Intercept

D.1 The PUL relay in the marker is held operated by the locking ground from the TBI relay in the AIS sender, which prevents operation of the CB relay causing a marker time-out. To prevent this condition contact 7, 8B FLGA relay is added to the TBI lead to the AIS sender connector.

Automatic Intercept Service - Failure of AIS Calls When the PBX Allotter and Option BM are Provided

D.2 The AAN and BAN leads to the AIS sender connector are connected together through OAN- and BAN- relays in the PBX allotter circuit when option BM is provided. This causes the operation of the AAN and BAN relays in the sender when either the AAN or BAN lead is grounded. To prevent this condition an AIC1 contact is added to the OAN1 lead to the PBX allotter circuit by option BU which should be provided when the PBX allotter, option BM and automatic intercept service is provided.

Automatic Intercept Service - Trunk Guard Test

D.3 Contact 3, 4B (LTR) relay is replaced by contact 1, 3B (HTR) relay to ground the LTR lead to the AIS sender on light traffic terminating calls only so that the trunk guard test is made only on light traffic. This change is made to make this marker agree with the wire spring marker.

No Test Operation for Calls-Waiting Feature

D.4 The marker is arranged to provide improved no-test operation with the calls-waiting feature.

Minor CAD Change for Immediate Ring Feature

D.5 Minor CAD errors on the marker controlled immediate ring features have been corrected.

D.6 Miscellaneous minor CAD changes are made to bring the SD into agreement with WECo drawings which are correct.

F. Changes in CD Sections

F.1 Add the following to D.02 Calls-Waiting of Appendix 36D.

(d) Special and No-Test Operation - On special calls to call-waiting customers the call-waiting feature is disabled in the marker. If the call encounters line busy, it is routed to busy tone without attempting call-waiting operation. If the regular appearance of the line appears idle, the marker requests that the CWLC determine if the line is connected to a call-waiting circuit by grounding the CWHO lead to the CWLC. The CWLC will return ground on the CWK lead if the customers line is truly idle and the marker will complete the call to the regular appearance. If the customer is connected to a call-waiting circuit, the CWLC returns ground on the NCW lead, causing the marker to route the call to busy tone. For no-test calls, there are four different actions that may be taken by the marker.

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(1) Connect the call to the regular appearance if the customer is truly idle.

(2) Connect the call to the line link no-test vertical if only the regular appearance is busy.

(3) Connect the call to the CWLC no-test vertical if the customer is connected to a call-waiting circuit.

(4) Route the call to overflow if a line link no-test connection is required but the no-test vertical is busy or if a CWLC no-test connection is required and either no-test vertical is busy.

For the first action, the marker informs the CWLC that it is handling a no-test call by grounding the CWH1 lead. If the customer is not connected to a call-waiting circuit, the CWLC returns an NCW indication. The NCW along with a line idle indication allows normal completion to the regular appearance. The NCW with a line-busy indication will cause the second action. The marker will set a no-test connection to the line link no-test vertical. For the third action, the CWLC informs the marker that the customer is connected to a call-waiting circuit by returning a CWK indication instead of NCW. The CWK will cause the marker CWNT relay to operate, indicating that the call is to be completed to the CWLC no-test vertical. The CWNT in operating starts the release of relay NTH and grounds the CWH2 lead to the CWLC to indicate to the CWLC that a no-test connection is required. The CWLC performed the necessary steps to associate the particular call-waiting circuit with the called customer before it returned a CWK indication. Therefore, it is ready to operate the proper select magnet on the call-waiting link when the marker grounds the CWH2 lead. The hold magnet for the CWLC no-test vertical is operated in parallel with the line link no-test hold as soon as the slow-release NTH relay releases. No crosspoints will be closed on the line link no-test vertical since the marker did not operate a line link select magnet. If the call requires a no-test connection at the CWLC and either no-test vertical is busy, the call is routed to overflow. The marker NTB relay will be operated by the CWLC over the CWH4 lead if the CWLC no-test vertical is busy or the JB relay will operate from a ground on the line link no-test hold if it is busy. Either relay will operate the OV relay to route the call to overflow.

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.1 Provision is made for the TSPS arrangement for international direct distance dialing. This arrangement includes 12-digit capability.

A.2 The marker is arranged for the call-waiting feature.

A.3 Improved channel testing features are made available in the markers.

A.4 Additional traffic registers are provided to record selected types of incoming calls.

A.5 The marker is changed to provide the trunk number indication using the F- to RFTN number group cross-connection.

B. Changes in Apparatus

B.1 Added

Fig. 194, 195, 196

Relays

MT24, U982, Option CM, Fig. 28
TRC, 276A, Option BF, Fig. 76
PBXC, U722, Option BA, Fig. H
PRLLA, AJ12, Option BB, Fig. 173

Network

TRC, 185A, Option BF, Fig. 76

Lamps

SMA, 13J, Option CW, Fig. 91
LBS2, 13J, Option CS, Fig. 91

B.2

Superseded	Superseded By
VFTO-4 Relays, U1404, Option CG, Fig. 5	VFTO-4 Relays, U1405, Option CH, Fig. 5

D. Description of Changes

D.01 IDDD - The TSPS arrangement for international direct distance dialing, IDDD, is provided in the marker. Included in this arrangement is the capability for handling 12-digit numbers since some international numbers will contain 12 digits.

(a) Register Indications to the Marker - The originating register indicates an IDDD station-to-station call by grounding the FAC and 11 leads to the marker which causes the IDS relay to operate in the marker. The IDDD person-to-person calls are indicated by grounding the FAC and FVD leads which causes the IDP relay to operate in the marker.

(b) Translation - Operation of the IDS or IDP relay transfers the ground from the A digit translator (FS 16) to the IDS or IDP cross-connection terminals. The IDS and IDP terminals are cross-connected to RC- terminals to select the route relay.

(c) Sender Information - The IDDD and domestic calls may be served over a common trunk group to TSPS. The marker grounds the CL1 and CL8 leads to the sender to indicate an IDDD call. The sender then passes the IDDD indication to the TSPS. If a route relay is used for both domestic and IDDD traffic, a cross-connection must be made from the associated CR- terminal to an ID- terminal. The IDS and IDP tranfer contacts cause the ID- terminals to be connected to the CR-S terminals for domestic calls and to be connected to the CR-P terminals for IDDD calls. Thus, the CRP relay operates on IDDD calls. The CRP grounds the CL1 lead and the CL8 lead is grounded due to a CL- to CL8P or CL7S cross-connection, thus providing the CL1 and CL8 indications required for IDDD.

D.02 Calls-Waiting - The calls-waiting feature provides a means of completing a call to a customer even though the line is already busy. The marker will complete the call to a calls-waiting circuit which then signals the customer with a "beep" tone to indicate that a second call is waiting. The customer may then flash the switchhook to put the first caller on hold and converse with the second caller. Another switchhook flash will return the customer to the first caller.

(a) Dialing Protection - When the calls-waiting customer goes off-hook to

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initiate a call, the calls-waiting link circuit CWLC and the dial tone or combined marker set the customer to level 0 on the calls-waiting link. This provides dialing protection in that no incoming calls will be allowed to complete to the customer until after dialing has been completed. Upon completion of dialing, the level 0 connection is released when the originating register releases and the customer may now receive an incoming call via a calls-waiting circuit.

(b) Dial Tone Marker Functions - When a line link frame contains lines entitled to calls-waiting service, the VG- relay in the CWLC is in parallel with the line link VG- relay. This causes the marker XVGB relay to operate and, with the CWL relay operated from the line link connector, indicates to the marker that the call is originating from a line link frame containing calls-waiting customers. If either CWL or XVGB operate alone, a trouble record with a regular release is given at the end of the call. The CWL relay closes ground through the XCW primary winding over one of the VF- leads to the CWLC to request that the customer be set to level 0 for dialing protection. If the line in question does not have calls-waiting service, the NCW relay is operated and the marker sets a regular dialing connection. For call-waiting lines, the marker must receive a CWK from the CWLC before completing the connection. If a continuity test failure is encountered with the CWK relay operated, relay RLH operates. The RLH relay operates relay CWF to indicate the failure and signal the CWLC over the XCW lead to release the dialing protection. Relay RLK operates as a check that the dialing protection was released and in turn operates the GT1 relay to allow completion of the call. Relay CWF remains operated and causes a trouble record with regular release at the end of the call.

(c) Completing Marker Functions - As in the dial tone marker, the XVGB relay is used to detect a line link frame equipped with call-waiting service and relay CWL is operated over the CWL lead from the line link connector to indicate that the call-waiting link circuit is attached through the connector. If the called line is found busy, the operation of relay LBTA will operate relay CWS. The CWS closes battery to the CWS lead and ground to one of the VF- leads to the line link connector to operate a CWS and LP- relay in the CWLC. If the line does not have call-waiting service, or the line has call-waiting service and is already connected to a call-waiting circuit, or there are no call-waiting circuits available, the CWLC will return ground on lead NCW to operate relay NCW. The NCW closes ground to relay LB to set the call to line-busy. If the called line has call-waiting service and is to be connected to a calls-waiting circuit, the CWLC will select a call-waiting circuit, attach the called line to the call-waiting circuit and pass the line number of the call-waiting circuit to the marker over the CWN-, CWH-, CWT-, and CWU- leads to operate correspondingly designated relays in the marker. Operation of relay CWN- operates CWC1 which in turn operates CWC2. The CWC1 and CWC2 cause release of the operated N- relay to release the HN-, T-, and U- relays associated with the called number, and close the outputs of the CWH-, CWT-, and CWU- relays to the HN-, T-, and U- relays to indicate the line number of the selected call-waiting circuit. When the call-waiting link has finished connecting the call-waiting circuit to the called line and checked the connection, ground is received on the CWK lead to operate relays CWK and CWR. Operation of relay CWR operates relay RCY2 to recycle the marker for connection to the call-waiting circuit associated with the called line. The recycle causes the release of the line link connector and reseizure of a number group connector to determine the line location of the selected call-waiting circuit. The marker then completes the call to the call-waiting circuit as it would for a regular line.

D.03 The marker is equipped for an improved method of channel testing using the master test control circuit. This new arrangement will allow the repair employee to seize both ends of a plugged busy channel on test calls.

(a) Options CM and CN provide the changes required for this feature.

D.04 Several new traffic registers are added to provide records of selected incoming traffic. These registers include:

(a) IB and IBP incoming attempts to busy lines,

(b) IH and IHP incoming attempts to hunting lines, and

(c) IFFM and IFFMP incoming first failure to match.

Options BA, BB, and BC (rated Standard) provide these new registers.

D.05 A previous dial tone only traffic register is reinstated to provide counts of dial tone second failures to match.

(a) Option BD (rated Standard) provides the FMP peg count.

D.06 Option BF is added to provide for marker operation with the F- to RFTN- cross-connection in the number group for the trunk number indication, TNK.

(a) The TRC relay will be operated instead of an RCN- relay on calls dealing with trunk numbers. The TRC will then operate the TNK relay to provide the proper trunk number operation.

D.07 The marker is changed to provide additional protection against false grounds on the AST and BST leads to the trunk link connector. If the XSL relay fails to operate; the SL relay will now operate prematurely to a false ground and stop the markers progress.

(a) Option CF (rated Standard) provides this feature.

D.08 The marker is changed to provide a means of stopping the progress of a call before releasing the dialing linkage when a party identification failure, TR-RP, occurs. Either the TP or RP relay must remain nonoperated to provide ground for the code point. This will prevent the previous action of causing the customer to revert to dial tone on these failures.

(a) Option CV (rated Standard) provides an 'only one up' check on the TP and RP relays, while option CU (rated Mfr Disc.) is assigned to the previous wiring.

D.09 The operate path for the RO plant register is changed to prevent plant register operations on test calls.

(a) Option CL (Standard) provides the new wiring and option CA MD represents the old arrangement.

D.10 Option CZ is added to provide a break-contact of the MT13 relay in the originating traffic peg count leads. This contact prevents the counting of originating traffic due to test calls. The peg count leads affected are TOR, TMOR, and TOPR.

D.11 Option CY is provided to assure work timer recycle on terminating and intraoffice calls to numbers set up for calling line identification. Option CY allows the HUTK relay to operate earlier (through an NCRA contact), thereby recycling the timer. The CY option also prevents locking the TRB and TRB1 relays operated after a calling line identification record. This allows another record to be taken if a trouble condition occurs.

D.12 The marker is modified to increase the maximum number of outgoing sender link select magnets that can operate to eight. Option CW provides this feature by adding the SMA resistance lamp in parallel with the existing SMB lamp in the operate path of the outsender link select magnets. The addition of the SMA lamp provides the extra current necessary to operate eight select magnets.

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CROSSBAR SYSTEMS
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MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.1 Superseded	Superseded By
JSA Resistor, 18BM, Fig. 191	JSA Resistor, 18BU, Fig. 191

D. Description of Changes

D.1 The marker is changed to allow automatic intercept service to be added to marker groups with option BM (rated Mfr Disc.). Prior to this change option BN (rated Standard) had to be added to marker groups adding AIS.

D.2 Contact 4M(AIC2) relay is moved from 12(FAC1) to 5T(TFK3) to prevent lockup of the AIC- relays on failure of the sender advance check which prevents releasing the sender connector when the marker restores to normal.

D.3 Contact 8,9T(FLGA) is added to the lock path of the PN, TN, EN, PTN, relays and contact 6,7T(FLGA) is added to the operate path of the CSW relay to release these relays after completion of the forward linkage. This will close through the operate path of the CB and CB1 relays on intraoffice calls routed to the automatic intercept center.

D.4 The 2B(AIC2) in the operate path of the DCT1 relay is replaced with 9B(AIC3) relay and contact 4,5T(FLGA) relay is added to the operate path of the AIC relays to check for the operation of the AIC2 relay.

D.5 Contact 3M(AIC) relay is moved from 1T(FLG) to 2T(FLG) to prevent marker blockage on intraoffice calls routed to the automatic intercept.

D.6 A make-contact of the RCY5 relay is added to the AIC2 relay operate path. This will insure that the number group information for the called number has released before proceeding with the automatic intercept functions.

D.7 The bias current of the XJS1 relay is changed to prevent false operation of the XJS1 while operating the steering level magnets of the twelve level junctor switch. The JSA resistor was changed from 100 Ω to 300 Ω to provide the proper bias current.

D.8 Contact 4(AIC2) is moved from 11T(RCY5) to 10T(RCY5) to lock in the AIS sender connector when the marker advances to call back linkage on IAO calls routed to the automatic intercept.

D.9 Contact 12(CSW) is moved from 2(FNB) to 7(TBIB) to insure the release of the RSK on calls routed to the automatic intercept center.

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.1 Automatic intercept features are provided in the marker.

A.2 The marker is arranged to permit cancellation of the "E" digit intercept feature.

A.3 Provision is made in the marker to allow the use of interchangeable numbering plan area codes and office codes.

A.4 A feature is made available to determine code pattern information with marks from the originating register on 7- and 10-digit calls.

A.5 The marker is equipped to permit charging on all local completing CAMA calls including calls to free numbers.

A.6 Improved peg count control circuitry is provided for offices with both paired and nonpaired line link frames.

A.7 Cabling changes are made to reduce the switchboard cable buildup on the common equipment frame and to provide a multiple appearance of the BG- terminals on the supplementary class of service frame.

B. Changes in Apparatus

B.1 Added

Relays

DESIG	OPT	CODE	FIG.
AIC	-	AJ12	192
AIC1	-	AJ12	192
AIC2	-	AJ501	192
AIC3	-	AJ12	192
AICK	-	AJ12	192
INCT	DS	AJ508	193
INCT	DT	AJ503	193
INL	-	AJ503	193
NAIC	-	AJ12	192
ORA	DV	U1396	165
TT	-	AJ503	193

Networks

DESIG	OPT	CODE	FIG.
AIC	-	185A	192
AIC2	-	185A	192
AICK	-	185A	192
INCT	DT	185A	193
INL	-	185A	193
NAIC	-	185A	192
TT	-	185A	193

Diodes

DESIG	OPT	CODE	FIG.
LT	-	426G	193
TT	-	426G	193

B.2

Superseded	Superseded By
MT12, U1113, Opt DR, Fig. 79	MT12, U1182, Opt DZ, Fig. 79

D. Description of Changes

D.01 Automatic Intercept Features

D.0101 General Operation

When the marker determines an intercept condition, it recycles and bids for an AIS sender through the AIS sender connector. When an AIS sender is obtained and connected to the marker, the marker primes the sender with information to transmit to the AIS center. The sender then selects an idle line circuit and provides the line link

location of the selected circuit to the marker. The marker connects the intercept call to the selected line circuit and disconnects. The sender then outpulses to the AIS center where the calling line will be connected to an announcement machine.

D.0102 Type of Intercept, FS78

The type of intercept is controlled by certain cross-connections left out of the number group and by cross-connections made in the marker. The table below indicates the intercept conditions that are controlled by the number group cross-connections.

Number Group Cross-Connections Made	Intercept Cross-Connection Enabled
G	GI
G,F	TI
None	NI

When the cross-connections are omitted in the number group the TYM timer will operate and in turn will operate the TBI relay. In addition to the above conditions that are controlled by the number group, there are three intercept conditions which are generated in the marker as follows:

Terminal Grounded	Condition
TNI	Trunk Number
BTI	Blank Number
NMI	Class of Service Mismatch

Typical cross-connections made in the marker for AIS treatment are as follows:

CROSS-CONNECT

FROM	TO
NI, TI	RI
TNI, BTI, NMI	BN
GI	VCI or DCI

Three intercept conditions RI, BN, and TBI are generated (FS78, FS111) that may route calls to one of two cross-connections, AIS--route to automatic intercept center or NAI--not automatic intercept center processing. The NAI intercept call is processed locally. In addition to the three intercept conditions listed above, VCI or DCI may be used to route certain intercept calls to local processing.

D.0103 Marker Recycle for AIS Conditions SC119, SC137

When one of the intercept conditions is generated in the marker, the cross-connections shown on FS111 determine whether the intercepted call will route to the intercept center (AIS) or be processed locally (NAI). If the call is routed to AIS, then relays AIC and AIC1 will be operated which start the marker AIS recycle action. An AIC relay contact operates RCY2 which results in releasing the number group (RNG relay operates) and any line memory information (LLI relay releases) that may have been obtained from the number group. Operation of SPT relay blocks the operation of PBX- and CKO relays thus preventing PBX hunt operation. Operation of AIC1 relay prevents the selection of an NSS- relay, thus preventing another bid to a number group.

D.0104 Marker Bid for AIS Sender, SC137

When the marker checks that the number group and line memory has been released relays RCY4 and RCY5 operate. This action releases relay RNG and operates relays SNG-, to bid for an AIS sender through the AIS sender connector. The connector is arranged to permit only one marker in a marker group to have use of the connector. The connector serves a maximum of three AIS senders. The start lead (AICS) extends battery through an RCY5 relay contact to the preference circuit for marker preference. When preference has been obtained by the marker, MCA and MCB connector relays operate which operates the NGK relay. Start battery for the sender half of the connector is extended over lead BS41 after the NGK relay has been operated.

Traffic considerations arising as a result of using only two or three senders indicate that the marker holding time awaiting an idle sender may exceed the short delay time (SDT) of the marker. Because of this, the SDT timer is stopped by operation of RON relay if no sender is available to the marker when it obtains preference in the sender connector. If no sender is available for a period of 1.25 to 1.5 seconds, the sender-connector ASB timer will operate which will operate relay PMO in the marker. Operation of PMO will result in setting the intercept call to an overflow or reorder tone.

If a sender becomes idle before the timer operates, then the sender half of the AIS sender connector is operated which releases the ASB timer and causes NGK1 relay operation. Operation of relay NGK1 causes relays AIC2 and AIC3 to operate. Contacts

on relay AIC2 provides a circuit to hold part of the sender connector operated after relay RNG operates. This sequence will be described below. The SF and SFT relays are also released which release the SDT and LDT timers and start the work timer, WT.

D.0105 Line Circuit Identification by AIS Sender, SC137

The AIS senders perform three major functions:

(a) select an idle line circuit,

(b) provide the equipment location of the selected line circuit to the marker, and

(c) complete the sender functions.

When an idle AIS sender has been selected, the marker transmits the following information to the sender: The class of intercept, BN, RI, or TBI; 4-digit line-numerical, and information that can be used to reconstruct the office code (AAN, AEN, APN, ATN, BAN, BEN, BPN, BTN, BNTH, EN, PN, PTN, TN) is connected through the AIS sender connector to operate corresponding relays in the selected sender. When a check has been completed on the information sent to the sender, relay UK is operated in the marker and the sender bids for an idle AIS line circuit. If no idle AIS line circuits are available, the AIS sender connector will operate the PMO relay in the marker causing the marker to set the intercept call to overflow or reorder, after which the marker will disconnect.

If an idle line circuit is obtained, the AIS sender will provide the equipment location of the selected line circuit to the marker. When the marker has received this information, the marker RNG relay will operate which permits a partial release from the AIS sender connector. The operation of RNG relay releases SNG- relays. This action opens the leads supplying battery to the connector relays MCB, MCC, and MCD. Relay MCA and all of the sender half of the AIS sender connector relays are maintained operated via the NBS4 and NGS leads under control of AIC2 relay contacts.

As soon as the line equipment location has been received and checked by the marker, selection of the line link frame and a channel is made for the forward linkage (FLG) of the call. A ringing code is also returned to the marker to operate relay RCL even through the CSW relay is operated on all AIS calls.

D.0106 AIS Sender Advance, SC137

When the marker has completed its channel tests and selection and has operated the hold magnets, the DCT relay operates and signals the completion of the forward linkage. With an AIS call, the DCT relay grounds an AIS sender advance lead (AIV). If the call is a TER call, the AIV lead ground is provided through AIC2 and TER5 make-contacts. If the intercept call is an ITR call the DCT relay grounds the lead, after the call back linkage has been set, through the make-contact of relay AIC2 and the break-contacts of TER5 and FLGA.

If the AIS sender has satisfied its line circuit (LR) check, then the ground from the marker AIV lead will cause the AIS sender to supply a KP start via the line circuit to the distant AIS center.

D.0107 Advance Check and Disconnect, SC137

When the AIS sender receives a ground on the sender advance lead (AIV) from the marker, the sender will return a ground on the advance check lead (AICK) to the marker providing the conditions in either (a) or (b) are met:

(a) if the marker is operating on heavy traffic (HTR) or is serving an intra-office (ITR) call, a ground is returned immediately after the advance (AV) relay operates in the sender or,

(b) if the marker is operating on light traffice (LTR) and is serving a terminating (TER) call, then the sender will return a ground on the AICK lead if:

(1) the sender AV operates;

(2) the TCT timer operates; and

(3) either the TG1 or the OF1 relay operates in the AIS sender.

If either of the conditions under (a) or (b) is met and a ground is provided on the AICK lead, the marker AICK relay will operate and cause release from the AIS sender connector by releasing relays AIC2 and 3. Relay AICK operation extends the DCT ground to operate DCT1 relay for a TER call or DCT2 relay for an ITR call. Operation of one of these relays permits the marker to disconnect from the call.

If the conditions listed under (a) or (b) are not met, the WT timer will operate and cause a time-out disconnect. Under this

condition, the marker will ground a reorder (RO) lead to the AIS sender to release it from the line circuit. In addition, a trouble record will be made and the intercept call will be routed to overflow or reorder tone.

D.0108 Marker Test of AIS Feature, FS78

The marker may be tested for operation of the AIS feature by one of two general methods:

(a) by forcing regular intercept (RI) AIS condition from the master test control (MTC), or

(b) by selecting assigned directory numbers from the MTC that will cause an AIS intercept of any of the intercept classes - BN, RI, TBI.

When the AIS intercept has been generated, the call will progress as described above, however, a specific sender or line circuit may be selected. The method to do this is discussed below.

The method of forcing the RI intercept condition permits using any combination of numbers for the line numericals. This permits the AIS sender operation to be checked for correct outpulsing using any combination of digits. Included in these combinations are the AIS center test codes of which the last three numericals are "10X".

D.0109 AIS Sender and Line Circuit Selection (Testing) FS105

The marker and other circuits associated with the AIS service are arranged to perform certain tests. Whenever an AIS test is performed that uses the marker, a ground is passed to the MTC from the marker through the AIS sender connector. The ground is used in the selection of an AIS sender or line circuit. Alternatively, a specific sender or line circuit may be selected.

When a specific circuit is selected, the selection circuit will override a maintenance-busy condition in order to select the circuit for test. The selection circuit will not override a service-busy condition.

D.0110 Sender Tests Requiring No Digit (ND) Operation FS63

The marker operation with the AIS sender is more similar to number group operation than it is to sender operation. The exception to this is the sender advance and check operation. As a result of the unique arrangement, the ND indication to the marker is blocked when making an AIS test since the marker has no indication that a sender is involved in the intercept call. The circuitry is provided an ND indication directly to the AIS sender and prevent marker interaction is provided.

D.0111 Line Circuit Test Operation Using Dedicated AIS Senders FS63

The line circuit selection with AIS is accomplished by the AIS sender rather than the marker. Therefore, on AIS line circuit test calls the line test indication to the marker is blocked and is passed directly to the AIS sender for line circuit control.

D.0112 Automatic Monitor Sender-Register Test Circuit (AMRST) Operation With AIS Line Circuits FS105

The AMRST is used in conjunction with the MTC to select and test AIS sender and line circuits. The MT relay in the AMRST is connected to the MON lead in the MTFC. When the connection is established to the marker, the MON relay in the marker is operated. Operation of the marker MON relay prepares the marker for operation with the monitor by connecting control leads between the monitor and marker.

When the marker selects the outgoing sender through the sender connector, the M relay of the sender operates from ground supplied from the marker and connected through the AIS sender connector. The sender M relay serves as a cut-in relay for leads from the sender to the monitor.

D.0113 Apparatus Fig. 192 and option DL provide the automatic intercept feature.

D.02 Cancellation of "E" Digit Intercept Feature

The feature to intercept 10-digit calls that contain a digit "0" or "1" in the "E" position has been rearranged on a cross-connection basis. The marker can now be cross-connected to intercept 10-digit calls containing a "0" in the "E" digit position and/or calls containing a "1" in the "E" digit position, or neither if both cross-connections are omitted. This new arrangement is required to allow DDD calls to Mexico and also is required for interchangeable area codes and office codes.

D.021 Option DO provides the new cross-connectable arrangement.

D.03 Interchangeable Area Codes and Office Codes

The interchangeable codes feature equips the marker to translate and route 7- and 10-digit codes that have an office code which is identical with an area code. The marker is able to separate these 7- and 10-digit codes by using a screening field that is controlled with 7- and 10-digit indications from the register circuits. The originating register provides an OR mark for 7-digit codes and a FAC mark for 10-digit codes. The incoming registers provides an LT mark for 7-digit codes and a TT mark for 10-digit codes. With these marks the marker can screen, using S relays, on a 7 or 10 digit, originating or incoming basis.

The LT lead to the marker is common to both originating and incoming registers. To allow the LT mark to be used for indicating 7-digit codes on incoming calls, provision is made to operate the INCT relay via the TCA or TCB lead on all incoming calls. Using the INCT relay with an LT mark, the INL relay is operated to indicate 7-digit incoming calls. The INL, TT, ORA, and FACA relays are then used to control S screening relays to separate the 7- and 10-digit interchangeable codes.

The local translator (TC7) in the U&Y marker is equipped with hard wire screening to translate a "0" or "1" in the "A" digit position of a dialed code. The hard-wire-type screening was provided to allow the more flexible screening fields to be used for other features. This screening field is still provided with the use of interchangeable codes but with some additional flexibility. The screening fields for a "0" and a "1" digit are broken apart and individual cross-connection terminals are made available for the different types of calls. The new arrangement will allow toll operator codes to be translated with a TAN or TAN1 mark as well as a TOLL mark from the incoming register.

As the interchangeable codes come into use, it is possible that calls incoming from step-by-step offices using BX codes may have a "0" or "1" to be registered in the "A" digit position of the dialed code. Therefore, the outputs of the BX code translator (TC6) is arranged to provide individual cross-connection terminals so that any "A" digit can be translated or sent to reorder as required. There are only eight 2DT-relays provided to translate the second digit (0-9) of a BX code, but since they are cross-connectable, eight relays should be adequate for the present time. Typical cross-connection Notes 401 and 432 illustrate the new arrangements using interchangeable codes.

D.031 Apparatus Fig. 193 with option DS or option DT provides the interchangeable codes feature.

D.04 Automatic Code Pattern Generation

The marker is equipped to permit the OR and FAC marks from the originating register to indicate code pattern information on 7- and 10-digit AMA calls. This feature allows the CP- cross-connections to be omitted on 7- and 10-digit outgoing and intraoffice routes when customer class-of-service traffic sampling is not provided.

D.041 This feature is provided by option DV.

D.05 The marker is changed to provide a toll charge (TCH) indication on all local completing CAMA calls. This will permit charging on CAMA calls completing locally to free numbers.

D.051 Option DX (rated Standard) provides an operate path for the TCH relay on CAMA calls and option DW (rated Standard) provides the original operate path for the LCH relay on CAMA calls.

D.06 The marker is changed to insure registration of the TIPR traffic register and to prevent false FM and IFM peg counts in offices with both paired and nonpaired line link frames.

D.061 Option DY (rated Standard) provides this improvement by supplying a lock path for the PRL relay.

D.07 Multiple BG- Terminal Appearance

The BG00-35 cross-connection multiple is extended from class-of-service frames (0) and (1) to include the supplementary class-of-service frame. This change will allow cross-connections to be made between terminals SC300-359 and BO-11 (grp A&B) via the BG- grouping terminals.

D.051 No option is used since this change involves cabling only.

D.08 Reducing Switchboard Cable Buildup

On the marker common equipment frame, where switchboard cable buildup prevents

the placement of stiles and rear covers, switchboard cabling that has recently been added can be reterminated via the center upright to reliee the congestion.

D.081 No option is used since this change involves cabling only.

D.09 Miscellaneous changes are made to correct drawing errors and to bring the SD into agreement with WECo drawings.

D.10 The designation of the SPC lead that is used to indicate traffic sampled calls to the trouble recorder via the M.T.F.C. is changed to SMP to prevent having two leads, with the same designation, to the same connecting circuit.

D.101 No option is used since only the lead designation is changed.

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ISSUE 5B
APPENDIX 33A
DWG ISSUE 59A

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

D. Description of Changes

D.1 The automatic intercept feature provided by App Fig. 185 and 186 and options FI and FG on Drawing Issue 54D is removed from the drawing. No units have been manufactured and a more economical method of providing automatic intercept features for existing offices is made available on Issue 60D of the marker.

D.2 The STD and STMF cross-connection terminals are given a multiple appearance on the common equipment frame. This permits MTF automatic monitor testing of TOUCH-TONE® originating registers in a marker group equipped for only two register groups and must be applied in these marker groups when TOUCH-TONE originating registers are to be monitored.

D.3 The TBC6-9 cross-connections on the T and RR frame are rearranged to ease the wiring congestion in the area of the cross connection field. This change must be applied in offices with 12-level trunk link switches.

D.4 Option GC is rated Standard for all dial tone markers to insure that leads TR and MST to the traffic register are operational.

D.41 This change must be applied in dial tone markers that have been converted from a combined or completing marker since Issue 51D.

D.5 False Operation of the TIR Relay - When the BR- relays are released by SNG2 on calls involving PBX hunting or by RCL on intraoffice calls a race condition occurs. If BR- releases faster than RCT- the TIR relay may operate falsely. To prevent this condition a make-contact on the gate relay (BRG) is added to the path that detects all BR- relays unoperated. This causes the down check to be effective only while the BR- leads to the immediate ring control circuit are gated into the marker. The check path is now open during all release sequences.

D.51 This change must be applied in offices with the marker controlled immediate ring feature.

D.6 A change is made in the holding path for the RNG relay in markers arranged for calling line identification. This change corrects a race condition on a "failure to match" on the call back portion of an intraoffice call. On such a "failure to match", the marker recycle should release the RNG relay and operate the LLI relay. Prior to this change, if LLI operated before RNG released, LLI held RNG operated.

D.7 A DAC break-contact is added in the NCRA relay operate path to prevent calling line identification records on direct access calls to 101 ESS.

D.8 A DAC make-contact is added to bypass the UK contact in the RNG relay operate path. This change permits RNG to operate on direct access calls to 101 ESS in markers arranged for calling line identification.

D.9 The marker is changed to provide a CL8 only indication to the sender. The CLK2 relay is operated along with the CLK1 relay when the CL8 cross-connection is used. This will satisfy the markers sender check circuit and the call is allowed to complete.

D.91 Option CD (rated Standard) is added to provide the CL8 indication in offices with a common non-ANI trunk group to a TSP center for "0" and "1" coin calls. Options CB and CC (rated Standard) are assigned to previous wiring.

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.1 The marker is arranged for 2000 trunk numbers.

A.2 The marker is arranged to function with 12-level trunk link junctor switches.

A.3 The "records of selected traffic conditions" feature is modified to allow incoming reorders to be trapped, and a lead to the MTF plant register is added to record incoming reorder requests.

A.4 Provision is made for routing of coin class calls without coin deposits.

A.5 An improved trouble detecting circuit is provided for use with customer class-of-service traffic sampling features, and provision is made for operation with the traffic sample monitor circuit.

A.6 The all-originating-register-busy peg count circuitry used during route advances is improved.

A.7 The marker fusing is changed to prevent operation of the C-32 fuse when the ABC code contains a 3-out-of-5 digit.

A.8 A new arrangement is added to provide for reorder on terminating calls receiving an insufficient number of digits.

B. Changes in Apparatus

B.1 Added

10LV - AJ501 Relay - Fig. 191

12LV - AJ501 Relay - Fig. 191

CSA - AJ45 Relay - Option DA - Fig. 183

CSAN - AF512 Relay - Option DA - Fig. 183

CTK - 316U Relay - Option DA - Fig. 183

CTKA - AF98 Relay - Option DA - Fig. 183

B.1 Added (Cont)

MT30 - AJ81 Relay - Option DA - Fig. 183

(2) TB8,9 - U814 Relay - Fig. 189

TGS4 - 1/2AK22 Relay - Option ES - Fig. 183

(2) THK0,1 - 1/2AK501 Relay - Option EM - Fig. 190

(2) THT0,1 - AJ501 Relay - Fig. 190

XJS1 - 316R Relay - Fig. 191

10LV - 185A Network - Fig. 191

12LV - 185A Network - Fig. 191

CSA - 185A Network - Option DA - Fig. 183

CSAN - 185A Network - Option DA - Fig. 183

CTKA - 185A Network - Option DA - Fig. 183

(2) TB8,9 - 1/2 177C Network - Fig. 189

(2) THK0,1 - 185A Network - Option EM - Fig. 190

(2) THT0,1 - 185A Network - Fig. 190

XTB8,9 - 1/2 177K Network - Fig. 189

TBS5 - 13J Lamp - Option DF - Fig. 32

(2) TB8,9 - 200CL Inductor - Fig. 189

JSA - 18BM Resistor - Fig. 191

B.2

Superseded	Superseded By
EXA - U1396 Relay - Option EZ - Fig. 178	EXA - U1415 Relay Option EW - Fig. 178
RO - U988 Relay - Option EU - Fig. 43	RO - U1354 Relay Option EW - Fig. 43

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B.2 Superseded (Cont)	Superseded By
SCK - U1298 Relay - Option EX - Fig. 37	SCK - U1430 Relay Option EY - Fig. 37
SCN - U988 Relay - Option EX - Fig. 37	SCN - U1430 Relay Option EY - Fig. 37
TRT - U67 Relay - Option ET - Fig. 79	TRT - U1317 Relay Option EW - Fig. 79

C. Changes in Circuit Requirements Other Than Those Caused By Changes In Apparatus

C.1 The circuit requirements table is changed to specify a nongrounded battery test setup for the DCT relay.

D. Description of Changes

D.1 Reorder Trap Circuit - the "records of selected traffic conditions" feature is modified to allow incoming reorder requests to be trapped. Also, a plant register is provided to record the number of incoming reorders.

(a) The modifications are provided by option EW. The old arrangement, options ET, EU, EV, is rated "Mfr Disc.".

D.2 2000 Trunk Numbers (Fig. 190) - The marker is arranged to allow 2000 trunk numbers to be provided in a U and Y marker group. These facilities may be used in CAMA or non-CAMA offices.

(a) The IRMC forwards to the marker either trunk number thousands 0 or 1 over leads THT0-1 resulting in the operation of a marker THT- relay. The marker uses the relay in selecting a number group or, on CAMA first operation, grounds a THT- lead to the CAMA sender, for use on CAMA second operation.

(b) Figure 190 and option EM provide the new arrangements.

D.3 Traffic Sampling Trouble Detection Improvement - the marker is arranged to provide a more complete trouble detecting circuit for use with customer class-of-service traffic sampling features. Provision is also made for operation with the traffic sample monitor circuit.

(a) A translation mark from the register or customer class-of-service indicates that a WATS customer is to be served. The originating classes are screened from the incoming classes for the purpose of traffic sampling. Those classes to be sampled will cause the CSA marker relay and the TS- relay in a traffic sample circuit to operate. After a sender is connected and the linkage through the office completed on SOG and on the call-back portion of ITR calls, a ground is sent to the STEP or RESET winding in the traffic sample circuit counter. The CTK marker relay is in series with these windings and is used to verify whether or not the counter windings have been energized. The CSA and CTK relays provide a check on the operation of the traffic sampling features.. If the check fails, the call is completed and the marker disconnect is blocked until a trouble record is taken after which the marker returns to normal.

(b) The IAO and CT cross-connections are provided for those customers requiring traffic sampling on intraoffice calls.

(c) Two methods are available for testing the traffic sample circuits associated with a marker. A key in the master test control circuit allows the associated traffic sample circuits to be operated on marker test calls. No error is introduced in the traffic sample count during the test calls if the marker is made service busy and if the number of test calls made is equal to one more than the number set on the CTR counter in the traffic sample circuit being tested. The results of these test calls may be determined by observing the CTR counter of the traffic sample circuit under test or by using the traffic sample monitor and test circuit.

(d) When the traffic sample monitor circuit is provided the marker sends a ground to it each time a sample indication (SPC) is sent to an outsender circuit. The traffic sample monitor also monitors the inputs and outputs of the traffic sample circuit to and from the marker. This allows a matching check to be made on the counter mechanism in the traffic sample circuit. If when the marker is associated with a traffic sample monitor, a trouble is encountered and a trouble record is taken, the marker will ground the TBR lead to the traffic sample monitor restarting its matching tests from the beginning of its testing sequence.

(e) Option DA provides the improved trouble detection circuitry and the required leads to the traffic sample monitor circuit. Option DB represents the old arrangement and is rated "Mfr Disc.".

D.4 New Connection Circuits - Traffic Sample Monitor and Test Circuit, SD-27876-01.

D.5 All Originating Registers Busy Peg Count - the marker is changed to improve the scoring of "all-originating-register-busy" peg counts during route advance functions. Option DD (rated Standard) provides the improved arrangement and option DC (rated "Mfr Disc." represents the old arrangements.

D.6 Dial Tone First - the marker is equipped for routing of coin class calls with or without coin deposits. Option EY provides this feature.

D.7 12-Level Trunk Link Junctor Switches - the marker is arranged to function with the 12-level trunk link junctor switch. The marker receives an indication from the trunk link that indicates whether a 10-level or 12-level junctor switch is being used. A 12-level indication causes a reversal of polarity on the XJS and JCK tests. It also cancels bias on the DCT test when 12-level trunk links are paired. In addition, a select magnet cross-detection circuit is provided.

(a) Option EM and Fig. 191 (rated Standard) provide this feature.

D.8 The marker is equipped to provide a new battery supply lead for an additional trunk link connector relay.

(a) Option DF (rated Standard) provides this feature.

D.9 Two more TB- relays (TB8 and 9) are added for operation with 12-level trunk switches. When a marker is arranged for 12-level switch operation it will be equipped with ten TB- relays (TB0-9).

D.10 Provision is made for master test control circuit and remote office test line circuit access to the CGA and CGB leads on completing calls. These leads are provided from the line link circuit through the marker, when the marker is arranged for over 30 classes of service. This arrangement also provides ground on the CGA and CGB leads from the completing marker to the line link circuit when the MT21 relay is not operated.

D.11 A change is made in the PBX toll diversion feature to permit the CHA relay to operate when relays ANTD and AMA6 are both operated.

D.12 A condition exists that could cause the C-32 fuse to operate when the ABC code contains a 3-out-of-5 digit. instead of a 2-out-of-5 digit. The marker fusing is changed to allow the SKA and SKB lamps to be fused on C-57 instead of fuse C-32. This arrangement reduces the load on fuse C-32 to a safe level even when the ABC code contains a 3-out-of-5 digit.

(a) Option DJ provides the new arrangement and option DI represents the old wiring.

D.13 Option DH provides for reorder on terminating calls receiving an insufficient number of digits. If not enough digits are received, the first empty digit should receive a single 7 instead of a 2-out-of-5. The lone U7, T7, HN7, or TH7 condition applies ground to the TEA relay, causing the call to route to reorder. If option DH is not provided, such calls are treated as a trouble condition.

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.1 Added

TG54 - AK22 Relay - Option ES - Fig. 183

D. Description of Changes

D.1 An open circuit condition in the operate path of the MBK6 relay existed in completing or combined markers equipped with traffic sampling (Fig. 183) but not equipped with code conversion (Fig. 119). The addition of the TGS4 relay (option ES) allows this open circuit condition to be corrected. In completing or combined markers, in this same marker group, that are not equipped with App Fig. 183 a ground is provided for the NSP lead to the outgoing sender connector with option DE.

BELL TELEPHONE LABORATORIES, INCORPORATED

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

A. Changed and Added Functions

A.1 A PBX toll diversion feature is added.

A.2 Provision is made for operation with 12 level trunk switches.

B. Changes in Apparatus

B.1 Added

ANTD Relay, AF122, Fig. 188

NCTD Relay, AJ508, Fig. 188

NTD Relay, AF522, Opt "EC", Fig. 188

TD Relay, AF522, Opt "EC", Fig. 188

TDK Relay, AF531, Fig. 188

TB6,7 Relay, U814, Fig. 189

MT25A, 29 Relay, AK501, Fig. 186

RTC1 Relay, AJ131, Opt "EH", Fig. 59

RT5-9 Relay, 1/2AK4, Opt "EH", Fig. 60

B.2

Superseded	Superseded By
MBS1-9 Relay, U1371, Opt "ED", Fig. 56	MBS1-9 Relay, U1370, Opt "EE", Fig. 56
RTC Relay, U76, Opt "EG", Fig. 59	RTC Relay, AJ131, Opt "EH", Fig. 59
RTO-4 Relay, U521, Opt "EG", Fig. 60	RTO-4 Relay, 1/2AK4, Opt "EH", Fig. 60

B.3 Added

ANTD Network, 186A, Fig. 188

NCTD Network, 186A, Fig. 188

NTD Network, 185A, Opt "EC", Fig. 188

TD Network, 185A, Opt "EC", Fig. 188

TDK Network, 185A, Fig. 188

RTC1 Network, 185A, Opt "EH", Fig. 59

TB6,7 Network, 1/2 177C, Fig. 189

XTB6,7 Network, 1/2 177K, Fig. 189

B.4

Superseded	Superseded By
RTC Network, 177E, Opt "EG", Fig. 59	RTC Network, 185A, Opt "EH", Fig. 59

B.5 Removed

RTO-4 Network, 1/2 177C, Opt "EG" Fig. 59

B.6

Superseded	Superseded By
TMK2 Resistor, 185, Opt "FW", Fig. J	TMK2 Resistor, 196W, Opt "FX", Fig. J
WT1 Resistor, 145A, 1.52 meg, Opt "VW", Fig. 79	WT1 Resistor, 145A, 0.249 meg, Opt "EI", Fig. 79

B.7 Added

TB6,7 Inductor, 200CL, Fig. 189

C. Changes in Circuit Requirements Other Than Those Applying to Added, Superseded or Removed Apparatus

C.1 A special adjustment is provided for relay CLP, U211, option "KE", to assure its operation in the circuit.

D. Description of Changes

D.1 PBX Toll Diversion (FS112 and App Fig. 188)

The PBX toll diversion feature provides a means of screening out PBX

originating calls requiring toll diversion. If the marker determines that a call fits in the toll diversion category, a ground signal is sent to the originating register over the "RV1" lead. The originating register sends a reverse battery signal to the PBX. The PBX then decides whether to permit the call or abandon it to the No. 5 office, diverting it to the PBX operator. The marker continues to establish the call, assuming it to be valid unless it is abandoned.

D.2 Screening (See Note 430)

Relay S- contacts are used to screen out toll diversion calls. An NCNC call requiring toll diversion (call to an operator, for example) operates the NCTD route series relay via the contacts of screening relays associated with PBXs requiring toll diversion. In a similar manner, ANI calls requiring toll diversion operate the ANTD route series relay.

D.3 Screening With AMA

If the office is arranged for AMA, calls may be screened to provide toll diversion on AMA calls by operating the TD relay for toll diversion calls and the NTD relay for nontoll diversion calls. A positive check in the operate path of the CHA relay requires either a toll diversion or a no-toll diversion indication on AMA calls. Therefore, all AMA calls must operate the TD or the NTD relay.

D.4 Screening by Message Billing Index

If the office is arranged for AMA, the PBX toll diversion feature may be arranged for discrimination by message billing index. With this arrangement the MBS- relay contacts are used with S- relay contacts to separate calls from a PBX by message billing index. An AMA call from a PBX may operate the TD relay for a diversion signal and another call from the same PBX, but with a different billing index, may operate the NTD relay thus not generating a diversion signal. All AMA calls must still operate either the TD or the NTD relay.

D.5 An improved arrangement is provided for operation of the TMK relay.

D.6 An arrangement is provided for sending the MF senders a class 5 and class 8 combined signal when using a common trunk group to TSPS No. 1.

D.7 TB6 and TB7 relays have been added for operation with 12 level trunk switches.

D.8 An arrangement is provided for adding additional route transfer (RT-) relays to facilitate the addition of the crossbar tandem dynamic overload control feature.

D.9 The marker is arranged for a larger WT1 resistor to increase the timing range of the work timer.

D.10 Ground is provided on the "CGA" and "CGB" leads to the line, line link, and connector circuit for completing markers arranged for 60 classes of service on a 1-out-of-30 basis.

D.11 The marker is arranged to provide for ringing distinction on intercept trunks for use with an announcement machine.

D.12 The "MT25" lead to existing test circuits is now also cabled to the remote office test line circuit.

D.13 The MT25A and MT29 relays are added to App Fig. 186 to provide an improved testing arrangement for automatic intercept service.

F. Changes in Description of Operation or Changes in CD Section

F.1 Change D.17 of CD-25550-01, Issue 5B, Appendix 28D for drawing issue 54D, to read:

D.17 Sampling on ITR Calls

If an intraoffice route uses flat rate trunks, the CP5 relay will be operated.

If a sample is requested, the CP- cross-connection for that route must be connected to CP-P which cancels the sample request on that call. This is necessary since the marker has not been designed to allow intra-office route advances to anthing other than paths busy, busy line, etc. However, on the next call by the same customer a sample will again be requested and, if AMA equipped trunks are available, an AMA record will be made.

If the intraoffice route is an AMA route, the SCB relay operating with the AMA4 relay operated will select a sender group by operating an OSG- relay, see B69. In this case, the sender is required only for transmitting information for the AMA record. The intra-office calls proceed with the call-back portion with the sender attached, similar to an SOG call with a sender.

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DEPT 5211-WJM-MFF-PT

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CROSSBAR SYSTEMS
NO 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.1	Superseded	Superseded By
	Desig RV3, Code V338, Opt "FE", Fig. 33 Relay	Desig RV3, Code U982, Opt "FE", Fig. 33, Relay

D. Description of Changes

D.1 A different RV3 relay is provided for marker controlled immediate ring.

D.2 Minor changes are made in the calling line identification feature.

D.3 Option "GD" is made mandatory for all markers with pulse conversion or CAMA added after issue 51D, thus providing a PCL1 relay whenever App Fig. 94 is provided.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5611-WJM-MFF-RH

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.1 Traffic sampling by means of AMA record is provided.

A.2 Automatic intercept service is provided.

A.3 Provision is made for marker controlled immediate ring.

A.4 Calling line identification is provided.

B. Changes in Apparatus

B.1 Apparatus Changes for Additional Selection and Control Relay for General Use

B.11 Added

Relay PEG1, Code U57, App Fig. 31, Option "FA"

Network PEG1, Code 185A, App Fig. 31, Option "FA"

B.2 Apparatus Changes for Traffic Sampling by AMA Record

B.21 Added

App Fig. 183

Relay AMA6, Code U844, App Fig. 9, Option "GW"

Relay CP5, Code U1374, App Fig. 67, Option "GW"

Relay NIDA, Code U1150, App Fig. 169, Option "GY"

Network CP5P, Code 1/2 177C, App Fig. 67, Option "GW"

Network CP5S, Code 1/2 177C, App Fig. 67, Option "GW"

Network NIDA, Code 186A, App Fig. 169, Option "GY"

B.22 Superseded

Relay MBS0, Code U1371, App Fig. 56, Option "FC"

Superseded By

Relay MBS0, Code U1370, App Fig. 56, Option "GW"

B.3 Apparatus Changes for Automatic Intercept Service

B.31 Added

App Fig. 185

App Fig. 186

Relay TTK, Code U1355, App Fig. 33, Option "FG"

B.4 Apparatus Changes for Marker Controlled Immediate Ring

B.41 Added

App Fig. 184

Relay RV3, Code U338, App Fig. 33, Option "FE"

Relay SNG2, Code U1384, App Fig. 68, Option "FE"

B.5 Apparatus Changes for Calling Line Identification

B.51 Added

App Fig. 187

Relay VFL, Code U1415, App Fig. 68, Option "FO"

Relay UK, Code U1354, App Fig. 68, Option "FO"

Relay TRB1, Code U338, App Fig. 3, Option "FP"

Network TRB1, Code 185A, App Fig. 3, Option "FP"

D. Description of Changes

D.1 Traffic Sampling

D.11 The combined and completing markers are changed to provide traffic sampling by AMA record. This feature may be provided in a marker by the addition of App Fig. 183.

The addition of option "FB" is required in markers which are not equipped for traffic sampling, but are in a marker group which has a marker equipped for traffic sampling.

D.12 Traffic sampling is a feature that periodically causes an AMA record to be made on certain SOG or ITR calls. The information obtained in this manner from a call can be used as a basis for allocating revenue within and beyond certain geographical areas, or as required by CCSA networks. The AMA record sample indicates the following:

(a) conversation time

(b) where the call originated, and

(c) where the call terminated.

The ability to sample a call is determined by screening and by code pattern: screening to detect the class or classes requiring sampling; and code pattern to ensure that trunks are selected to permit an AMA record on calls requiring sampling.

Sampling is controlled by a traffic sample circuit which contains a reverse counting counter. This counter is manually set to a predetermined number, and as each call of the desired type is completed, the counter in the traffic sample circuit decreases its count by one digit. When the predetermined number of calls has been counted, the counter reaches zero and signals the marker to request a sample. The next call of the desired type is sampled, and calls for an AMA record to be made. If, at the end of this call, a sender has been selected, and the AMA- relays in the marker operated, the counter is reset to its predetermined number. Subsequent calls will be counted and another sample taken as described above.

Requests for sampling are handled for both chargeable and nonchargeable calls. Charge calls result in the operation of a message billing index route series relay MBS1-9. This, in conjunction with the sample mark, indicates a sampled, billed call to the accounting center. For noncharge calls, the operation of the sample relay and AMA code pattern relays cause the operation of the MBS0 route series relay. Along with the sample mark, this combination indicates a sampled, nonbilled call to the accounting center.

As many as five traffic sample circuits may be associated with each marker for sampling different services.

D.13 Operation of Traffic Sample Circuit, FS109

The class or classes of calls that require sampling are indicated by the combination of code point and class-of-service screening relay which is cross-connected to a TRS- terminal for one of the traffic sample circuits. Ground on the "TS" lead connects the sample circuit to the marker. At the completion of the call, ground is placed on the "CT" lead to the sample circuit, which causes the counter to decrease its count by one. The "CT" lead is grounded either by the operation of the AVK1 relay when a sender is attached, or by operation of the DCT2 and PEG1 relays on ITR calls without a sender.

The counter mechanism in the traffic sample circuit is back acting, thus when the counter approaches "0", the transfer contact in the counter does not operate until ground is removed from the "CT" lead. Ground on the "CT" lead is removed on marker release. When the counter reaches "0", then the next time that the TS relay operates to connect the sample circuit to the marker, the "SA" lead will be grounded to operate the SA relay in the marker.

D.14 Sample Control

Requests for sampling may be made by two different means:

(a) By cross-connection of S- to SAC terminal to sample every call of that type in which case no traffic sample circuit is required.

(b) By cross-connection of S- to TRS- terminal to sample calls periodically as directed by the traffic sample circuit.

In either case, SA relay operates to initiate sample functions in the marker.

Relay SA Operated:

(a) Transfers the no-sample "NSP" lead from the sender, to the XT2 cross-detection relay, B128.

(b) Transfers the sample "SPC" lead from the sender to control of the TGS3 relay.

(c) Partly closes an operating path for the MBSO relay, or route advance, or cancel request, as determined by operation of the CP5 code pattern relay on noncharge calls, B37.

If the call is noncharge, and if the trunks of the selected route are arranged for AMA (CP5 relay normal), the operation of one of the route series relays (ie, NCNC) directs the class check ground to the MBSO relay. Relay MBSO operated operates the AMA relay and associated AMA- relays which further extends the class check ground toward the class check CLK relay, through a contact of the operated MBSO relay.

If the trunks of the route are not equipped for AMA, CP5 relay operates. This results in one of two alternate actions:

(a) the request for AMA is canceled, and

(b) the route advance relay operates.

These actions are dependent upon the CPP and CPS relays in conjunction with the CP5 relay as described in the 400 series notes on cross-connection information.

If the call is billed, one of the MBS 1 through 9 relays operates, causing the AMA- relays to operate. In this case, a flat rate route series relay will not operate, and the path through the SA relay contact and CP- relay contacts to the MBSO relay is disabled.

D.15 Check of Sample Mark to Sender

When the sample, SPC, or no sample NSP, mark is transmitted to the sender, the MBK6 relay operates, and should remain held operated from the sender when TGS2 relay releases.

Contacts of the MBK6 relay are included in the sender OST check circuit to check this operation (see B81).

CAMA senders are not arranged to provide sampling, or a holding ground for the MBK6 relay. Since this relay will operate on CAMA as well as AMA calls, the check contact of the MBK6 relay is bypassed on CAMA calls by a contact of the RNT3 relay.

D.16 Counter Reset

During a sampling condition, the SA relay is operated and the following operations are required to reset the counter:

(a) The AVK1 relay must be operated to check that a sender has been attached to the marker.

(b) The AMA6 relay must be operated. This indicates that the AMA- relays have operated and an AMA record requested.

(c) The TS relay in the traffic sample circuit is operated.

If any of the above conditions are not met, the counter will not be reset and the sample request signal from the traffic sample circuit will be repeated on the next call of that type. A sample will again be attempted on the next call of the class or classes desired.

D.17 Sampling on ITR Calls

If an intraoffice route uses flat rate trunks, the CP5 relay will be operated. If a sample is to be taken, operation of the SA relay causes a route advance by operating RAV1,2 relays and a new ITR route may be selected.

If a new route is an ITR, AMA route, then the SCB relay operating with the AMA4 relay operated will select a sender group by operating an OSG-relay, see B69. In this case, the sender is required only for transmitting information for the AMA record. The ITR call proceeds with the call-back portion with the sender attached, similar to an SOG call with a sender.

D.2 Automatic Intercept Service (App Fig. 185 and 186, Options "FI,FG")

The combined and completing markers are arranged to route line intercept calls to an automatic intercept center, AIC. The calls are switched to an outgoing intercept trunk on the line link frame and an MF sender is attached to the trunk. The seven digit intercepted number plus an arbitrary digit to identify the type of intercept is outpulsed to the AIC. The center will

provide recorded messages or route the call to an intercept operator, depending on the type of intercept required.

D.21 Recognition of an Intercept Condition

When the marker encounters an intercept condition, relay BN, RI, or TBI will operate (see Note 400, part 2). The BN or RI will operate AIS as an indication that the call is to be routed to the AIC. The TBI may also result in routing the call to the AIC or, depending on local office considerations, it may cause operation of NAI (as will DCI and VCI,) to route the call to the local DSA switchboard.

D.22 Office Code Generation

Before the marker can continue with the call it must determine the office code of the called number by operating one of six OFC- relays. On originating and five or seven digit incoming calls, the OFC- is operated from a local completion relay.

On four digit incoming calls, the OA or OB mark plus the incoming trunk class determine which OFC- relay. If the incoming trunk class is nondiscriminating, the OA or OB mark plus number group mark PN, TN, or EN indicates the OFC- relay. On calls from nondiscriminating trunk groups to plugged up lines (TBI) or numbers that return a PTN or BNTH from the number group, the office code is not identified and the UOS or UOB terminal will be grounded. These terminals are cross-connected to operate the OFC- relays associated with office codes receiving the most intercept traffic.

Once the office code of the called number is determined, relay CKO will operate to cause a number group recycle, releasing information received from the first number group. Upon completion of the recycle (CKR operated,) AIS1, 2, and 3 relays operate and the marker is ready to select an intercept trunk and an MF sender associated with the trunk.

D.23 Intercept Trunk Selection

An auxiliary intercept relay is used to select the intercept trunk group. This relay generates a four digit number to control selection and seizure of a number group containing the line link locations of the intercept trunks. When the number group is seized, it is given a PBX hunting indication and the marker proceeds to select an idle trunk. Translation for the selected trunk contains line link frame location and a TNK indication instead of a ringing combination. The ringing combination is not needed since the marker cancels ringing switch operation and audible ringing is returned from the AIC.

D.24 Sender Selection

With AIS1 operated, an OSG- relay will operate to select the sender group associated with the intercept trunk group. Once the sender group is determined, the marker proceeds to select and connect to an idle sender. With SKA or SKB operated, indicating possession of a sender and a sender connector, the line link frame containing the selected trunk is seized. Relays are operated in the line link frame to give the marker access to an F relay in the trunk circuit. With the marker having control of both the sender and the trunk, it proceeds to connect them together through a sender link.

D.25 Operation of the Sender Link Select Magnet

Relay LLS or TLS operates when a sender is seized to indicate either line link selection or trunk link selection. On AIS calls, LLS will operate to extend the "SSO-9" leads to the line link and connector providing a path for operation of the sender link SS- relays.

With the nonpreferred OS- relays released and SSA or SSB and LLS operated, the sender link select magnet associated with the selected sender is operated. Contacts of the SS- relay close through the operate path of the sender link hold magnet SH-, through the trunk circuit F relay to operate the hold magnet associated with the selected trunk. Operation of the hold magnet and sender and trunk controls are the same as regular sender operation.

D.26 Transmitting Information to the Sender

Digit steering relays KGS3 and KGS4 are operated to transmit the thousands, hundreds, tens, and units digits of the intercepted number to the D, E, F, and G slots, respectively, in the sender. The KGS5 relay transmits the office code information from the OFC- relays to the A, B, and C slots in the sender.

One arbitrary digit is transmitted to the sender to inform the AIC of the class of intercept associated with the number.

As shown in Note 400, part 2, cross-connections are made to prefix the digit "0" for blank number treatment, digit "3" for regular intercept, and digit "1" for trouble intercept.

Class leads "CL1" and "CL3" are grounded to the sender to disable the inter-sender timing circuit.

Checks are made on the information stored in the sender and the sender connector is released.

D.27 Sender Advance, FS49

On terminating calls, the advance signal is given to the sender after the marker has checked that the cross-office linkage has been established, (DCT operated) and that the information has been transferred satisfactorily, (RSC operated). On intraoffice calls, the same checks are made before the DCT1 is allowed to operate and the advance signal is sent to the sender upon completion of the call back linkage.

D.28 Trunk Guard Test

On light traffic, the sender will perform trunk guard tests on all terminating calls. Marker operation is similar to TG tests on SOG calls with the exception of the LTI relay functions. The LTI, lock trunk identity, operates on all terminating, automatic intercept calls. This relay locks in the information necessary for identifying the particular line link trunk used in case a TG failure is encountered.

D.3 Marker Controlled Immediate Ring, App Fig. 184 and Option "FE"

Combined and completing markers may be equipped (App Fig. 184 and Option "FE") to provide immediate ring on calls requiring code 1 ringing.

When an office is equipped for marker controlled immediate ring, the code 1 ringing voltage from brush 1 of the ringing machine is connected to level 6 of the ringing selection switch, brush 2 ringing is connected to level 2, and brush 3 ringing is connected to level 3. The marker operates the proper level of the ringing selection switch according to information received on the "BR1-3" leads from the immediate ring control circuit.

D.31 Marker Operation

In establishing the terminating portion of the call, the SNG2 relay in the marker operates, causing the BRG relay to operate (FS88). The BRG connects the "BR1-3" leads thru to the immediate ring control ckt. One or two of the "BR1-3" leads will be grounded by the immediate ring control ckt.

If one of the "BR1-3" leads is grounded the corresponding BR- relay operates, operating the corresponding RS- relay.

If two of the "BR1-3" leads are grounded, operating two BR- relays, the marker operates the RS- relay corresponding to the higher numbered BR-. (In this case, 1 is considered higher than 3 since the order of operating BR- relays is 1, 2, 3, 1, 2, etc.) Two BR- relays are operated when approaching the time that the ringing voltage is transferred from one brush to another. In this case the marker selects the higher numbered brush because the lower one may not provide a ringing voltage of sufficient duration before the transfer occurs.

D.32 Trouble Conditions

If an alarm condition exists in the immediate ring control circuit or if the circuit is under test, it operates the CIR relay in the marker and cancels the immediate ring feature in the marker.

When the RCT- relay operates for code 1 ringing, one or two BR- relays should be operated. If none of the BR- relays is operated or if all of them are operated, the TIR relay operates and causes a trouble record to be taken.

If a "BR-" lead is open, the marker will have no BR- relays operated on some calls, thus causing a trouble record. If a "BR-" lead has a false ground on it or if two "BR-" leads are crossed, the marker will have all three BR- relays operated on some calls, thus causing a trouble record.

When the CIR or the TIR relay operates, ground is transferred to the CIR terminal and one of the RS2, 3, 6 relays operates depending on which BR1-3 terminal is cross-connected to CIR. Therefore, when

CIR or TIR operates, the immediate ring feature is canceled and a predetermined (by cross-connection) RS- is operated.

D.4 Calling Line Identification, App Fig. 187, Options "FO" and "FV"

When the office is equipped for calling line identification, trouble records are taken on all calls terminating to specific previously selected numbers in the office. These records may be used to determine the originating line or the incoming trunk. In addition, the office may be equipped to take trouble records on outgoing calls to specific numbers in other offices. This requires the addition of the called number detector circuit for calling line identification in the office and its connection to the marker (option "FV").

D.41 Calls Terminating in the Office

Calling line identification on calls terminating to a number in the office is set up by a special number group cross-connection. The number group applies battery thru this cross-connection to the marker "UK" lead when a call is being established to the number requiring calling line identification. The battery on the "UK" lead prevents the operation of the UKA relay in the marker. This provides an operate path for the NCRA relay when the VFL relay operates. The NCRA relay operating causes the UK relay to operate. The NCRA also causes the operation of the TRR relay so that a trouble record is taken.

For calls to numbers not requiring calling line identification the number group grounds the "UK" lead. The UKA relay operates, operating the UK relay and preventing the NCRA relay from operating.

D.42 Outgoing Calls to Other Offices

The called number detector circuit for calling line identification may be set up to detect from one to three separate numbers. This circuit monitors the marker "A2/5-K2/5" leads to the outgoing sender connector. When grounds appear on all of the "A2/5-K2/5" leads corresponding to one of the numbers to be detected, the detector circuit grounds one of the "M1-3" leads to the marker. Ground on one of the "M-" leads operates the NCRA relay, causing a trouble record to be taken.

D.5 Additional CAMA Screening, Option "GV"

Terminals CMFO, 1 and CMSO, 1 and associated wiring are provided so that the S300-359 relays may be used for CAMA screening.

D.6 Provision is made for trunk class signals on thru switched calls (option "FM").

D.07 The dial tone and combined markers are arranged to ground the "ST" lead to the automatic monitor on calls to either dial pulse or TOUCH-TONE originating registers when the automatic monitor is equipped for TOUCH-TONE.

D.08 An appearance of the LS, LS2, ELS, 1XS, and FGS cross-connection terminals is provided on the supplementary class of service frame for access to the SW300-359 terminals.

D.9 Terminals NSA and NS9 are provided for additional cross-connections for digit shifting on the completing and combined markers.

D.10 New Connecting Circuits

SD-27681-01 - Traffic Sample Circuit

SD-27820-01 - Immediate Ring Control Circuit

SD-27833-01 - Called Number Detector Circuit

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5611-WJMaC-MFF-JBS

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. Changes in Apparatus

B.1 Added

S300 through S359
Networks
Code 185A
App Fig. 176

D. Description of Changes

D.1 The marker is changed to provide looping of the DT3 relay contact 1,2B to enable the paired line link feature.

D.2 Contact protection networks have been added on the S300 through S359 relays.

D.3 Provision is made for testing of the mixed line link frame (MLF) indication.

D.4 Miscellaneous CAD changes have been made.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5611-WJMcC-MFF-AMA

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CROSSBAR SYSTEMS
NO.5
MARKER CIRCUIT

CHANGES

D. Description of Changes

D.1 Battery and ground supplies were not furnished for the six register group feature and the overload announcement feature, when these features were equipped in dial tone markers.

Battery and ground was supplied from the translator frame which is provided for combined or completing markers only.

Option "GR" (rated Std) is added to provide battery and ground supplies from the common equipment frame for dial tone markers while option "GS" provides battery and ground from the translator frame for combined markers.

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DEPT 2312-RF-JWB-WJP

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.1 To provide direct in dialing to 101 ESS on a multilead access basis.

A.2 To provide operation with the traffic data processor.

A.3 To provide cross detection between hunting and nonhunting ringing combinations.

A.4 To provide additional peg count leads to the MTF plant register.

A.5 To provide screening of reverting trunk groups on a dial pulse or TOUCH-TONE basis.

B. Changes in Apparatus

B.1 Added Relays

Desig	Code	Option	Fig.
CSW	AJ15		182
DAC	AJ503		181
DAC1	AJ503		181
(6)PGRO-5	293D		180
PTM	1/2AK6		181
SON1	U1396	"GD"	67
TLK	AJ72		181
TLT	1/2AK6		181
XRCN	U1410	"GB"	91

B.2 Added Networks

Desig	Code	Option	Fig.
CSW	185A		182
DAC	185A		181
DAC1	185A		181
(6)PGLO-5	185A		180
(6)PGRO-5	185A		180
TLKP	185A		181
TLKS	185A		181

B.3 Added Lamps

Desig	Code	Option	Fig.
HGL	13J	"GQ"	68
VFL	13J	"GQ"	68
VGL	13J	"GQ"	68

B.4 Added Resistor

Desig	Code	Option	Fig.
DAP	59H		181

B.5 Superseded Relay

Desig	Code	Option	Fig.
PCL1	U1399	"GC"	94

Superseded By

Desig	Code	Option	Fig.
PCL1	U1439	"GD"	94

D. Description of Changes

D.1 The marker is changed to provide direct-in-dialing to 101 ESS on a multilead access basis. Figure 181 and option "GJ" (Rated Std) provide this feature.

D.11 General Description

Multilead access to 101 ESS is a variation of either a terminating or intraoffice call to provide direct-in-dialing to stations served by a 101 EPBX satellite. These stations are assigned 7 digit numbers in a number series associated with the marker group and are reached by a common group of trunks from the line link frame. When a call is received for one of these stations, the marker connects to a direct access pretranslator (DAP) instead of the regular number group to obtain a translation of the called number. The DAP circuit on receiving the called number, transmits it to the 101 control unit which returns information concerning the location of an idle trunk in a trunk group serving the called station. The DAP circuit transfers this information to the marker which sets up a linkage to the idle trunk and continues with the call in a normal manner while the 101 ESS control unit extends the call from the line link frame to the station at the satellite.

D.12 Line Number Translation

Marker action at the beginning of the call is normal until a number group translation of the called number is required. Instead of going to an NG start terminal, the STO-9 per NSSO-5 terminals are connected to one of the ten start leads associated with a direct access pretranslator connector. When the connector is cut through, the DAC relay in the marker is operated as an indication that the call is to a 101 ESS satellite and the marker proceeds to transmit the called number information to the direct access pretranslator.

In addition to the hundreds, tens, and units digits, the DAP circuit requires a thousands digit and an indication of the type of call: POTS, CCSA, or one of three test calls. The thousands digit information is included with the start indication and the DAP circuit is capable of determining which digit is represented by each start lead. The marker automatically sends a POTS indication on all service calls, since it is not arranged to handle CCSA traffic. Test call indications, TCA, TCB, or TCC, are controlled by the test frame when making tests of the direct access circuitry and equipment.

When a thousands digit and a type of call indication is received by the DAP circuit, it immediately returns a PN, TN, EN, or PTN indication so the marker can make a physical, theoretical check of the number and transmit the tens digit to the DAP.

Once the DAP circuit is satisfied that it has received all the information from the marker, it calls in the 101 control unit for a translation.

The control unit selects an idle trunk associated with the called station and returns the line link location to the DAP circuit.

The control unit maintains a record of the state of each trunk and once it has assigned an idle trunk circuit to a call, it reserves the trunk and associates it with the called station for four seconds. If for some reason the marker does not set a linkage to the trunk until after the four second time period, the control unit will connect the trunk to the PBX attendant.

Once the DAP circuit is satisfied that it has received all the information concerning the idle trunk, this information is sent to the marker via the DAPC. The translation will be similar to that normally received from the number group plus an additional TLK mark which is an indication from the DAP circuit that the translation is valid.

Upon receiving a LLF location from the DAP circuit, the marker proceeds to establish a cross-office linkage from the incoming or intraoffice trunk to the assigned LLF location and continues with the call in a normal manner. Ringing and busy tones are controlled at the satellite, thus the marker sets the ringing switch to a silent level.

The 101 ESS trunk circuit will satisfy normal continuity and ground tests and will go off-normal when linkage is established, thus signaling the 101 equipment to extend the call to the called station.

D.13 Alternate Actions

D.131 Free Numbers

If the called number is free, the 101 control unit will send an FNA or FNB indication to the marker via the DAP circuit.

The DAC relay transfers the ground for the RS- relays to contacts of the FNA and FNB relays. This will result in operation of the CSW relay on calls with a local charge condition while the RS- relays are operated on toll charge calls. Operation of the CSW relay prevents setting the ringing switch and contacts of the relay are used to satisfy checks of ringing switch operation.

D.132 Intercept

Treatment of unassigned, changed, or disconnected numbers within a partially used hundreds block assigned to the 101 ESS satellite is provided by the 101 system. If an entire hundreds block is unassigned, the control unit gives the marker a BNTH indication instead of the location of an idle trunk. This indication, along with TLK and DAC, will cause the marker to set the call to intercept.

D.133 All Trunks Busy

If the 101 ESS control unit is unable to find an idle trunk, it will ground the "PMO" lead to the marker via the DAP circuit. The TLK and UK relays are also operated as a verification of the PMO. On terminating calls the marker will set an overflow condition in the incoming trunk and on intraoffice calls it will route-advance and set the call to a tone trunk. It may be noted that UK is operated only as a verification of PMO. The UK relay indirectly controls the TYM, number groups timer, used to detect various intercept conditions, none of which are needed on calls to 101 ESS.

D.134 Line Busy or Failure to Match

If the marker encounters a line busy or failure to match condition when attempting to set a channel, it will perform a PBX recycle and return to the DAP for another idle trunk location. The PBX recycle is modified slightly since calls to 101 ESS are nonhunting. Operating the SPT relay with DAC provides a nonhunting type recycle by disabling the PBX 1 and 2, CKO, and CKR relays. A second line busy or failure to match will result in setting the call to reorder.

D.135 Trouble Indications

One of the following trouble indications may be received when the marker is requesting a translation.

PTM - indicates that the DAP circuit failed to receive the proper amount of information from the marker.

TLT - indicates that the DAP circuit detected a trouble in the information returned by the 101 control unit.

Either of these indications will result in a trouble record and second trial.

D.2 The marker has been arranged to function with the 1A traffic data processor (TDP) system. Figure 180 and options "GM" and "GN" (Rated Std) provide this feature. Options "GL" (Rated "Mfr Disc.") and "GK" (Rated Std) provide wiring when the TDP is not provided.

D.21 The TDP is an electronic data collection system that replaces the traffic registers in a No. 5 crossbar office. Marker operation with the TDP differs in two significant ways from operation with traffic registers.

1. Inputs to the TDP must be separated at least 5 microseconds to insure proper counting. This makes it necessary to prevent one event in the marker from simultaneously pegging several traffic register leads.

2. A much shorter input pulse (0.5 ms) is sufficient to peg the TDP. This requires that precautions be taken to insure that no short false pulses are applied to the "TR" leads.

The marker has been modified so that the operation of the PEG relay will not simultaneously peg several leads to the traffic register (TR) circuit. Operation of the PEG relay starts a series chain of reed relays to operating, each of which scores one "TR" lead and operates the next relay in the chain. Changes were also made

to insure that transfer contacts in "TR" leads do not release until after ground has been removed from the "TR" lead.

D.22 Traffic register leads have been arranged to provide the following additional information:

(a) Both paired line link frame registration and dial pulse or TOUCH-TONE indication on total originating peg count. (TOR)

(b) PTCO - Office overflow paired line link traffic - lead furnished on a one per marker basis and pegged each time a paths busy condition is encountered on a call involving a paired line link frame.

(c) PTOG - Total through switched calls paired line link traffic - A new lead furnished on a one per marker basis and pegged each time the marker sets a tandem linkage on a call involving a paired line link frame.

D.23 The modifications for use of the TDP allow the marker to function with either the traffic data converter circuit or with regular traffic registers. This feature can be installed in offices not equipped with the TDP system.

D.3 The marker has been arranged to provide additional peg count data for the plant register circuit. Option "GD" (Rated Std) provides a new plant register leads for the combined and completing markers and option "GE" (Rated Std) provides the new leads for the combined and dial tone markers. Option "GC" (Rated "Mfr Disc.") provides wiring when the feature is not provided.

D.31 The plant register peg counts supplied by the new marker leads are as follows:

(a) TPC (Total Peg Count) The lead is furnished on a one per marker basis and is pegged on every marker seizure.

(b) DTPC (Dial Tone Total Peg Count) The lead is furnished on a one per marker basis and is pegged each time the marker is seized for a dial tone call.

(c) OGO-9 (Sender Group Seizures) The leads are furnished on a one per marker per sender group basis. One lead is pegged each time the marker seizes a sender.

(d) SSO-9 (Stuck Sender Peg Count) The leads are furnished on a one per marker group per sender group basis. One lead is pegged on each trunk guard test failure.

(e) DTR (Dial Tone Trouble Record Peg Count) The lead is furnished on a one per marker basis and is pegged each time the marker encounters trouble on a first trial dial tone call.

(f) DMST (Dial Tone Second Trial Failure Peg Count) The lead is furnished on a one per marker group basis and is pegged each time the marker encounters trouble on a second trial dial tone call.

(g) LRF (Link Release Failure) The lead is furnished on a one per marker group basis and is pegged when the marker encounters a trouble condition from the incoming register link.

D.32 The "TR" and "MST" leads have been arranged to provide peg counts only on completing marker functions.

D.4 The marker is changed to detect crosses between hunting and nonhunting ringing combinations.

D.41 A common battery supply for the RCT-relays is provided through a cross detection relay to detect excessive current when more than one relay is operated.

Options "GB" (Rated Std) and "GT" (Rated "Mfr Disc.") are added.

D.5 The marker is changed to provide screening of reverting trunk groups on a dial pulse or TOUCH-TONE basis.

D.51 A contact of the ORM relay is used to determine if a call is to use a TOUCH-TONE or dial pulse reverting trunk.

Option "GH" (Rated Std) is added.

D.6 The marker is changed to provide an additional work timer recycle on tandem calls, thereby preventing false GT2 failures when slight LLF seizure delays are encountered.

Option "GF" (Rated Std) is added.

D.7 The marker is changed to provide an appearance of the LCB cross-connection terminal on the tandem screening frame.

Option "GO" (Rated Std) is added.

D.8 Resistance lamps are added in series with certain contacts of relay HGL, VFL, and VGL to prevent excess current through these contacts when certain cross conditions exist in the number group.

Options "GP" (Rated "Mfr Disc.") and "GQ" (Rated Std) are added.

D.9 The marker is arranged to provide five "ST" signals via the "CRO/7" leads to MF outsenders for operation with the traffic service position system No. 1.

The cross-connection notes are changed for this feature.

D.10 Relay CSW (cancel ringing selection switch) is added to satisfy marker trunk class checks when ringing switch operation is not required.

Figure 182 provides this feature.

D.11 Miscellaneous changes are made to bring the drawing into agreement with WECo "T" drawings.

F. Changes in CD Sections

F.1 Add the following connecting circuit to paragraph 4.

SD-27801-01, Direct Access Pretranslator Connector Circuit

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2312-RF-JWB-WJP

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

D. Description of Circuit Changes

D.1 CAD figures 53, 58, 60, 119, 201, 203, and 205 have been changed to provide two mounting plates with D type terminal strips on the class-of-service frame. Associated changes have been made on sheets B126, D15, and D17 for the added terminals.

These terminals provide a standard cross-connection facility for the "increased flexibility of BC points", feature, replacing the previous method of connecting appropriate switchboard cable leads on the rear of the frame.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2312-EON-JWB-VW

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.1 To provide paired line link operation.

A.2 To provide a maximum of 60 classes of service.

A.3 To provide increased screening facilities.

A.4 To provide a means to make a record of selected traffic conditions (trap circuit).

A.5 To provide six originating register groups.

A.6 To provide an overload announcement feature for emergency traffic conditions.

A.7 To provide a TOG peg count on a per marker basis.

B. Changes in Apparatus

B.1 Added Relays

	Desig	Code	Option	Fig.
	AN	AK22		179
	AN1	AJ503		179
	AN2	AJ12		179
	AN3	AJ12	JS	179
	ANC	AK22		179
	CGA	280BA		177
	CGA1	U1354	JC	177
	CGA1	AF521	JE	175
	CGB	280BA		177
	CGB1	U1354	JC	177
	CGB1	AF521	JE	175
	CKG8	U607	JW	29
	CKG9	AF521		175
(3)	CTB0-2	AJ200		175
(5)	CUB0,1,2 4,7,	AJ81		175
	D	AJ700		174
	DT5	AF42		179
(4)	DTR0-3	AJ507	JN,JM	174
	EX	316A		178
	EXA	U1396		178
	FCD0	AF501		174
	FCD10	AF501	JO	174
	FCM0	AF501		174
	FCM10	AF501	JO	174
(4)	FCR0-3	AF501		174
(4)	FCR10-13	AF501	JO	174
	LFKA	AF169		173
	MF	AJ700		174
	MFK	AF169		173
	MFL	AF96		173
	MT21	U593		177
	MT27	U934 or UB5	JY	28
	NANC	AK22		179
	PRL	AF96		173
	PRLL	AJ12		173
	RCY6	AK22		179
(60)	S 300-359	AF506		176
	STPA	AF35		173
	TR2G	U1414	JK	178
(3)	VP0-2	AF504		174
	VPT	AF42		174
	XDR	AJ510		174

B.2 Superseded Relays

Desig	Code	Option	Fig.
TRT	U1375	HA	79
RD	U1392	JP	104
FTK1	U1394	JV	5

Superseded By

Desig	Code	Option	Fig.
TRT	U67	JJ	79
RD	U809	JX	104
FTK1	U1347	JW	5

B.3 Added Networks

Desig	Code	Option	Fig.
CGA1	186A	JC	177
CGA1	186A	JE	175
CCB1	186A	JC	177
CGB1	186A	JE	175
CKG9	186A		175
D	185A		174
DT5	185A		179

	Desig	Code	Option	Fig.
(4)	DTRO-3	185A	JN,JM	174
	FCDO	185A		174
	FCD10	185A	JO	174
	FCMO	185A		174
	FCM10	185A	JO	174
(4)	FCRO-3	185A		174
(4)	FCR10-13	185A	JO	174
	LFKA	185A		173
	MF	185A		174
	MFK	185A		173
	MT21	186A		176
	PRLL	185A		173
	STPA	185A		173
(3)	VPO-2	185A		174
	VPT	186A		174

B.4 Added Resistors

Desig	Code	Option	Fig.
DCT2	18CJ	JB	31
EX	18AG		178

B.5 Added Capacitors

Desig	Code	Option	Fig.
MFL	KS-13368,L3		173
PRL	KS-13368,L3		173

D. Description of Circuit Changes

D.01 The marker has been changed as follows to provide paired line link operation on all types of completing call functions. Figure 173, option JB, and coordinated options LK and JY provide this feature. Options JH and JI, are added to provide variations in traffic register connections, and options JG and JF (rated Std) provides wiring when no paired line link feature is provided.

D.011 The paired line link feature provides for the sharing of two full sized junctor groups in the serving of calls by two line link frames. The reduction in the possibility of matching failures by this arrangement allows an increase in the call carrying capacity of the mated frames.

D.012 The feature is particularly applicable to offices that have grown to a maximum size with paired trunk link frames. This feature may also be desirable for certain offices where the existing junctor pattern offers less capacity than this system will provide. However, in cases of partially equipped installations, it is necessary to change the junctor distribution to a full size, as in the 20LL-10TL or 40LL-20TL size before the feature may be applied.

It must also be realized, that to apply this feature for the purpose intended, the marker capacity must be such that it can handle the increased load for those calls that attempt "mate" frame operation.

D.013 The paired line link feature makes available, on a junctor step basis, the junctor sub-group from a numerically adjacent "mate" line link frame. The junctor pattern required provides only first junctor sub-groups, each containing ten junctors.

This mate operation is made possible by the addition of auxiliary junctor switches on a new auxiliary line link frame. This frame contains ten 200 point crossbar switches with their horizontal multiples split into left and right halves, one half of a frame serving one line link frame of a pair.

The horizontals of the junctor switches on the even frame of a pair of line link frames are extended to the horizontals of the left auxiliary junctor switches, similarily the horizontals on the odd frame are extended to the horizontals on the right side of the auxiliary frame. The auxiliary junctor switches may be considered as extension junctor switches.

The verticals of the left auxiliary junctor switches are connected to the verticals of the odd line link frame junctor switches. The verticals of the right auxiliary junctors are connected to the verticals of the even line link frame junctor switches.

This vertical multiple of the junctors to the line link frame junctor switch verticals, and to the auxiliary junctor switch verticals provides the cross-over to allow the junctors of a sub-group to be used for "mate" operation through the cross-points of the auxiliary junctor switch.

D.014 In the required 10TLF junctor pattern, the junctor sub-group from an even line link frame terminates on the left half of a trunk switch. The junctor sub-group from the adjacent higher numbered odd line link frame terminates on the right half of the same trunk switch.

Thus by controlling the selection of either right, or left trunk switch, the junctor sub-group of the mate line link frame is selected. By operating the cross-points of the appropriate auxiliary junctor switch, this mate junctor sub-group is enabled.

The control for this selection is provided by the junctor step mechanism in combination with the paired line link indication in the marker.

D.015 Figure 173 and option JB provide the wiring and apparatus for paired operation. Options JG and JF provide the original wiring for nonpaired operation. Associated with the paired feature is option JI which provides connection to certain traffic registers if some of the line link frames are paired. Option JH provides no connection for the registers if all line link frames are paired.

D.0151 In a particular office, the marker recognizes a paired line link frame by the presence of solid ground on the LFK lead when the associated line link connector is closed. This ground operates the PRL and LFKA relays. A nonpaired line link frame will have resistance ground on its LFK lead, in which case only the LFKA relay operates. LFKA relay operated, operates the LFK relay and marker operation continues.

D.0152 PRL relay operated, operates PRLL relay. These relays have no effect until such time that a channel test is made. With the 10TLF relay operated, and no channels available, the operate path for the FMP relay is diverted by the PRLL relay to the STP relay. STP relay operated, with the sequential release of GC relay and operation of STP3 relay initiates the junctor step. Subsequently, STP1 relay releases, relay STP2 operates, JGO relay releases and JG1 relay operates.

D.0153 STP3 relay operated with PRLL relay operated and MFK relay normal operates the STPA relay. STPA relay operated locks around the contact of MFK relay, and places resistance battery on the MPP lead toward the line link connector. This MMP lead connects to the MPP relay in the line link preference control circuit of the mate line link frame.

MPP relay operated has two functions:

(a) It closes its contact in the work preference chain of that preference control circuit in order to seize the auxiliary line link frame when preference is gained.

(b) It closes solid ground toward the line link connector for the line link frame associated with that preference control circuit. If this particular line link frame should have its connector closed to some other marker, solid ground on the MFK lead will operate the MFK and MFL relays in that marker, opening the operate path for the STPA relay, and preventing that marker from attempting "mate" operation.

D.0154 When preference is gained in the mate line link frame preference control circuit, the auxiliary line link frame associated with this pair of line link frames is seized. Relays operate in this frame to cut through the select magnet leads from the line link frame to the select magnets of the auxiliary frame junctor switches. The choice of select magnets will be controlled by the horizontal group relays in the line link frame junctor switch.

Seizure of the auxiliary line link frame will transmit resistance ground on the MFK lead through the connector to the marker. MFK relay alone operates, and with STPA relay operated, completes the operate path for the TK relay.

During this time, the STP2 and JG1 relays, as described in paragraph D.0152, in combination with the PRL relays operated, have selected the opposite half of the trunk switch, and reoperated those relays, such as the PNR pattern normal relay, in the junctor step and control circuits in preparation for channel test. With the operation of the TK relay, channel test is again made.

If no channels are available on this second attempt, a failure to match results and the marker recycles.

D.0155 When a marker is in the process of completing a call, and its MFK and MFL relays operate as described in paragraph D.0153 (b), the marker will be prevented from attempting mate operation. If the call can be completed using the first junctor sub-group, it will do so as normal. The other marker (attempting mate operation) will wait until it has work preference before it can complete.

Should this marker attempt a junctor step because of a channel busy condition, the combination of STP3 and MFL relays operated will force a failure to match, and subsequent recycle by operating the FMP relay. This action is necessary because use of the mate line link frames junctor sub-group is denied. Each line link frame of the pair would wait for release of the other line link frame in order to use its junctor sub-group if recycle was not forced in this manner.

Marker recycle causes this marker to drop its line link and trunk link connectors, and allows the other marker to gain preference, seize its mate line link frame and complete the call.

The condition is also possible that two markers will attempt mate operation with each one of a pair of line link frame at such a time that the STPA relays in both markers operate. In this case, operation of the MPP relays in each of the associated preference control circuits returns solid ground to operate the MFK and MFL relays in each marker. With the STP3 relay also operated in each marker, both will experience a failure to match and recycle.

D.0156 The seize frame timer is started each time the marker attempts "mate" operation, and is cancelled upon seizure of the auxiliary line link frame.

D.016 The DCT circuit is modified to compensate for the extra hold magnet provided by the auxiliary junctor switch. The bias resistors of this circuit are now arranged for the following conditions.

*LLFR Size	TLFR Size	+DCT Ckt Resist.		Number of Hold Magnets	
		Primary	Secondary	LLFR	TLFR
P	STF	0	0	2	2
NP	STF	0	0	3	2
P	PR	5	0	2	3
NP	PR	5	0	3	3

* P - Paired Line Links +DCT1 Relay Normal

N.P. - Non-Paired Line Links

D.017 For the mate frame lockout conditions described in paragraph D.0155, a traffic register is provided to peg the number of times that STP3 and MFL relays operate together during paired line link operation. This register will provide data on the occurrence of this lockout condition to indicate the relative success of "mate" operation.

D.018 Traffic registers are also provided in partially paired line link offices for total and sample channel peg counts, total originating and total incoming peg counts, originating matching loss and incoming matching loss peg counts.

D.02 60 classes of service with two groups of 30 customer classes on a one-out-of-thirty basis are now provided in the marker. A supplementary class-of-service frame has been added to provide the 60 additional S- relays, 60 additional SC-terminals, and two additional class-of-service sorts.

D.021 The marker may have a maximum of sixty classes of service. The sixty classes are composed of two groups of thirty classes, one in group "A" and the other in group "B".

D.022 Dial Tone Marker Functions

The class-of-service of a customer line is assigned on a vertical file basis on the line link frame. A vertical file, within a vertical group, may be assigned to any one of thirty classes of service, however, a vertical group may be assigned to only one group of thirty classes, i.e., group "A" or group "B". Therefore all vertical files in a vertical group will be in the same group of thirty classes of service. If an office is equipped with a maximum of thirty classes of service, all classes will be in the same class-of-service group.

D.0221 After the marker has identified the vertical group and vertical file of the calling customer line, the CSO-29 relays will test for the presence of ground on the CSO-29 leads to the line link frame. When sixty classes of service are provided the CGA and CGB relays will test for the presence of battery on the CGA and CGB leads to the same frame. The CGA or CGB relay operated will indicate to the marker and the originating register the group of thirty classes of service that is associated with the calling subscriber line, while one CSO-29 relay operated will indicate the class-of-service associated with that line.

The operation of a CSO-29 relay will extend a ground to operate either the MCN, MAN, 2P, CN, or AO relay. These relays indicate to the originating register and to the marker the type of subscriber lines associated with a particular class-of-service. Therefore, when an office is equipped with sixty classes of service, the CSO-29 relays must be associated with the same type of subscribers lines in both group "A" and group "B". (i.e., if CSO-9 - Grp "A" is assigned to MAN lines, then CSO-9 - Grp "B" must also be assigned to MAN lines.)

D.0222 The class-of-service of a customer's line is forwarded to the originating registers when a CGA1 or CGB1, a CTO-2, and two CUO/7 relays are operated by the CGA or CGB and a CSO-29 relay.

Option JC and App Fig. 177 provides the apparatus and wiring required for this feature.

D.023 Completing Marker Functions

After the originating register seizes the marker, ground is extended to the marker to operate a CTAO-2, and two CUO/7 relays when a maximum of thirty classes of service are provided. When an office is equipped for additional class-of-service screening (App Fig. 175 and 176) the ground extended to the marker from the originating register will operate a CTBO-2 relay in parallel with a CTAO-2 relay, and will operate two CUBO/7 relays in parallel with the two selected CUO/7 relays. In addition, when sixty classes of service are provided (option JE) the originating register will extend a ground to operate the CGA1 or CGB1 relay.

The operation of one CTAO-2 relay and two CUO/7 relays, and the CGA1 relay when provided, will ground the one associated cross-connection terminal "SWCO-29". Ground on one of this group of "SWCO-29" terminals will operate one or more of the SOO-44 and S100-144 relays that are cross-connected to the "SWC-" terminal. When the additional class-of-service screening facilities are provided (App Fig. 175 and 176), the operation of a CTBO-2 relay and two CUBO/7 relays, and the CGB1 relay when provided, will ground two "SWCO-29" terminals. Each of the grounded "SWC-" terminals will operate one or more of the S300-359 relays associated with the selected SWC- terminal. The two selected SWC- terminals will be in different groups of "SWCO-29" terminals. Three groups of SWCO-29 terminals may be provided in the marker.

D.024 The class-of-service frames provide a maximum of ninety U-type S- relays. SOO-44 relays and S100-144 relays are provided on CS frames "0" and "1" respectively. The wiring pattern for these relays requires the provision of one S- relay per group of twelve SC- points for each class-of-service in the office. For example: a marker arranged for thirty classes with thirty-six SC- points requires ninety S- relays. As shown in Note 410, the twelve fixed contacts on each S- relay is multipled to the twelve fixed contacts on four other S- relays. The make contacts are wired to individual terminals SO-11.

D.0241 The supplementary class-of-service frame provides an additional sixty S- relays for each of four markers. These relays are furnished in single mounting plate units. Each unit has twelve, wire spring relays and two D- type terminal strips. The control winding terminal of each relay is wired to an SW- punching on terminal strip TA. The twelve make springs of each relay are wired to twelve service treatment punchings SO-11, on terminal strip TM. The twelve fixed springs on each relay are wired in multiple to three other relays on the same unit and the common multiple is connected to twelve punchings designed USCO-11 on the D type terminal strips. Thus the wiring pattern on each unit gives three sets of four relays and each set of relays have twelve USC- punchings on the unit terminal strip.

D.0242 The marker is arranged for 96 service common, SC-, punchings (Note 427). Sets of twelve SC- points, that is, SCO-11, SC12-23, and SC24-35 are connected on a job basis to the required number of S- relay contacts on CS frames "0" and "1" with frame local cable. The S- relays are assigned in groups of five to provide the required number of relays for each set of twelve SC- points.

D.0243 On the supplementary class-of-service frame sets of twelve SC- points, that is SCO-11, SC12-23, etc, SC84-95 are connected by means of loose wire to the unit terminal strips, USC- points. Loose wire is also assigned on a job basis to multiple the required number of S- relays in groups of four relays to each set of twelve SC- points.

The SC- points on the supplementary CS frame may be assigned in a manner similar to SC- point assignment on CS frames "0" and "1". That is, the SC- points for which the treatments are variable from class to class,

with no particular pattern, must be handled on an individual treatment basis; one S- relay must be furnished per class per twelve SC- points. The SC- points for which two or more classes are always treated alike may be served on a group part basis; one relay may represent several classes for this group of SC- points. See Table I, B28.

D.03 The marker has been changed to provide a record of selected traffic conditions (trap circuit). Apparatus figure 178 and options JJ, JK and MA provide this feature, and option HA, the original wiring rated "Mfr Disc." for this feature.

D.031 A record of selected traffic conditions can be made with peg count registers and with the trouble recorder for traffic study or maintenance purposes. The EX relay is a high resistance, polar relay that may be used to detect the particular traffic conditions. The EX relay has a high resistance winding to minimize the interaction between the EX relay and the existing circuits; however, when 130V circuits, polar relay circuits, or timing circuits are considered as detection points the circuits should be carefully analyzed for possible interaction.

D.032 The EX relay closes through the EX lead to the Jack, Lamp and Key circuit to operate a register for each EX relay operation on both 1st and 2nd trial marker usages. An EX key is provided in the Jack, Lamp and Key circuit that may be closed to cause a record to be made with the trouble recorder in addition to the peg count record. The record will be identified with an EX punch on the card. When the EX relay operates with the EX key closed an auxiliary relay in the marker, EXA, will be operated to force a start to the trouble recorder. The EXA relay can be operated only on 1st trial operations.

D.033 If the condition to be detected occurs before the trunk link frame has been seized, such as the operation of a particular route relay, the start lead, ST-, to the trunk link will be opened by the EXA relay and the marker will block. The trouble recorder will be called in to make a record and the call may then complete on a 2nd trial basis.

D.034 If the condition to be detected occurs after the trunk link has been seized, but before a channel has been selected, two possibilities exist:

(a) Without the EX and EXA punchings cross connected the call will complete on 1st trial, but the record will not be taken until the point of marker disconnect. The EXA relay forces the operation of the transfer start relay, TRS, which diverts the operating ground for the D1S1, 2 relays, to operate the TRR relay. The TRR relay forces a record by the trouble recorder and gives a normal release.

(b) With the EX and EXA punchings cross-connected, a record by the trouble recorder is called for immediately after detection of the selected traffic condition and the call may then complete on a 2nd trial basis.

An example of this condition could be a failure to match or a reorder indication.

D.035 If the condition to be detected occurs after a channel has been selected the call will complete on 1st trial and the operating ground for the D1S1, 2 relays will be diverted by the TRS relay to force a record to be taken by the trouble recorder, and to give a normal release. An example of this condition could be the selection of a particular channel relay.

D.04 The marker is modified to handle four (4) additional originating register groups. Figure 174 and option JN provide the apparatus and wiring for all six register groups for use with the combined marker. Figure 174 and JM option provide this feature for use with the dial tone marker for all six register groups.

The functions of the original two register group relays D, and MF, - option JL (rated Std) are replaced for this feature by the D and MF relays provided by Figure 174.

Each register group can serve either a dial pulse or multifrequency network. Assignments shall be made on a local office basis.

Relays DTRO-3, Figure 174, have been added for the additional four register group routes.

Relay XDR has been added to provide cross-detection of the six register group relays.

D.041 The marker has also been changed to provide vertical pattern treatment of vertical groups to provide flexibility in the assignment of vertical groups to register groups. Relays VPO-2, Figure 174, have been added for this purpose, and in addition relay VPT is added for vertical pattern test from the master test frame control circuit.

D.042 In the combined marker, the originating register routes for the six originating register routes have been completely separated from the completing marker ROO-04 routes. The ROO-04 relays are no longer used for register routes when six originating register groups are provided.

Contacts of the MF, D, and DTRO-3 register route relays replace the function of the R- route relay contacts.

Also included in Figure 174 are the FCDO, FCD10, FCMO, FCM10, FCRO-3, and FCR10-13 relays which replace the function of the FC- and FCA- relays in cutting through the FTC- frame test leads. Six new FTC- leads associated with these six originating register group FC-- relays have been added to the trunk link circuits for testing for idle register groups.

In the dial tone marker, contacts of the MF, D, and DTRO-3 relays of Figure 174 replace the functions of the original MF and D relay contacts.

D.043 Leads TG2-5 have been made available for the additional register groups. In the combined marker, the corresponding TG2-5 relays are enabled from the DTRO-3 relays.

D.044 Traffic register leads PCRO-3 and BRO-3 have been added for channel and register busy peg counts respectively for the additional register groups. The traffic register circuitry for the D and MF register groups, has been rearranged to simplify and to conform to the added wiring.

D.045 All information for cross-connections has been added to the 400 series notes.

D.05 The marker has been changed to allow the ST- lead to the automatic monitor register and sender circuit to be cut through only on dial tone, dial pulse calls. Option JX provides this arrangement, option JP (rated "Mfr Disc."), the original wiring.

D.06 The marker has been modified to provide the overload announcement feature which allows dial tone calls to be set up to announcement trunks during emergency traffic conditions. Figure 179, option JW and option JS (combined marker) or JT (dial tone marker) provide this feature. Six originating register groups must be provided in order to have this feature. Option JU provides the wiring when the overload announcement feature is not provided.

Routing to an announcement trunk is provided on a vertical group basis by assignment of vertical groups. The purpose of the feature is to reduce traffic by informing calling customers of an emergency condition in order to ensure access to the originating registers for certain customers not assigned to the overload announcement. However, a second failure to match, or trunks busy condition is necessary in order for the marker to route to the overload announcement trunks.

D.061 For this feature, FTK1 relay (option JW) has replaced FTK1 relay (option JV) to provide additional contacts. Relay CKG8 has been added, (option JW), also to provide additional contacts.

The register memory check circuit has been modified to keep the GTL relay operated after RK1, RK2, and RK3 relays have operated, and certain checks on the register memory are by-passed when the marker routes to the overload announcement trunks in which case there will be no register attached.

D.062 Rerouting Attempted Calls to Local Overload Announcement During Dial Tone Delays

Operating the AN key on the master test frame jack bay activates the local overload announcement facilities in the office. The operated key cuts in the announcement trunks, starts the announcement machine, and operates the AN relay in all dial tone or combined markers in the office which in turn lights a guard lamp on the MTF jack bay.

D.063 Marker Operation

All originating registers busy, or all channels busy causes a failure-to-match condition in the marker. If the marker gets a failure-to-match, and the AN relay is operated, the AN1 relay will be operated in addition to the normal functions performed in the marker. In the case where all registers are busy, the AN1 relay operates after the TBTA timer has operated. With the all channels busy condition, a failure-to-match after a second junctor retest is made will cause the AN1 relay to be operated. In either of the above situations, if the AN relay was not operated the marker would route advance.

D.061 The AN1 relay operated will transfer the vertical group indication (normally used for vertical pattern control) towards the ANC or NANC relays dependent on the cross-connection assignment. The contacts of the DT4 relay, along with the contacts of the MLF relay prevents any interruption if the vertical pattern cross-connections are in use, resulting in the release of one of the register group route relays (D,MF, or DTRO-3).

D.0632 If the NANC relay operates, the operating ground for the AN1 relay will be extended to the RAV1 relay, and cause a route advance as in normal operation.

D.0633 With the ANC relay operated, this same ground is extended to the RCY and RCY1 relays forcing a second recycle. At the same time, ANC operated, operates the RCY6 relay, the AN2 relay, and if in the combined marker, the AN3 relay.

RCY6 relay provides additional contacts during recycle to prevent selecting a route until the recycle function is completed.

AN2 and AN3 relays operated transfers and enables the TG- and TB- leads assigned for the announcement trunk, and connects all other TG- and TB- leads to the cross-detection relays. In the combined marker this is done by forcing the release of all TG- and TB- relays.

AN2 relay operating also transfers the operating ground for the FC-- relays toward the FCAN terminal which is assigned to one of the FCRO-3 relays for the announcement trunk route.

When the recycle function is completed, and the FM failure to match or TBTB trunk busy relay releases, SNK relay goes normal, the AN, RCY6, RCY, and RCY1 relays release, the announcement route is enabled by closing the assigned TG- and TB- leads, and operating the assigned FCR- relay.

The AN1, AN2, and AN3 relays are locked operated through contacts of the AN relay, which in turn is controlled by the vertical group VGTO-13, and VTK1 relays.

D.064 To provide flexibility in the assignment of announcement trunks, TG2-8 leads and TB1-5 leads are made available.

All cross-connecting information is contained in the 400 series notes.

D.065 The marker will attempt to set up the call to an announcement trunk in a manner similar to setting up a call to a register. However, if all announcement trunks are busy, the marker will get a failure-to-match and will route advance to disconnect.

The marker will make a peg count (PCA) each time the marker finds all announcement trunks busy. A peg count (BA) will also be made each time the marker finds all announcement trunks busy.

The master test frame has access to the AN2 relay to allow testing of the announcement feature in an office.

D.07 Provision has been made for a TOG peg count on a per marker basis. The marker has been arranged for this peg count each time it sets up a tandem, or toll outgoing call. Option JR provides the wiring for this feature. Option JQ (rated "Mfr Disc.") provided the original wiring.

D.08 The marker has been modified to provide the XSC lead from the number group connector to the master test frame connector in order to show the "XSC" trouble punch mark.

D.09 The marker has been changed to rate the PDD, PDM, FAD, FAM, LTD, LT, and FMP leads "Mfr Disc." Option JZ has been added for this purpose.

D.10 The marker has been changed to allow the remote office test control circuit (ROTC) to connect to the marker through the master test frame connector, and directly to the marker via the CGA, CGB, TTO-19 trunk test leads, and the MT3 and MT9 leads.

The remote office test control circuit (SD-27727-01) is part of a facility for selecting and making transmission and operational tests on certain trunks of a remote unattended office.

D.11 Miscellaneous changes have been made to agree with WECo "T" drawings.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2312-ELO-JWB-CR

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. Changed and Added Functions

A.1 The marker cabling has been changed to provide increased flexability for prefix "0" and "1" screening.

A.2 The marker is changed to provide PBX recycle on first failures to match.

B. Changes in Apparatus

B.1 Added

Relays

Desig	Code	Option	App Fig.
FLGA	U1396		172
RCY5	U1326		172
TER5	U1396		172

Networks

Desig.	Code	Option	App Fig.
FLGA	185A		172
RCY5	185A		172
TER5	185A		172

D. Description of Circuit Changes

D.1 The "A" section index is corrected to show the same issue number as listed on each sheet of the drawing.

D.2 The fusing for App Fig. 169 is changed from fuse B17 to C53 to agree with WECo drawings.

D.3 The marker is arranged to provide PBX recycle on first failures to match of calls to PBX lines. The existing circuitry routes first failures to match to overflow. The existing wiring is made "KZ" option (rated Mfr Disc.), and the new feature is provided by "JA" option and App Fig. 172 (rated std.).

D.4 The CADs are changed to provide increased flexability in the assignment of B- terminals for offices arranged for prefix "0" and "1" screening. The B- terminals can now be cross-connected to route series "RS-" terminals or to class of service "SC-" terminals. The "RS-" points and "SC-" points associated with the "B-" points may be assigned in groups of twelve (12) by the individual office. However, the combined total of "RS-" and "SC-" points associated with "B-" point cannot exceed 36.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2312-JBS-JWB-LH

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 To arrange the marker to set up trunk test connections in conjunction with the Trunk Test Register Circuit.

A.2 To allow the users of DTWX and/or WADS services access to trunk groups without requiring that prefix "1" access code be used.

A.3 To allow use of the CL3 lead when ANI and/or person-to-person operation is provided.

A.4 To indicate 101 ESS calls to the transverter.

A.5 To provide separate trunk groups for line link intercept.

B. CHANGES IN APPARATUS

B.1 Added Relays

MT25 - U67 - KT Option - App Fig. 67
MT26 - U1375 - KT Option - App Fig. 67
AIOD - U1080 - KY Option - App Fig. 169
NIOD - U1150 - KY Option - App Fig. 169
ITC - U226 - App Fig. 170
ITCA - U1371 - App Fig. 170
ITNA - U940 - App Fig. 170
ITNB - U940 - App Fig. 170
AVK2 - U59 - App Fig. 171

Removed Relays

AVK2 - U86 - App Fig. 171

Added Networks

AIOD - 185A - KY Option - App Fig. 169
NIOD - 185A - KY Option - App Fig. 169
ITC - 186A - App Fig. 170
ITCA - 186A - App Fig. 170
ITNA - 186A - App Fig. 170
ITNB - 186A - App Fig. 170
AVK2 - 185A - App Fig. 171

Removed Networks

AVK2 - 1/2 177C - App Fig. 171

D. DESCRIPTION OF CIRCUIT CHANGES

The following applies to the completing and combined markers:

D.1 Option KT is added in order to arrange the marker to operate with the Trunk Test Register. The route relay delete and arbitrary digit information to the sender is changed on test calls made to a test trunk at the distant office.

Two relays, MT25 and MT26, are added to give the new information. MT25 only operated indicates delete 3 with no arbitrary digits. Both MT25 and MT26 operated indicates delete 6 with no arbitrary digits.

This new test feature can be initiated from the Trunk Test Register or the Master Test Control Circuit.

D.2 Option KU is added in order to allow the users of certain special classes, such as WADS or DTWX not providing digit "1" access codes, access to routes requiring prefix "1" codes.

D.3 Option KR is added in order to allow the Master Test Frame to use lead CL3 when ANI and/or person-to-person is provided. Previously, the necessary MT relay contact was part of KE option, provided only for person-to-person. Part of option KE is shown as option KS rated "Mfr Disc."

D.4 Option KY is added in order to provide a sender TP indication for PBX's arranged for automatic identified outward dialing (101 ESS).

D.5 The marker is changed to provide for separate line link intercept trunk groups.

Relays ITC, ITCA, ITNA and ITNB are added to provide this feature. Cross-connection terminals are added to allow the selection of an intercept trunk group as indicated by the source of the call. App Fig. 170 is rated STD.

D.6 There is a possibility that relay XT5 may be operated falsely by a locked

relay in the out senders as the marker is released. Relay AVK2 is changed to provide additional contacts. These added contacts serve to open the NOB, OBS leads upon marker release. App Fig. 171 and option OR are added and rated STD.

D.7 Option KW is added in order to split the load on Fuse C23 when App Fig. 48 is used and 3 out of 5 is received in the H-T-U digits. The previous fusing is shown as option KV and rated "Mfr Disc."

D.8 Option KX is added to provide a 1/4 amp fuse for ringing supply voltage, for use with a ringing machine fused at 1/2 amp. A 1/2 amp fuse for ringing supply voltage is used if the ringing machine is fused over 1/2 amp.

D.9 Paragraph 32 of note 102 has been expanded for use of the coin zone feature with WATS, WADS, etc.

D.10 Changes are made in CADs 65 and 78 to agree with WECo drawings. Two terminal designation changes are made in CAD 197.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2312-LRY-JWB-VW

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

A. CHANGED AND ADDED FUNCTIONS

A.1 The marker is changed to allow customer dialing of person-to-person calls by means of a prefix "0" digit preceding 7 or 10 digit calls.

A.2 Provisions are added to transmit additional class of service information to the outsender for person-to-person service.

A.3 The marker is changed to provide better control of the BD lead to the traffic register circuit when the marker encounters an all originating register busy condition.

A.4 Facilities are provided in the marker for using four tip party and four ring party screening points and coin zone dialing at the same time.

A.5 Provisions are made for ANI and LAMA operation in the same marker.

A.6 The marker options are changed to allow the CDRO-9 relays to be used as denied or diverted route relays without providing coin zone operation.

A.7 An option is provided to prevent a relay race condition between the NOB and TOB relays on trunk service observed CAMA calls.

A.8 The marker is changed to prevent seizure of a sender when the ABC code contains 3 out of 5 digits.

B. CHANGES IN APPARATUS

B.1 Added Relays

Desig	Code	Option	App Fig.
LT2	U1325	KE	167
CL7	U1374	KE	168
CL8	U1374	KE	168
TPA	U1315	KM	M

B.2 Superseded

Desig	Code	Option	App Fig.
CLP	U899	YL	67
SLK1	U1356	KN	34

Superseded By

CLP	U211	KE	67
SLK1	U1355	KO	34

B.3 Added Networks

Desig	Code	Option	App Fig.
LT2	185A	KE	167
CL7P	½ 177C	KE	168
CL7S	½ 177C	KE	168
CL8P	½ 177C	KE	168
CL8S	½ 177C	KE	168

B.4 Superseded

Desig	Code	Option	App Fig.
CRK1	½ 177C	YM	67
CRK2	½ 177C	YM	67
CRK3	½ 177C	YO	67
CLK3	½ 177C	YO	67

Superseded By

Desig	Code	Option	App Fig.
CRK1	186A	KE	67
CRK2	186A	KE	67
CRK3	186A	KE	67
CLK3	186A	KE	67

B.5 Added Resistors

Desig	Code	Option	App Fig.
CL7	KS-13492-L1-1500	KE	168
CL8	KS-13492-L1-1500	KE	168

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

C.1 Requirements for the following relays have been changed:

11X
DRRO-1
FGK
HMT
TC7
TCHO-9

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The marker is arranged for prefix zero operation. This permits the customer to dial 7 and 10 digit "person-to-person", "charge to a third number", and "special" calls directly to the called number.

D.2 An operator is required on all prefix zero calls. Upon learning from the customer the type of service desired, the operator will operate a class of call key to establish the proper charging rate. When the desired party at the called station answers, the operator starts the timing of the call and releases from the connection.

D.3 When prefix zero operation is provided option KE and App Fig. 166 and 168 are required. Prefix zero operation requires that prefix "1" options also be provided, therefore App Fig. 167 and a second App Fig. 166 must be provided.

D.4 Three relays (LT2, CL7 & CL8) have been added as part of option KE. The LT2 relay is used for screening and local translation of the "0" prefix person-to-person codes. The CL7 and CL8 relays are provided to indicate "0" prefix coin and non-coin classes to the outsender. Class relay CL8 indicates a prefix "0" coin call routed via a common trunk group with prefix "1" calls.

D.5 Option KB is added to insure the presence of ground on the BD lead to the traffic register circuit for a sufficient length of time to score a traffic register when the marker encounters an all originating registers busy condition.

D.6 To prevent a relay race condition between the NOB and TOB relays on trunk service observed CAMA calls, option KO (rated Std.) is provided. Previous apparatus and wiring is now shown as option KN is rated "Mfr Disc."

D.7 Paragraph 58 of note 102 is changed to permit both ANI and LAMA operation in the same marker.

D.8 The SWP-SWP3, SWR-SWR3, and SWT-SWT3 punchings used for class of service grouping have been restored to the original arrangement allowing all of these punchings to be used for two party screening. The KM option provides for this arrangement and allows the coin zone dialing feature to be provided at the same time. Option KL constitutes the previous wiring. Both option LK and KM are rated Standard.

D.9 Option KK is provided to prevent false operation of the NOB or OBS relay when wire spring senders are provided. Option KJ (MD) can only be used with "U" type senders.

D.10 The CDRO-9 relays are now a part of option KP and may therefore be used as additional denied or diverted route relays with or without coin zone dialing. Option KP (Std.) was previously a part of App Fig. 156.

D.11 A correction is made in markers arranged for digit "1" access codes by providing option KC when option NZ is not provided.

D.12 The marker is changed to prevent false operation of an access code screening relay during originating type test calls by the addition of option KG. Option KF (MD) represents the previous wiring.

D.13 Option KI is provided to prevent peg count of the FM register on test calls. Option KH which was part of option NX is rated "Mfr Disc."

D.14 App Fig. 161 which is used to intercept unauthorized customer 10 digit DDD calls and App Fig. 166 which is used when prefix "0" or "1" code screening is provided. The apparatus units were fused from the misc. relay rack. The units will now be fused from the marker to make the marker busy if the fuses are operated.

D.15 The CAD Fig. (105, 107, 151, 152) are changed to allow the AR 0/7 and BR 0/7 leads to be connected to the master test frame connector when code conversion is not provided and CAMA is provided.

D.16 The following miscellaneous changes are made:

A. With a Record

1. The CAD information is changed to include contacts 1 and 2 top of the AN1S relay to conform with Western Electric drawings.
2. Paragraph 53 is added to note 105 with information to prevent false number groups seizure on unauthorized 10 digit calls.
3. Information is added to the circuit requirement tables for the FGK, 11X, TC7 and DRRO-1 relays.

B. Without a Record

1. A portion of option SX is corrected on the SD.

2. Coordinates of the RYT lead on sheet B98 is corrected.

3. Part 10 of note 400 is corrected.

4. The ELT relay contact protection network is changed from "1" to "4".

D.17 To prevent seizure of a sender when the ABC code contains 3 out of 5 digits an option, KQ, has been provided.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2312-JBS-JWB-HB

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED OR ADDED FUNCTIONS

A.1 To arrange the combined or completing marker to function with originating register serving pushbutton stations for peg count differentiation.

A.2 To screen by means of a digit one access code calls to extra charge destination.

A.3 To ensure return of line busy instead of overflow tone to MR lines on calls to busy free numbers.

A.4 To provide a short cycle gate control for line link marker connectors.

B. CHANGES IN APPARATUS

B.1 Added Relays

ORD - U1396 - App. Fig. 165
ORM - U1396 - App. Fig. 165
FACA - U1354 - LT option-App. Fig. 165
FGK - UA137 - LX option -App. Fig. 83
BSO-5-AF506 - App. Fig. 166
ELT - U1325 - App. Fig. 167
AMB1 - U717 - option LZ - App. Fig. 73

B.2 Superseded

Relay 11X-U1368-LW option-App. Fig. 38
Relay TC7-U1345-LW option-App. Fig. 38

Superseded by

11X-U1325-LX option-App. Fig. 38
TC7-U1325-LX option-App. Fig. 38

B.3 Added Networks

The following 185A networks were added:

ORD & ORM - App. Fig. 165
BSO-5 - App. Fig. 166
ELT - App. Fig. 167
FGKP & FGKS - LX option - App. Fig. 83
AMB1 - LZ option - App. Fig. 73

B.4 Added Resistors

FGK - 18BH resistor - LX option
App. Fig. 83

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Pushbutton Station sets are being introduced for use in the No. 5 systems. To facilitate maintenance and to provide control of peg counts on a DP or MF basis, App. Fig. 165 and option LT have been added.

D.2 A new feature is added to prevent false charges resulting from customers dialing in error to an extra charge destination. An access code (the digit one) must prefix the called number to such destination whether for 7 or 10 digit calls. App. Fig. 166 and 167 are added and option LX is added replacing the previous wiring and apparatus now shown as LW option (M.D.) When option LX is used, option F must be provided; and it should be noted that a cross on the FG- leads will not result in a trouble record punch XFG. KA optional wiring is provided when less than 10 trunk link frames are used and access codes are used to bypass the contacts of relay "FG1" (F option) which will be inoperative under this condition.

D.3 Option LZ is added to provide a short cycle gate control for the line link marker connectors. Lead AMB is added to the line link marker connector or to the master traffic control circuit. Previous wiring is shown as option LY and is rated M.D.

D.4 Option LV is added to prevent overflow tone from being returned instead of line busy tone on intra-office calls originated from a measured rate class of service to a free number when the called line is busy. The previous wiring is shown as option LU rated M.D.

D.5 Miscellaneous Changes

D.51 The following sheets were changed to correct errors and to clarify information. No records are maintained for these changes since the WECo drawings are correct.

A. Sheet B15 - A multiple symbol shown at 11B of OSG-9 relays. This has been moved to the lead designated by NL option since the multiple is not required for option NM.

B. Sheet B41 - Information box coordinates corrected to read 115C8.

C. Sheet B49 - Information box at location G3 has been changed to show correct information.

D. Sheet B58 - FCG relay - tolerances added to primary and secondary winding resistance values. FCG relay contacts were shown incorrectly and have been corrected.

E. Sheet B59 - FCG relay - tolerances added to primary and secondary winding resistance values. Contacts 6 and 77 of relay LTR were shown as a "break" symbol and have been corrected to show a "make" symbol.

D.6 In note 104 (sheet D10), reference has been made to the use of App. Fig. 138 and RZ wiring when wire spring outsender connectors are used. This permits lighting of the in use lamps for the connectors.

D.7 In note 104 reference has been made to note 105 for the RX option added on Issue 38D so that coordination with NX option is required for failure to match peg counts.

D.8 Par. 93 of note 103 has been changed to include reference to CAMA operation for App. Fig. 99.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2312-ASM-JWB-LL

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 A change is made to prevent false scoring of the plant register when a marker which has been made busy is tested. LS option - STD - is added replacing LP option - "Mfr. Disc." - which was previously not designated or shown.

D.2 In Note 101 reference is made for the CTOB relays - App. Fig. 151 - to be associated with ground D2. This change is made without record as the WECo drawings are correct.

D.3 A change is made to associate the "151" option ground for the operation of the SOR relay with ground supply C2. Previously this ground had inadvertently not been assigned to any supply. This change is made without record as the WECo drawings are correct.

D.4 The following changes are made to clarify notes and to correct drafting errors on previous issues. Therefore, no record is being maintained for these changes.

D.41 1L (FE1) and 1U (FE0) are shown connected to ground. Previously these were shown connected to battery.

D.42 Trouble recorder panel symbol is added for the CSO-29 leads on sheet B4.

D.43 The winding of the MCA relay of the line link on sheet B6 is shown connected to 48V instead of ground.

D.44 Trouble recorder panel symbol is added for the VTK1 lead on sheet B9.

D.45 Trouble recorders punch symbols are added for leads AD, AD', OD, OD', ORC0', ORC1', and ORC2' on sheet B16.

D.46 On sheet B27, multiple note associated with the SBO-8 terminals formerly read "As spec in Note 416".

D.47 Trouble recorder punch symbols are added for leads FG0, TF0-7, MAK1, and FS0-19 on sheet B34.

D.48 On sheet B50, spelling corrected for trunk link circuit.

D.49 On sheet B59, the CONB resistor is shown connected to +130V battery instead of ground and tolerance ±1% added.

D.50 On sheet B88, coordinates C1, a superflous line has been eliminated between 2B of BNA and 3 & 4T of DCIA.

D.51 On sheet B103, location for lead RCY1 formerly read "92E6".

D.52 On sheet C46, location added for contacts 6, 7, 8B of FMP relay.

D.53 On sheet C62, location for contact 1 of INT1 relay formerly read "10968".

D.5 CAD190 is changed to agree with WECo drawings.

D.6 CAD's 86 & 171 is changed to rate designation of the DT lead "Mfr. Disc."

D.7 CAD74 is changed to provide a multiple of the DCI and VCI leads between wire spring and nonwire spring markers in the same group.

D.8 39 sheets are added. These are sequence charts to facilitate training and maintenance.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2312-ASM-JWB-RE

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The line concentrator feature added as an after date Standard on Issue 38-D is removed.

B. CHANGES IN APPARATUS

B.1 Apparatus changes due to the removal of the line concentrator feature are as follows:

REMOVED APPARATUS

Desig.	Code	Option
LCT	U1348 relay	App. Fig. 157
LCT	1/2 177C network	App. Fig. 157
TRSA	U459 relay	App. Fig. CE
TRSA	U1319 relay	App. Fig. CF

ADDED APPARATUS

Desig.	Code	Option
TRSA	U459 relay	App. Fig. 79

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The line concentrator feature added as an after date Standard on Issue 38-D is removed from the marker without record as the W.E.Co. did not provide the feature for any No. 5 office.

The lead index for the AM, CB, CHK, D, LCT, LIT, NTT, TER1, TRC, and TST leads to the "Preference Control and Make-Busy circuit for Line Link and Marker Connector Control circuit for Remote Line Concentrator is removed.

Also the LIT lead to the "Line Installation Test Control circuit" (Line Link Frame) and the TRC lead to the "Master Test Frame Connector circuit" are removed.

App. Figs. 157, CE, and CF are removed from the figure index.

Options MZ, LA, LB, LC, and LD are eliminated from all records.

D.2 Marker Cross-Connection

The marker cross-connection is changed to alleviate the condition whereby the MS-relays associated with the wire-spring relay type connector preference control circuit may not operate due to the switchboard cable resistance. The change constitutes a rearrangement of cabling between various wire-spring relay type marker connector frames and the marker. The connection between groups of connectors on a frame as well as between marker connector frames is determined by their marker preference.

THE FOLLOWING APPLIES TO DIAL TONE AND COMBINED MARKERS:

Separate groups of five connectors located on the same LL marker connector frame will be connected together at the connector frame terminal strip. Connection between LL marker connector frames will be made as before at the marker's MAK-, MCK, and MSK- cross-connection terminals.

THE FOLLOWING APPLIES TO COMPLETING AND COMBINED MARKERS:

The cabling change provides one set of start (ST-) and end (E-) leads for each type of connector (ORMC or IRMC). The extension of the preference chain between connector frames (of the same type) is accomplished by use of cross connection facilities provided on the connector frame. Connection between the last ORMC and the first IRMC will be made as before at the marker's MAK-, MCK-, and MSK- cross-connection terminals.

D.3 Note 102 Par. 124 and Note 105 Par. 39 are changed to clarify MA and MO options in anticipation of future use of these options with other features.

D.4 The marker is changed to prevent a trouble recorder card on a PBX allotted call after the selected number group is seized and all lines are found busy. The change consists of insuring the operation of the RCY2 relay with the introduction of LP option.

Option LP Std. replaces Option LO Mfr. Disc.

Additions are made in Notes 104 and 105 covering Options LO and LP.

D.5 A TSR1 check lead to the outgoing sender connector circuit is required when the sender connector circuit sender part uses wire spring relays and when some but not all of its associated sender groups are arranged for AMA or ANI.

Option LQ (Std.) is arranged to provide the TSR1 lead.

Additions are made in Notes 104 and 105 covering Option LQ.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2312-JC-REH-DW

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The marker is arranged to provide Automatic Number Identification, ANI, of the calling customers line for CAMA accounting of extra charge calls.

B. CHANGES IN APPARATUS

B.1 Added Apparatus

Relay			Networks	
Fig. No.	Desig.	Code	Desig.	Code
162	DRRO,1	280E		
163	CL6	UB32 or U1372	CL6P-6S (1)	177C
164	ANI	UB15 or U1355	ANI	1/2, 177C
	ANIS	U1370	ANIS	1/2, 177C

D. DESCRIPTION OF CIRCUIT CHANGES

Automatic Message Accounting, AMA, is desirable for extra charge calls originated by local customers.

At present Local Automatic Message Accounting, LAMA, arrangements are available for recording the charge details for individual and 2-party lines when the volume of traffic justifies the extra equipment investment.

With low calling rates an alternative arrangement known as Centralized Automatic Message Accounting, CAMA, is available. With CAMA, calls requiring charging are trunked through some central point containing the call recording equipment. All information pertaining to the call except the calling number is pulsed from the No. 5 office to the central point. An operator at the central point obtains the calling number on each call.

With the development of ANI, Automatic Number Identification, the operation will be fully mechanized and an operator will not be required. The use of ANI should simplify the procedures for the customer, provide greater billing accuracy, and increase the speed of the connection.

The circuit operation and apparatus required for an ANI call is very similar to an AMA Subscriber Outgoing Call. The main difference is that an ANI call does not require Message Billing, Recorder Number, Code Pattern, or Number Structure information.

In order to reduce circuit options and new equipment J code lists, the marker circuitry was arranged to reuse many of the AMA options. In a few cases excess apparatus will be provided.

An ANI call will be from a calling customer within the No. 5 office and reach the marker from the originating register. The marker will translate the office code and ground some code point to operate a route relay. As shown in Notes 420, 421, and 422, an ANI call may operate a route relay directly or operate a diverted route relay DRRO,1 which in turn operates a route relay. In any case the R punching of any route relay associated with an ANI route will be connected to the ANIS punching to operate the route series, ANIS, relay.

The route relay cross connections will be as follows:

1. TB-, TG-, RA-, CR-, DL- - Use Standard Information.
2. CP-, MBS- - Omit cross connections.
3. CL- - The CL- information requires sending on the CL3 and 5 leads. This is a new combination and requires the use of an added CL6 relay.

The new information as covered on Sheet D21, Part. 18 is as follows:

CL- to CL4S. ANI Operator Identification of Calling line. Send on CL5 lead to sender.

CL- to CL6S. ANI, Automatic Identification of calling line. Send on CL3 & 5 leads to sender.

Marker operation for an ANI call is essentially the same as a SOG, Subscriber Outgoing Call, with Sender operation, SON, and Local AMA charging. The only difference is the amount of information transmitted to the sender. Apparatus provided on AMA options but not required for an ANI call will be cancelled by the operation of the ANI relay.

A summary of the information that the marker transmits to the sender for the various type of calls is as follows:

SOG Call With Sender Operation

Type Information	No AMA	Local AMA	ANI	Note
Called Number	Yes	Yes	Yes	
Arb. Dig.	Yes	Yes	Yes	
Send 11	Yes	Yes	Yes	
Delete	Yes	Yes	Yes	
Class	Yes	Yes	Yes	
AMA	No	Yes	No	1
Calling Line Location	No	Yes	Yes	
TP, RP	No	Yes	Yes	
OBS, NOB	No	Yes	Yes	
TVT, SC.	No	Yes	Yes	
Recorder No.	No	Yes	No	1
Mess. Billing Index	No	Yes	No	1
Code Pattern	No	Yes	No	1
Number Structure	No	Yes	No	1

Note 1. Functions cancelled by the operation of the ANI relay.

All other headings, no change.

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

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

C.1 To correct miscellaneous drafting errors made on previous issues, the requirements are changed for the following relays:

A0,1,2,4,7
AST
BST
NOB
OBS
RCTB
TSC6-9
XARN
XBRN

C.2 To correct miscellaneous drafting errors made on previous issues, the requirements are changed for the following electron tubes:

PTO-9
PTL

D. DESCRIPTION OF CIRCUIT CHANGES

This circuit is reissued on a detached contact basis to facilitate training, maintenance and future design. This circuit, being issued on a detached contact basis, removes the need for the OS's and U-type marker relay "shorts" per X-75367. Issue 41-D agrees in every respect with Issue 40-B except as outlined in the following:

D.01 A new "C" section is added which includes all apparatus appearing on the circuit drawings. The numerical designations of apparatus figures are identical to the circuit figure numbers shown on Issue 40-B. Circuit notes describing apparatus options which were shown on previous issues are eliminated. The information contained therein is now included in this section as part of the figure in which the options appear. These were former Notes 106, 108, part of 110, 111-114, 117, 118, 122 and 135.

D.02 A Figure Index is added to the "A" sheets listing apparatus figures in numerical and alphabetical order. This index includes the CAD's and unit equipment drawings involved with each figure as well as the type of marker associated with each figure. This information was formerly included in the supporting information for unit equipment. Unit equipment drawing J28755G is added for Apparatus Figure 147 since it was missing on previous issues.

D.03 The Option Index is expanded to include the associated marker in which the options appear.

D.04 Apparatus Figure 80 and its asoociated information is omitted since this figure was never manufactured.

D.05 The FARO punching is shown on FS22 and the FCM. FCD and FCRA00-04 punchings are shown on FS29. The cross-connection information for these punchings was previously included in Note 400 but the punchings themselves were never physically shown on the circuit drawings.

D.06 The following changes are made to conform with the manufacturing "J" drawings.

(a) Options on contact protection networks are changed as follows:

Network	App. Fig.	Change From	Change To
CLK3	67	YL	YO
CRK3	67	YN	YO
DLK3	67	YS	YK
TGS	67	YS,YO	YO

(b) Remove option from the following contact protection networks. These options apply to the wiring portion only.

Network	App. Fig.	Remove Option
HMT1	31	RH, RI
MAK	73	OG, OH
NOB	BH	OY
OBS	BH	OY

(c) Correct the code of the XLH capacitor shown in Apparatus Figure 30 from 137QA to 437QA.

D.07 The following capacitors were erroneously shown as contact protection networks on previous issues.

Capacitor	App. Fig.
JCKO	29
LBTB	30
LBTF	30
SAO-9	77
TO-19	26
TLO-19	29
XFTN	91
XFUN	91

D.08 A drafting error in the wiring of the TNA4 and UA4 relays shown in Apparatus Figure BQ and the NT5 relay shown in Apparatus Figure 78 is corrected.

D.09 The following former notes are changed in the process of converting the issue into FS form.

(a) Contact protection Note 103 replaces former Note 104.

(b) Record Note 104 replaces former record Notes 103(A) and 103(B). The new note includes identical information except for references in the "See Note" column which was changed to agree with the new note numbering arrangement and to include a record of a code change made on Issue 28-B for contact protection networks changed from the 181 type codes to the 177 type codes.

(c) Coordinating information shown in the former 100 and 300 series notes is now shown in new Note 105. Note 105 specifies coordinating option requirements for the marker and has incorporated the following notes formerly shown on Issue 40-B: Notes 105, 107, 109, part of 110, 115, 116, 119-121, 123-134, 311, 332, 336, 339, part of 340, 345, part of 348, 353, 357, 360, 361 and 365.

(d) Record Note 106 replaces former record Note 103(C).

(e) The 200 series notes formerly shown in the "C" series of notes are now located in the "D" section.

(f) Apparatus Figures 101(A) and 101(B) are omitted from the schematic circuit drawings and are now shown as part of new Note 415.

D.10 The circuit requirements for the CDKO,1 relays are added since these requirements were omitted from previous issues due to a drafting error.

All other headings, no change.

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 In the combined and completing marker, the TCB peg lead to the Trunk Link Connector circuit is rated Mfr. Disc. with the introduction of the five wheel peg count register for totalizing originating calls (TOR peg).

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

C.1 The requirements have been changed for the following relays:

CAA	PCN
MO-9	PNC
MBSO-9	PPX
NCCN	TCCN
NCNC	TCNC
OPE	TGS1-3
	TRR

D. DESCRIPTION OF CIRCUIT CHANGES

The following changes apply to combined or completing markers

D.1 Traffic Register Facilities

The marker is changed, with the introduction of the five wheel peg count register to rate the TCB peg count lead to the Trunk link and Conn. circuit Mfr. Disc.

On Issue 38-D traffic register features were changed to simplify traffic administration of the equipment by obtaining certain call data on a per marker basis instead of on a frame basis and other call data on office totalizing registers. However, the control of the traffic register over the TCB lead through the Trunk Link and Conn. circuit was not to be removed until a five wheel peg count register was made available for totalizing originating calls (TOR). This register is now available.

Option LE Mfr. Disc. covers the TCB lead. Option LF Std. is added as a false option for record purposes.

Additions are made in Notes 102 and 103B. Note 136 is added covering Options LE and LF.

D.2 Relay Race Conditions

D.21 Failure to release the OST1 relay on outsender type calls, when the marker recycles or route advances may occur if the recycle or route advance takes place before the OST2 relay operates to remove locking ground for the OST1 relay. To insure release of the OST1 relay, its locking circuit is placed under control of a make contact of the RYC relay which releases on recycle or route advances.

Options LH Std. and LG Mfr. Disc. are added to Figures 32, 33 and 89.

Paragraph 32 is added to Note 134 to include Option LH.

Note 103B is changed to include Options LG and LH.

D.22 Failure to release the TK and CHT relays on junctor retests during SOG (subscriber outgoing) class calls may occur and cause the marker to falsely seize a busy channel on the next junctor test. To prevent seizure of a busy channel, the marker is changed to open the locking circuit of the TK relay when the GC relay releases between junctor tests. The TK relay then properly conditions the CHT relay for channel busy timing.

Option LK Std. is added and supersedes existing Option SM which is being rated Mfr. Disc.

Additions are made in Notes 103B and 103C covering Options SM and LK.

D.3 The marker is changed to permit marker relay OR to operate when the register grounds lead FAC. This change is needed for DDD (FACD) dialing where trunk service observing is not required and where the markers are equipped with Figure BC. Where DDD operation is employed, the originating register grounds the OR lead for local codes (7 digits) and the FAC lead for area codes (10 digits). Figure BC, which does not have lead FAC is changed to accept ground over the FAC lead for area codes.

This change is required when wire spring originating registers or markers are added and DDD dialing is employed.

Options LJ Std. and Option LI A&M are added. Additions are made in Notes 103B and 134 to include Options LI and LJ.

D.4 Miscellaneous Changes

D.41 The following changes are made to clarify notes and correct drafting errors on previous issues. Therefore, no record is being maintained for these changes.

Cross connecting information for the SWTI terminal of Figure 43 is removed from Figures 11, 13, and 15 and Note 400.

Location information for Option NS is added in the Option Index.

Reference to Figure BX, in Paragraph 15 of Note 134, is corrected to read Figure BK.

In Note 412, the 1TR lead and 1TR relay designations are corrected to read 1TB.

In Figure BL, the 11 top contact of relay OBN is correctly shown as a make contact.

In Note 103B, reference to Paragraph 119, Note 102 is added for Option MF.

Information in Notes 102, 103, and 134 concerning the use of options for CAMA, Coin Zone and the use of a separate check of the TP circuit to trunks and senders are rearranged to permit uniform treatment in a future issue which will convert the drawing to the new type FS form.

CAD Fig. 395 is modified for Coin Zone.

D.42 The following changes use options created on prior issues since they are to be included in the initial shop production of those features.

D.421 Misdialed Double Area Codes

Options MQ and MR were added on Issue 38-D to intercept double area codes on DDD calls. The following changes are also required.

The INT make and INT1 break contacts are removed from the CHT biasing circuit to prevent the premature operation of the CHT relay on misdialed calls.

An MT14 relay break contact is removed from the operating circuit of the FAC1 relay to permit testing the DDD feature.

D.422 Force Advance of Trunk Link Frame Memory

Option MU was added on Issue 39-B to force the advance of the marker's trunk link frame memory circuit in those cases where the trunk link frame cannot be seized.

A contact on the SP relay is placed in the operate circuit of the TFK1-2 relays which control the advance of the frame memory feature. This SP contact prevents improper recycling of the SF timer when a request is made for a trouble record.

The following changes apply to combined, completing, and dial tone markers.

D.5 Line Concentrator

The lead index for the AM, CB, CHK, D, LCT, LIT, NTT, TER1, TRC, and TST leads is changed to agree with the new Pref. Cont. and Make-Busy Circuit for Line Link and Marker Conn. Cont. Ckt. for Remote Line Concentrator.

All other headings, no change.

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The marker is arranged to force the advance of its trunk link frame memory circuit when it cannot obtain possession of a trunk link frame. This prevents the repeated reselection of a trunk link frame in trouble.

A.2 The marker is arranged to prevent a premature release of the JT relay on a dial tone call, under heavy traffic conditions. A premature release of the JT relay could occur when the marker works with the faster operating wire spring line link and trunk link circuits.

A.3 The marker is arranged to prevent an XJC failure on a call to a PBX group having lines on various line link frames in a 6 or 7 trunk link frame size job.

B. CHANGES IN APPARATUS

B.1	Removed	Option	Replaced By	Option
Advance of the trunk link frame memory. Option MU(Std.) Option MT(Mfr. Disc.)	(SDT)U554	MT	(SDT)U694	MU

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

C.1 Test Note 2 is added for the HMS relay (see par. 6.4).

D. DESCRIPTION OF CIRCUIT CHANGES

THE FOLLOWING APPLY TO DIAL TONE, COMBINED OR COMPLETING MARKERS.

D.1 The marker is arranged to force the advance of the trunk link frame memory circuit. This change prevents markers from blocking in case a trunk link frame cannot be seized because the emergency transfer feature for the trunk link frame preference relays has not functioned.

The change consists of using the LDT and SDT timing relays to operate the TFK1 relay which removes the locking ground from the frame memory circuit. The operated TFK1 relay prepares the marker's trunk link frame preference circuit for advancing beyond the frame in trouble.

Option MU(Std.) consisting of one changed U type relay is added replacing option MT(Mfr. Disc.)

Paragraph 29 is added to Note 134.

Note 135 is added.

D.2 Fusing information is changed in Note 101(A) to rearrange battery fuse loading on Fuse A29.

Under trouble conditions, external to the marker, the A29 fuse may become overloaded and operate. Such troubles as a permanent ground on the register or sender reed switch locking circuits may cause the operation of an excessive number of FT-, FU-, HG-, or VF- marker relays associated with the A29 fuse.

Option MW(Std.) replaces option MV(Mfr. Disc.) and splits the A29 fuse load as follows:

A29 fuse: HG- and VF- relays
A55 fuse: GTU and GTL2 relays
B4 fuse: FT- and FU- relays

Paragraph 31 is added to Note 134.

D.3 Miscellaneous Circuit Note changes are made as follows:

External circuit coordinating Note 365 is rated (Mfr. Disc.) and its information is included in marker coordinating Note 134.

In Note 103(B), reference to Note 365 is removed and replaced by reference to Note 134.

THE FOLLOWING APPLY TO DIAL TONE OR COMBINED MARKERS.

D.4 The fast operating wire spring line link and trunk link circuits introduce a relay race, on a dial tone call under heavy traffic conditions which results in a premature release of the JT relay. The failure occurs because the HMS relay may release before the GTL relay

releases. The HMS relay closes a shunting ground toward the primary winding of the JT relay. The locking circuit provided by the tertiary winding of the JT relay cannot be closed until the GTL relay releases.

The released JT relay prevents the operation of the trunk link frame J- and T- hold magnets. This produces a no "SL" trouble recorder card.

Option MY(Std.) consisting of a wiring change is added replacing option MX (Mfr. Disc.)

Test Note 2 is added for the HMS relay. It specifies that contact 2-3T shall break before contacts 1-3B break.

Paragraph 30 is added to Note 134.

THE FOLLOWING APPLY TO COMBINED OR COMPLETING MARKERS.

D.5 In a 6 or 7 wire spring trunk link frame size office, a call to a PBX group having lines on various line link frames may cause an XJC failure by the momentary operation of two G- relays on the trunk link frame.

This failure is caused by a shift in the line link frame information when a PBX recycle occurs. A change in this information results in a change of JG- relays in the marker and the operation of a new G- relay in the trunk link frame. When the original G- relay in the trunk link frame is shunted down, it may release before the new G- relay is operated. The momentary operation of two G- relays causes an XJC failure.

The condition is corrected by releasing the GC relay when the initial line link frame information is released. This causes the trunk link frame G- relay to release quickly under an open circuit condition.

Figure CI (Std.) consisting of a wiring change, is added replacing Figure CH (Mfr. Disc.)

Paragraph 28 is added to Note 134.

Ground fusing information in Note 101(F) is changed to include Figure CH as part of the B11 ground, the G2 lead ground of Figure CI as part of the B12 ground, and the G1 lead ground of Figure CI as part of the C5 ground.

All other headings, no change.

D.6 Lead designations between figures are changed to conform with the shop drawings as follows:

Between Figs.	Change Lead	To Read
34,70	OSG	OSG1
J,53	CKR	CKR2
31,33,36,53,69	"	"
32,33	"	"
36,53	CKR1	CKR3
33,53	"	"
32,33	"	"
32,33	CKR	"

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The marker is arranged to provide traffic register features which will simplify traffic administration and obtain call data on a per marker basis. The new features are required for use with the traffic usage recorder.

A.2 The marker is arranged to work with line concentrator circuits.

A.3 The marker is arranged to provide for transmitting and checking TP (tip party) information to the sender and trunk separately and independently.

A.4 The marker is arranged to provide operator or machine announcement intercept for vacant or denied codes received over incoming trunks restricted to terminating service.

A.5 The marker is arranged to provide a coin zone dialing feature to permit dialing by coin customers to areas where the charge is greater than the initial deposit.

A.6 The marker is arranged to intercept double area codes on DDD calls.

A.7 The marker is arranged to provide local office completion of XOX/X1X area type calls.

B. CHANGES IN APPARATUS

Apparatus changes for the various features are as follows:

		ADDED APPARATUS (UNLESS OTHERWISE SPECIFIED)		
	FEATURES	DESIG.	CODE	OPTION
B.1	Traffic Register Data on a Per Marker Basis Options MA, MO (Std.	CHA1 CHA1 TBTC	U675 Relay 185A Network U675 Relay	MA MO
	Option NW (Mfr. Disc.) Remove	CB2	1/2 177H Network	NW
B.2	Line Concentrator	LCT LCT	U1348 Relay 185A Network	Fig. 157
	Figs. 157, CF (Std.)	TRSA	U1319 Relay	Fig. CF
	Fig. CE (Mfr. Disc.) Remove	TRSA	U459 Relay	Fig. CE
B.3	Transmit and Check TP (tip party) Information to the Sender and Trunk Separately and Independently	TPS TPS	U506 Relay 185A Network	Fig. 158
	Fig. 158 (Std.)			
B.4	Incoming Trunk, Denied and Vacant Code Intercept Treatment	DCI DCI VCI VCI	U351 Relay 185A Network U351 Relay 185A Network	Fig. 159
	Figs. 159, 160 (Std.)	DCIA DCIA VCIA VCIA	U940 Relay 185A Network U940 Relay 185A Network	Fig. 160
B.5	Coin Zone Dialing	CZ CZT CZ CZT CDRO-9 CDRO-9	U506 Relay U506 Relay 1/2 177H Network 1/2 177H Network U340 Relay 185A Network	Fig. 156
	Fig. 156 (Std.)			

FEATURES	DESIG.	CODE	OPTION
B.6 Intercept of Double Area Codes on DDD Calls Fig. 161 (Std.)	FAC1 FDO FD1 FEO FE1 INT INT1	AF132 Relay 1/2 AK6 Relay 1/2 AK6 Relay 1/2 AK6 Relay 1/2 AK6 Relay 1/2 AK6 Relay 1/2 AK6 Relay	Fig. 161

D. DESCRIPTION OF CIRCUIT CHANGES

THE FOLLOWING APPLY TO DIAL TONE, COMPLETING OR COMBINED MARKERS:

D.1 Traffic Register Facilities

The marker is arranged to provide traffic register facilities which will simplify traffic administration and obtain call data on a marker basis instead of on a frame basis. The feature is required for use with the traffic usage recorder.

Options MA, MO and NX (Std.) are added replacing option NW (Mfr. Disc.).

Option MS (Std.) is added for the combined marker only.

The B22 battery fusing information in Note 101A is changed to include relay CHA1.

The C2 ground supply in Note 101(f) is changed to include Figure 52.

Paragraph 124 is added to Note 102 and paragraph 25 is added to Note 134.

Note 104 is changed to show the CB2 network "Option NW" (Mfr. Disc.).

Peg count leads added for this feature are:

For the dial tone and combined markers:

DESIG.	FUNCTION
PCD	Peg Count Dial Pegs on a Dial Tone Orig. Register connection after channel selection
PCMF	Peg Count Multifrequency Pegs on a Multifrequency Orig. Register connection after channel selection
BD	Busy Dial Originating Register Peg Pegs when an "All Busy" Dial Orig. Register signal is received
BMF	Busy Multifrequency Originating Register Peg Pegs when an "All Busy" Multifrequency Orig. Register signal is received
FMP	Failure to Match Peg Pegs on a Failure to Match on a Dial Tone Connection
TPC	Total Peg Count Pegs any marker seizure

For the combined and completing markers:

TOR	Total Originating Peg Count Pegs on any call from the Originating Register Marker Connector when a linkage between a line link and trunk link frame is established
TCH	Total Channel Peg Count Pegs whenever the Marker establishes a linkage between the line link and trunk link frames.
TIP	Total Incoming Peg Count Pegs when the Marker completes a channel from an incoming trunk to a called line on a terminating class call
TCO	Total Office Overflow Pegs when a customer originated call is routed to a tone trunk

Peg Count leads shown as option NW (Mfr. Disc.) are as follows:

For the dial tone, combined and completing markers:

PCL	Test calls to line link frames
PCM	Marker test calls

For combined and completing markers:

INC	Incoming Peg Count on a trunk link basis
TER	Incoming Peg Count on a line link basis

D.2 Line Concentrator

The marker is arranged to work with the line concentrator.

The LCT relay is added to close leads which are used as control points between the line concentrator and marker.

When the line link and connector circuit establishes a connection between the marker and line concentrator; battery over the LCT lead operates the LCT relay. The marker returns ground to the concentrator over various leads to indicate the general class of call being served.

When the marker selects a channel, ground on the CHK lead is returned to the concentrator operating its CHK relay.

Before the concentrator can release the LCT relay must release to permit a marker disconnect.

Figures 157 (Std.), CF (Std.) and option MZ (Std.) are added replacing Figure CE (Mfr. Disc.) and option MC (Mfr. Disc.)

Option LD is added for completing markers only and replaces option LC (Mfr. Disc.)

Option LB (Std.) is added for dial tone and combined markers only and replaces option LA (Mfr. Disc.)

Option LC (Mfr. Disc.) is added for combined and completing markers only.

Paragraph 121 is added to Note 102 and Paragraph 27 is added to Note 134.

Note 104 is changed.

THE FOLLOWING APPLY TO COMBINED OR COMPLETING MARKERS:

D.3 Separate Check of "TP" Circuit to Trunks and Senders

The marker is arranged to provide for transmitting and checking TP information to the sender and trunk circuits separately and independently.

This change is required in the marker for coin zone dialing operation and to provide a uniform RPK trouble record punch indication when wire spring markers are added to U type offices.

With this change, the sender TP information is removed from the TPK relay and is associated with relays TPS and TGS2. The sender RP information lead is changed from the CLG relay to the TGS3 relay and relays TPS or RPK now operate as a 1 out of 2 check to insure that only one of the TP or RP leads is grounded.

The change requires a new interpretation of the RPK punch. Formerly, the TP and RPK punches indicated the condition of the TP and RP leads respectively. The RPK punch now indicates a 1 out of 2 check of the TPS and RPK relays.

Figure 158 (Std.) and options MI, MJ and ML (all Std.) are added replacing option MH (Mfr. Disc.)

Paragraph 121 is added to Note 102 and Paragraph 26 is added to Note 134.

The C15 battery fuse in Note 101(A) is changed to include Figure 158.

The C4 ground fuse in Note 101(F) is changed to include Figure 158.

Note 104 is modified to include this change.

D.4 Vacant and Denied Code Intercept

The marker is arranged to provide denied or vacant code intercept treatment for calls received over incoming trunks arranged for terminating service only. These calls may be routed to a switchboard, desk or machine announcement over a trunk appearing on the line link frame.

A vacant code is an unused or nonworking office code within an area numbering plan and a denied code is an office code to which some originating customers or specific incoming trunks are denied access because of rate or class discrimination.

At present, incoming trunks with only trunk link frame appearances return reorder on vacant or denied codes. As a result of this change, this arrangement is rated A&M Only and vacant or denied codes are set up to intercept trunks on the line link frame to permit operator or machine announcement treatment.

Denied or nonworking codes that enter the marker group over incoming trunks (in some cases screened through the S- relays) are either cross connected to operate the DCI relay or the VCI relay. The operation of the DCI or VCI relay will operate the BN or RI relay respectively, as well as the TER1, 2 and 3 relays which mark this call as a terminating call. The BN relay with the DCI relay operated will operate the DCIA relay. The RI relay with the VCI relay operated will operate the VCIA relay. The call then progresses as a terminating call that has encountered a blank number or regular intercept translation from the number group. The marker transmits the new DCIA or VCIA line number information to the number group and obtains in return the link frame location of the new intercept trunk.

Figures 159 (Std.), 160 (Std.) and Option MF (Std.) are added replacing Option ME (Mfr. Disc.)

Figure 159 includes leads "DCI" and "VCI" added to the traffic register circuit.

Cross-connecting terminals DCI, VCI, DCA, VCA, DC-ST, VC-ST, DC-HB, VC-HB, DC-TB, VC-TB, DC-U, VC-U, IND and INV are added at unused terminal block positions.

Fusing information is added to Note 101 to include Figure 159 in the A37 battery supply and A10 ground supply, and Figure 160 in the C12 battery supply and C2 ground supply.

Notes 104, 400, 402, 407, and 409 are changed.

D.5 Coin Zone Dialing

A coin zone dialing feature is added which permits dialing by coin customers to areas where the charge is greater than the initial deposit. The translation and screening arrangement for coin zone dialing operates one of the CDR- relays which permits the marker to select a special coin trunk and attach a sender with the proper pulsing information. The operated CDR- relay will operate a CZ or CZT relay in series with one of the trunk class relays to prime the trunk with 1 of 8 charge conditions over the CN, TC or TP lead. The trunk then calls in an operator and displays on lamps the proper charge for the call. The operator informs the customer of the charge involved and when deposited, signals the sender to start pulsing. The call is then completed.

The trunk may be direct, to a tandem office, or may be a junctor type trunk and tandem through the No. 5 office to gain access to the outgoing trunks serving non-coin traffic.

With the coin zone dialing feature, a diverted route relay is required for each combination of coin zone trunk group and charge conditions and the number of trunk class indications is increased from 4 to 8. To minimize route relay requirements, separate contacts on the coin zone diverted route relays are used to operate route and route series relays.

An AMA record may be required on some coin zone calls. In order to meet this requirement, marker changes are required to permit simultaneous transmission and check of TP (tip party) information to the sender and trunk.

Figure 156 (Std.) and Options MK and MP (Std.) are added. To provide simultaneous TP information to the sender and trunk, Figure 158 (Std.) and Option MI (Std.) must also be furnished.

Cross-connecting terminals CZ, CZT, CDRO-9, ZRSO-9, ZRTO-9 and CRRO-9 are added at unused terminal block positions.

In Note 101(F) ground supply information is added for Figure 156.

Paragraphs 22 and 24 are added to Note 134 and Paragraph 125 is added to Note 102.

Notes 104, 400, 402 and 403 are changed and Note 413 is added.

D.6 Misdialed Double Area Codes

The marker is arranged to intercept double area codes on D D D calls.

When an area code followed by a second area code or an operator code is misdialed by a D D D customer, the call is directed to an operator who may permit its completion. This introduces accounting center problems.

On a misdialed D D D call, a second area code or an operator code is recognized by a 0 or 1 in the D or E register.

The marker changes consist of operating an FAC1 relay when relay FAC operates. Detection of the misdialed D D D codes is obtained by operation of the FDO, FD1, FEO or FE1 code relays. When one of these detection relays operates, the INT relay is operated and causes the marker to route advance to a special intercept trunk group on the trunk link frame. The intercept routes should have the NSO relay operated. Normal route advance from the special intercept trunk should be to the common overflow route.

Figure 161 (Std.) and option MR (Std.) are added replacing option MQ (Mfr. Disc.)

Paragraph 122 is added to Note 102.

In Note 101(A) and 101(F), battery and ground supply information is added for Figure 161.

Notes 104, 400 and 405 are changed.

Cross connection information Note 414 is added.

Cross-connecting terminals INT, INT1 and INPB are added at unused terminal block positions.

D.7 Local Office Completion of XOX/X1X Area Type Calls

The marker is arranged to complete XOX/X1X area type calls that enter a CAMA marker group over incoming CAMA trunks from an office in another numbering plan area and require completion to offices in the CAMA marker group. This feature may also

be used for calls from one area to another where both the calling and called office are served by the same marker group.

Options NY (Std.) and NZ (Std.) are added.

Paragraph 113 in Note 102 is changed and Paragraph 126 added.

D.8 Miscellaneous Changes

The following changes clarify notes, correct drafting errors and bring the circuit in line with the shop product.

Part 20 of Note 400 provides cross connecting information for subscriber to subscriber intermarker group trunk operation for CAMA.

Reference to "coin zone" in the coin reroute cross-connecting information is removed in Notes 102, 400, 402 and 409.

Lead B2, inadvertently omitted on a previous issue, is shown between Figure 32, Sheet B20 and Figure 31, Sheet B19.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2312-SHM-REH-MC

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The marker is arranged to prevent a false release of the ringing switch hold magnet on no-test calls when working with wire-spring trunk link connectors. Failures result in a marker work time-out.

A.2 The marker is arranged to complete 1XX toll codes from incoming CAMA trunks and to dispose of vacant codes in the completing stage of a CAMA call.

A.3 The marker is arranged to prevent the operation of the JSQO-5 relays from crosses or ground troubles that occur in the master test frame connector. Such troubles may disable several markers.

A.4 The marker "D" Section is arranged to include cross-connecting information in a new "400 Series" note.

B. CHANGES IN APPARATUS

B.1 Apparatus associated with new Figure CD (Std.) has been added consisting of:

Relay (MT8A)	U338
Resistance (MT8)	18AG

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

C.1 The requirements have been changed for the following relays:

NOB
OBS
RGTO-1
RGT2-5
STF

D. DESCRIPTION OF CIRCUIT CHANGES

The following changes apply to combined or completing markers and shall be applied in the field as required:

D.01 The addition of wire-spring trunk link frame connectors to an office introduces a relay race in the no-test trunk. The faster releasing wire-spring multicontact relay in the trunk link connector may open the operating circuit to the ringing switch hold magnet before a holding circuit can be maintained upon release of the no-test trunk F relay. This results in a marker work time-out.

The following changes introduced in the marker prevent these conditions by delaying the release of the trunk link frame multicontact relay.

(a) Option "NV" (Std.) replaces Option "NU" (Mfr. Disc.)

(b) Reference is added in Note 365, Paragraph 9 requiring the use of Option "NV" with wire-spring trunk link connectors.

(c) Change is made in Note 103 (b).

D.02 A feature is added in the marker to provide vacant code treatment on CAMA (completing function) calls when a vacant code signal is received from a foreign area translator. In most cases the vacant codes are translated as such in the originating stage of a CAMA call or in the CAMA message billing equipment. However, this feature is used where the foreign area translator furnishes trunk routing information for areas other than those served by the CAMA message billing indexer. In addition provision is made to complete 1XX toll codes from incoming CAMA trunks. The "A" digit, one, is connected to give reorder when 1XX toll codes are not required during the CAMA function (incoming use) or is connected to the 3-digit code translator when 1XX toll codes are to be served.

(a) Option "MN" is rated Standard and replaces "MM" rated Mfr. Disc.

(b) Cross-connection terminals "CMS," "CAT1," "CA1-0" and "CA1-1" are added to Figure 151.

(c) Cross-connecting information for the "ROA2" terminal is changed to include access to the "CA1-0," "CA1-1" and "CMS" terminals. The "RCGOO-29" terminal information is changed to include access to the "CMS" terminal.

(d) Changes are made in Notes 102 (b).

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D.03 When the line verification test circuit is used, a change is required to shift the position of the "PTK" cable lead between the marker and master test frame connector to correlate a similar shift in the master test frame connector.

Cabling diagram information has been changed in Figures 228 and 307 to relocate the "PTK" lead from contact 25 of the MTFC relay A2 to contact 56 of the MTFC relay C1. This shift permits use of the lead in the connector for both testing on line verification test as well as trouble recording.

D.04 Wiring changes associated with the operating circuit of the MBK5 and NOB relays are introduced to permit markers equipped with Figure BH to add AMA features when also equipped with Figure BI where trunk service observing features have not yet been furnished. These changes are:

(a) Option "MB" rated A&M Only is added.

(b) Changes associated with Figure BH are designated "MB" Option.

(c) Change is made in Note 103 (b).

(d) Reference is added in Note 134, Paragraph 14 requiring the "MB" Option when the AMA feature is added to markers equipped with Figures BH and BI.

D.05 A feature is added to prevent putting several markers out of service due to a single trouble in some external circuit such as the master test connector. Such a trouble causes several odd or even JSQ-relays to falsely operate over the "JSQ-" leads to the master test frame connector. The changes introduced in the marker consist of opening the "JSQ-" leads to the master test frame connector in all cases except on those test calls which require control of the JSQ- relays.

The changes introduced in the marker to prevent this condition are:

(a) Figure CD rated Standard is added and includes an added MT8A relay. Figure CC rated Mfr. Disc. is added as a record of old wiring.

(b) Change is made in Note 103 (b).

(c) Fusing information is changed to include Figure CD in the A8 ground supply of Note 101 (F) and the A31 battery supply of Note 101 (A).

D.06 Cabling diagram information has been changed in Figures 265, 369 and 394 to correct the marker drawings and provide a path to close the Out. Sdr. "AV" circuit when pulse conversion is required without AMA. This change was made to conform with existing shop drawings.

D.07 The TBT timer is disabled on CAMA (function) calls. Where the timer is permitted to function, a trouble which develops may cause the route advance circuit to be brought into play. Although the circuit blocks the trouble record cards are difficult to analyze.

The correction specifies a CAMA route relay in the 10-19 "R" relay group with its "FC" terminal cross connections omitted as covered in Note 400, Part 33.

D.08 The following changes are made to clarify notes and to correct errors in the marker SD drawings.

(a) In Figure 101B covering 20-wire spring connectors per frame, wire-spring connector numbers are removed from the intermediate line link marker connector frame.

(b) Cross connection terminal designations shown on Figure 118 are changed from "ARN," "BRN," "CRN," "CVR," "CVB" and "CV" to "ARN00-99," "BRN00-99," "CRN00-99," "CVR00-99," "CVB00-99" and "CV00-99" respectively.

(c) Contact protection network at 7T (CV00-99) relay of Figure 118 has been redesignated (CV00-99).

(d) Cross-connecting information for the "CVS" terminal shown on Figure 119 is changed to read "To CVB00-99."

(e) Cross-connecting information for the "RB" terminal shown on Figure 53 is changed from "CVB" to "CVB00-99."

(f) Cross-connecting information for the "FAR00-99" terminals shown on Figure 140 is changed from "CV" to "CV00-99."

(g) Cross-connecting information for the "PSC0-23" terminals shown on Figure 135 is changed from "CVR" to "CVR00-99."

(h) Cross-connecting information for the "TSC0-9" and TSC10-45 on Figures 110 and 112 respectively is changed from "CVR" to "CVR00-99."

(i) In Note 318 cross-connecting information for the "RA" terminal is changed from "CV" to "CV00-99."

(j) Note 348 has been changed to conform with the changes for the "ARN," "BRN," "CRN," "CV" and "CVS" terminals and redesignated "ARN00-99," "BRN00-99," "CRN00-99," "CV00-99" and "CVS00-99" respectively.

(k) In Note 103 (b) reference to "QA" Option is added as (Std.) for completing markers for Issue 25-D.

(l) The "ORC" and "ORC0-2" terminals of Figure 151 have been added to Note 364 to explain the cross connections required.

(m) Note 364 has been changed to correct drafting errors.

(n) Figure 376 has been changed to correct cabling diagram information and bring it into agreement with SD-26025-01, Issue 4-B.

(o) "ROA" lead to the master test frame and connector circuit is added to Figure 43 to correct a drafting error when the circuit was reissued for Issues 33-B, 34-D and 35-D.

(p) The "ODT" lead to the master test frame connector circuit is removed from Figure 151. This lead is unnecessary and is not provided for in the master test frame connector circuit.

(q) Note 103 (b) is changed to correct errors and add various reference notes. These changes are:

1. In the "See Note" column reference is added to Note 339 for Options "WC," "UE," "Figure 102 or 109" and "VZ" shown changed on Issue 17-D.

2. Reference to Note 340 is added for "OC" Option and Notes 101 (A) and 120 for the "OD," "ON" Options shown changed on Issue 27-D.

3. Reference to Note 363 is changed to Note 337 and reference to Note 365, Paragraph 7 is added for the "OM" Option shown changed on Issue 29-D.

4. Reference to Notes 134, Paragraph 3 and 365, Paragraph 1 for the "VF," "VG" Options shown changed on Issue 18-B.

5. Reference to Note 365, Paragraph 8 for Figure CA and CB shown changed on Issue 33-B.

6. Reference to Note 128 for Figures BR and BS shown changed on Issue 35-D are added.

7. Reference to Figure 138 and "RZ" Option is added to the "If job records do not specify" column.

The following changes apply to combined, completing or dial tone markers and shall be applied in the field as required:

D.09 All cross-connecting information is shown in a new "400 Series" note included in the "D" Section.

(a) To make this change without going into the circuit drawing where the cross connection terminals appear and refer to the new Note 400, reference to Note 400 is added at the various 300 series notes.

(b) The following notes have been rated Mfr. Disc. and reference to new Note 400 added: 301-303, 305-310, 312-319, 323, 325-331, 333-334, 337, 338, 340, 342-344, 346-352, 354, 355, 358, 359, 362-364.

D.10 Coordinating information formerly shown in 100 and 300 series notes is now shown in ~~two~~ separate added notes. Note 134 is added and consists of information for coordinating options within the marker. Note 365 is added and consists of information for coordinating options affecting both the marker and external circuits.

The following notes have been rated Mfr. Disc.: 105, 107, 119 thru 121, 123 thru 128, 131, 133, 339, 340 and 357.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2312-MK-REH-CJ

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The circuit is reissued to show the sheet numbers used prior to Issue 35-D as well as the new sheet numbers which were applied on Issue 35-D. Each sheet whose number was changed on Issue 35-D has its former number added. The sheet index on sheets A1-A5 has a column added for former sheet numbers. In addition, a sheet-number conversion table is added on sheet A9.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2312-RKMcA-REH-JLC

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The combined or completing marker is arranged to complete centralized automatic message accounting (CAMA) calls for non-AMA customers is No. 5 Offices or cutomers in distant offices which are not arranged for AMA service.

A.2 The marker CAMA equipment is mounted on a supplementary bay serving four markers.

A.3 The combined or completing marker is arranged to receive the CAMA class information over two leads through the incoming register marker connector.

A.4 The combined or completing marker is arranged for CAMA trunk service observing.

A.5 The combined or completing marker is arranged for CAMA testing.

A.6 The marker SD- drawing sheets are indexed and changed to an individual sheet reissue basis. Indexing is as follows:

"A" Series - Sheet Index, Lead Index, Supporting Information, and Options Used Table

"B" Series - Schematic Drawings

"D" Series - Ckt. and Information Notes

"F" Series - Ckt. Reqts., Timing Req. and Vacuum Tubes Req. Tables

"G" Series - Cabling diagram Figs. and Equipment Notes

A.7 The circuit is rated (Mfr. Disc.) for combined markers. This makes the rating (Mfr. Disc.) for all three types of markers.

B. CHANGES IN APPARATUS

The following apply to combined or completing markers only.

B.1 New "CAMA" Figure 151 (Std.) is added consisting of relays

(ACD)	U1355 or UB15
(AD)	U1355
(CFA)	UA94
(CFA1)	U543
(CFGO-1)	U1325 or UB12
(CMC1-2)	U1396
(CMC3)	U1386
(CMCA,B,C)	U886
(CMFO-1)	U1325 or UB12
(CMF2)	U1430
(CMF3,4)	U1415
(CMJ)	U1370
(CMRO-1)	280E
(CMSO-2)	U1396
(CTFO)	U1396
(CTF1)	U1396
(CTF2)	U1396
(CTF4)	U1396
(CTF7)	U1396
(CTGS)	U1325 or UB12
(CTOB)	280BY
(DNC)	U1355 or UB15
(FC)	U1355 or UB15
(LCDO-2)	U1355 or UB15
(MBA)	S533
(OD)	U1355
(ORC)	U1415
(ORCO-2)	U1412
(RNT3)	U1415
(SOR)	U1325 or UB12
(TOG4)	U1396
(TTA)	U588
(VTC)	U1355 or UB15
(WKC)	U1355 or UB15

and associated contact protection networks, varistors.

(MPOA-E)	420G
(MP1A-E)	420G
(MP2A-E)	420G

capacitors

(MPOA-E)	441T
(MP1A-E)	441T
(MP2A-E)	441T

lamp

(CSB)	13J

and contact protection networks (SWCMO-2)

B.2 New trunk class Figure 153 is added consisting of relays

(TCA)	U1325
(TCB)	U1325
(TSC6-9)	U1415

and associated contact protection networks.

B.3 New CAMA Figure 155 (Std.) is added consisting of relays

S200-208) U1325 or UB12

B.4 CAMA Figure BQ (A&M) is added for use with Mfr. Disc. Figure 48 consisting of relays

(CTNA,B)	U1325 or UB12
(HNAO)	U1355 or UB15
(HNA1)	U1355 or UB15
(HNA2)	U1355 or UB15
(HNA4)	U1355 or UB15
(HNA7)	U1355 or UB15
(TNAO)	U1355 or UB15
(TNA1)	U1355 or UB15
(TNA2)	U1355 or UB15
(TNA4)	U1355 or UB15
(TNA7)	U1355 or UB15
(UAO)	U1355 or UB15
(UA1)	U1355 or UB15
(UA2)	U1355 or UB15
(UA4)	U1355 or UB15
(UA7)	U1355 or UB15

and associated contact protection networks.

B.5 New Figure BS (Std.) is added for the special markers O-1, consisting of relay (SPL2), U319)

B.6 Relays (PCCL) and (PCNO,2,3,5) are removed from Figure 94 and shown in a new pulse conversion Figure 154 (Std.).

D. DESCRIPTION OF CIRCUIT CHANGES

The following apply to combined or completing markers only.

D.1 The marker is arranged for centralized automatic message accounting (CAMA).

D.11 These changes are required for a new trunk class feature (two leads instead of one lead grounded thru the incoming register marker connector to identify the trunk class). It is required for the CAMA feature. Figure 153 is added and consists of relays.

(TCA)	U1325
(TCB)	U1325
(TSC6-9)	U1415

and associated contact protection networks.

Leads "TCA: and "TCB" are run to the Incoming Register Marker Connector Circuit.

Option "NC" (wiring only) is added and rated (Std.).

Cross connection terminal "SWTI" is removed from Figure 43 and added to Figures 152 and 153.

Wiring changes associated with relays (CKG3), (INC), (PCR) and (PCDO-1) are shown in Figures32, 43, 95 and 96 respectively.

"D5" battery and "D4" ground supply is added in Note 101.

Note 128 is added. It specifies the use of Figure 153, Figure BS, "NC" and "NO" options for CAMA in markers manufactured prior to Issue 35-D. Where Figure 48 is used, Figure BQ must also be added.

Option Note 102, contact protection Note 104, and circuit Note 342 are changed.

Cabling diagram information for this change is included as part of new Figures 388, 389, 390, 391 and 393.

The replaced Figure 152, consisting of wiring only, is added and rated (Mfr. Disc.).

D.12 The following are provided for the CAMA operation. They include (a) marker operation with a CAMA junctor circuit serving multiparty (four party or rural) local office customers, (b) marker operation with an incoming CAMA trunk circuit serving non-AMA customers in a distant office, (c) marker operation with a CAMA intermarker group trunk circuit serving multiparty (four party or rural) customers associated with the originating marker group where the CAMA equipment is installed in the completing marker group, (d) a marker CAMA function (first usage feature) for gaining access to the CAMA circuits used for establishing the charge rate, (e) a marker completing function (second usage feature) for completing the call, (f) testing features and (g) service observing features.

The marker changes are as follows:

Figure 151 is added and rated (Std.) This figure consists of relays

(AD)	U1355
(ACD)	U1355 or UB15
(CFA)	UA94
(CFA1)	U543
(CFGO-1)	U1325 or UB12
(CMC1,2)	U1396
(CMC3)	U1386
(CMCA,B,C)	U886
(CMFO-1)	U1325 or UB12
(CMF2)	U1430
(CMF3,4)	U1415
(CMJ)	U1370
(CMRO-1)	280E
(CMSO-2)	U1396
(CTFO,1,2,4,7)	U1396
(CTGS)	U1325 or UB12
(CTOB)	280BY
(DNC)	U1355 or UB15
(FC)	U1355 or UB15
(LCDO-2)	U1355 or UB15
(MBA)	S533
(OD)	U1355
(ORC)	U1415
(ORCO-2)	U1412

(RNT3)	U1415
(SOR)	U1325 or UB12
(TOG4)	UB96
(TTA)	U588
(VTC)	U1355 or UB15
(WKC)	U1355 or UB15

and associated contact protection networks,

varistors

(MPOA-E)	420G
(MP1A-E)	420G
(MP2A-E)	420G

capacitors

(MPOA-E)	441T
(MP1A-E)	441T
(MP2A-E)	441T

lamp

(CSB)	13J

Option "NT" at the LCDO, LCD1 and LCD2 protection networks is added (STd.). Figure 150, consisting of wiring only, is added and rated (Std.).

Figure 155, consisting of relays

(S200-208)	U1325 or UB12

is added and rated (Std.).

Figure BQ, consisting of relays

(CTNA,B)	U1325 or UB12
(HNAO,1,2,4,7)	U1355 or UB15
(TNAO,1,2,4,7)	U1355 or UB15
(UAO,1,2,4,7)	U1355 or UB15

and associated contact protection networks are added and rated (A&M).

Figure BR, consisting of wiring only, is added and rated (Mfr. Disc.).

Figure BS, for special markers 0 and 1, consisting of relay (SPL2), U319 is added and rated (Std.).

Relays (PCCL) and (PCNO,2,3,5) are removed from Figure 94 and shown in new Figure 154 (Std.).

Wiring changes associated with relays

(AMA3,5)
(MT12)
(OSGO-9)
(SNO)
(SOB)
(TAN)
(TGS1)
(TOL)

are designated "NL" and "NM" options (Std.).

Wiring changes associated with relays

(TOB)
(LPA)
(LPB)
(LTA)
(LTB)
(LEA)
(LEB)

resistor (H2) and contact protection network (TOG1) are designated "NO" option (Std.) and "NN" (Mfr. Disc.).

Wiring changes are shown associated with relays

Relay	Figure
(FTO)	9
(FU7)	9
(GTU)	9
(TR2C)	30
(CKG2)	32
(CKG3)	32
(CKG6)	32
(CKG7)	32
(DIS1)	32
(GTL)	32
(LLC1)	32
(RK1)	32
(DCK)	33
(ND1)	33
(OTT)	33
(TBK)	33
(TER3)	33
(TOG3)	33
(OST1)	34
(SLK2)	34
(INC)	43
(TRN)	47
(TRN1)	47
(HNO,1,2,4,7)	48, 108
(TO,1,2,4,7)	48, 108
(TBIA)	48, 108
(UO,1,2,4,7)	48, 108
(AO)	48
(ORK1)	49
(NCNC)	53
(PCN)	53
(SOO-44)	61
(S100-144)	61
(3NA)	126
(5ST)	126
(RN)	65, 126
(RNO)	65, 126
(RN7)	65, 126
(RNK2)	65, 126
(FGO-1)	61
(TFO,1,2,4,7)	66
(CRO)	67
(CR1)	67
(CR2)	67
(MBK1)	67
(MBK4)	67
(TGS2)	67
(FKA)	69
(RCT10)	75
(NT)	78

(SPH)	78
(SPL)	78
(SPL1)	78
(MRL1)	79
(MT1)	79
(MT13)	79
(TST)	79
(RAV1)	82
(ROA)	82
(SNK)	82
(TER1)	82
(RNT1)	89
(RNT2)	89
(PCL1)	94
(PCL2)	94
(PCL3)	94
(PCD0-1)	96
(BRN0-1)	121
(ARN0-1)	122
(TOBS)	144
(LCH)	AO, AP
(OR)	BC, BD
(NOB)	BG, BH
(CHA)	BI, BJ
(NSO)	E, F
(TER4)	J

Cross connection terminals "CFG," "CFGO", "CFTA1-4", "CFTO1-4", "CMC", "CMF", "CMJ", "CMR0-1", "CMS00-19", "CSB", "CSG", "CSTA1-4", "CSTO1-4", "CTAR", "CTOR", "DNC", "FRC", "HAT", "JTA0-2", "JTO0-2", "LCD0-2", "MP0A-E", "MP1A-E", "MP2A-E", "RCG00-29", "ROA2", "SGC0-3", "ORC", "ORC0-2", and "VTC" are added in Figure 151.

Cross connection terminals "SB20-22" and "S00-S11" are added in Figure 155.

Cross connection terminals "PAB," "PBB," "TAB," "TBB," "EAB," "EBB," and "LCB" are added in Figure 44.

Cross connection terminal "TOG" is added in Figure 82.

Cross connection terminals "OSGC0-9" are added in Figure 70.

Cabling diagram Figures 388, 389, 390, 391, 393 and 394 are added.

Cabling diagram Figure 392 is added and rated (A&M).

D0-4, D6-12 Battery and D0-D7 ground supply is added in Note 101.

Note 364 covering cross-connecting information for CAMA is added.

Note 130 is added. It specifies the use of "NO" option when CAMA facilities are furnished for the local office at a distant point.

Note 128, 310, 318 and 349 are changed to include CAMA.

Note 204 is rated (Mfr. Disc.). In Note 102, Paragraph 58 is changed to include CAMA.

Lead "CAMA" is run to the Service Observing Trunk Selection and Control circuit.

Leads "AD", "AD'", "ACD", "CAM", "CAMA", "CAMF", "CAMS", "DNC", "FC", "LCD0-2", "OD", "OD'", "ODT", "ORC'0-2", "VTC", and "WKC" are run to the Master Test Frame Connector circuit.

Leads "CMF", "CMS0" and "CMS1" are run to the Foreign Area Translator Connector Circuit.

Lead "TTA" is run to the Automatic Progression Trunk Test circuit through equipment Figure 314.

Leads "ACD", "DNC", "FC", "LCD0-2", "VTC" and "WKC" are run to the Incoming Register Marker Connector circuit.

Leads "AD", "OD" and "ORC0-2" are run to the Outgoing Sender Connector circuit.

Leads "AD", "OD", "TTA" and "TTM" are run to the Trunk Link and Connector circuit.

D.13 The following marker changes are for CAMA trunk service observing.

Wiring changes associated with relay (FAC) are shown in Figure BD.

Wiring changes associated with the MT11 relay in Figure 5 and the RNT relay in Figure 151 and a new "CAM" lead to the Master Test Frame Connector circuit are added.

Paragraph 120 in Note 102 is changed to include Figure CB for trunk service observing.

D.14 The marker is arranged to provide a CAMA bay fuse alarm controller circuit. The marker changes are as follows:

Relays

(CFA)	UA94
(CFA1)	U543

are added to Figure 151.

Wiring changes associated with relay (FA1) are shown in Figure 73.

Leads "FA2", "FA3", "FA4", and "FG1" run to Miscellaneous Circuit (Marker).

Lead "FG1" runs to Master Test Frame (Jack, Lamp and Key) circuit.

Cabling diagram information for this change is included as part of new Figure 389.

D.2 The marker SD drawing sheets are indexed and changed to an individual sheet reissue basis.

D.3 The drawing is rated (Mfr. Disc.) for the Combined Marker.

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SECTION I - GENERAL

1. GENERAL CAMA INFORMATION

The Centralized Automatic Message Accounting (CAMA) feature designed into the No. 5 Crossbar system provides automatic accounting for Non AMA customers (4 party or rural) in a No. 5 office as well as for various types of customers in a distant office that is not arranged for AMA service. Identification of the calling customer can be done by an operator or by automatic number identifying equipment.

Marker operation on CAMA calls fall into two major divisions i.e. the CAMA FUNCTION and the COMPLETING FUNCTION. The CAMA function provides means for associating a customer in the No. 5 or distant office with the CAMA equipment to establish and record the calling office code and line number as well as the called area and office code and line number. This information is required for accounting purposes. The completing function provides means for completing the connection to a called line in the local No. 5 offices or to distant offices via outgoing trunks.

2. GENERAL OPERATION

Dialing Plan

The design provides means for serving customers in one to three nearby number plan areas. Customer dialed calls can be seven, eight or ten digit. Local seven or eight digit calls conform to the standard 2-5 numbering plan. Ten digit calls are for foreign areas, the first three digits being the standard area codes. Hereafter reference to seven digit calls shall be taken to mean seven or eight digit.

3. TYPES OF TRUNKS SERVED

There are three general types of trunks serving CAMA traffic.

A. Calls from distant offices enter over incoming CAMA trunks. These trunks serve CAMA traffic and in some cases toll test calls. The non-charge, so called free traffic, is carried over separate trunk groups.

B. Calls from non AMA customers in the No. 5 marker group are completed over CAMA junctor trunks.

C. Where CAMA service is given to customers in a two marker group installation, calls from the non CAMA calling marker group are relayed to the called marker group (equipped for CAMA) over CAMA intermarker group trunks.

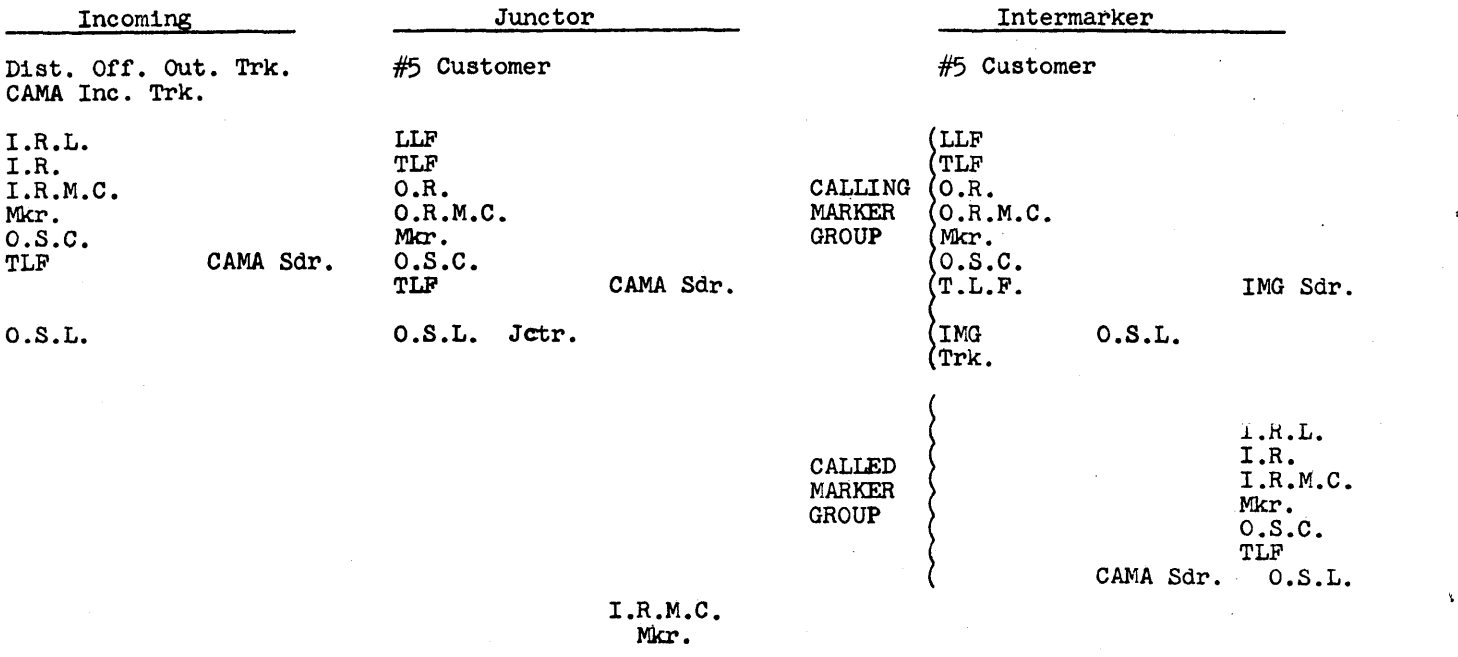
Traffic is completed to other offices via the standard type outgoing trunk or to called line numbers appearing on the line link frame of local offices in the No. 5 marker group.

4. SWITCHING PLAN

A. The number of marker uses and LLF, TLF crossbar switch connections for completed CAMA calls are as follows:

Type of Trk.	General Mkr. Function	Marker Use	Crossbar Switch Conn LLF	Crossbar Switch Conn TLF
Inc.	CAMA	One	None	None
	Completing	One	One	One
Junctor	CAMA	One	One	One
	Completing	One	One	One
Intermkr.	I.M.G.	One	One	One
	CAMA	One	None	None
	Completing	One	One	One

B. Traffic routes through the various circuits as follows:



5. MISCELLANEOUS FEATURES

The marker is arranged to provide the following additional features.

Marker Function	Feature
CAMA	Set Ckts. for Trk. Serv. Obs. on CAMA Inc. Trks, Junctor and Intermarker Trunks.
CAMA	Set Ckts. for CAMA Testing
COMPLETING	Establish Calls to Intercept for Vacant, Denied, or Free Calls

In addition such features as reorder, recycle, route advance, time out, trouble recording etc. are disposed of in a general manner similar to the following:

Marker Function	Trk.	Disposal Similar to
CAMA	INC or IMG	Pulse Conversion
CAMA	Junctor	SOG
Intermarker	IMG	SOG
Completing	Outgoing	TOG
Completing	Terminating in local office	TER

6. CONNECTING LEAD INFORMATION PERTINENT TO CAMA

Beside the various control lead information normally required by the marker and associated marker connectors, frame or out sender connectors the following are required for CAMA:

LEAD	DESCRIPTION	USED BY: MARKER — CAMA FUNCTION	MARKER — COMPLETING FUNCTION	TEST CKTS.	TBL. REC.	OTHER CKTS.
TCB and INC	LT-TAN CAMA CLASS	Yes		Yes		
TCB and PCR	TT-TOL " "	Yes		Yes		
TCB and PCDO	LT-TAN " "		Yes	Yes		
TCB and PCD1	TT-TOL " "		Yes	Yes		
CL1 and CL5	LT-TAN CAMA CLASS	Yes			Yes	CAMA SDR and AUTO-MONITOR
CL2 and CL5	TT-TOL CAMA CLASS	Yes			Yes	CAMA SDR and AUTO-MONITOR
AO-7 thru KO-7	CALLED NO	Yes	Yes	Yes	Yes	CAMA SDR
HTO-7,TTO-7, UTO-7	TRK NO	Yes	Yes	Yes	Yes	
ARO-7,BRO-7, CRO-7	TRK NO	Yes			Yes (AS HT'O-7, TT'O-7, UT'O-7)	CAMA SDR (AS HTO-7, TTO-7, UTO-7) and AUTO-MONITOR
FGO-1	TLF NO tens	Yes	Yes	Yes	Yes	TLF
TFO-7	TLF NO units	Yes	Yes	Yes	Yes	TLF
FTO-1	TLF NO tens	Yes			Yes (as FG'O-1)	CAMA SDR (as FGO-1)
FUO-7	TLF NO units	Yes			Yes (as TF'O-7)	CAMA SDR (as TFO-7)
ONN-9NP	RECORDER NO	Yes		Yes	Yes	
RNO-7	RECORDER NO	Yes		Yes	Yes	CAMA SDR
NT, NN, HF	ORIG RATE CLASS	Yes		Yes	Yes (as ORCO-2)	
ORC'O-2	ORIG RATE CLASS	Yes			Yes	
OR,FAC	CUSTOMER ORIG	Yes		Yes	Yes	
CAMA	CAMA CLASS	Yes			Yes	
CAMF	CAMA FUNCTION	Yes			Yes	
CAMS	COMPLETING FUNCTION		Yes		Yes	
CAM	TESTING	Yes		Yes		
CAMA	TRK SERV OBS	Yes				TRK.S.OBS. SEL.and CONT. FOR AREA TRANSL
CMF	CAMA FUNCTION	Yes				FOR AREA TRANSL
CMSO	COMPL. FUNCTION TAN		Yes			FOR AREA TRANSL
CMS1	COMPL. FUNCTION TOL		Yes			FOR AREA TRANSL
OD,OD'	OPER. IDENT.	Yes			Yes	
AD,AD'	AUTO. IDENT.	Yes			Yes	
ODT	TESTING	Yes		Yes		
OBS,NOB	TRK SERV OBS	Yes		Yes	Yes	CAMA SDR
LCDO-2	7 DIGIT DIALED		Yes	Yes	Yes	
ACD	10 DIGIT DIALED		Yes	Yes	Yes	
WKC	WORKING CODE		Yes	Yes	Yes	
VTC	VACANT CODE		Yes	Yes	Yes	
DNC	DENIED CODE		Yes	Yes	Yes	
FC	FREE CODE			Yes	Yes	
TST,TTA,DISC, DTT,TTM	TESTING	Yes		Yes		

SECTION II - DETAILED DESCRIPTION

7. REFERENCE TO PREVIOUS CIRCUIT DESCRIPTION SECTIONS

Thru-out this appendix reference is made to sections in the basic circuit description CD-25550-01, Issue 5-B where circuit operation is similar to that previously described.

8. INCOMING CAMA FUNCTION

The marker when assisting in the completion of an incoming CAMA call performs the following major functions:

(a) Registration of information from the incoming register which the marker requires in assisting a CAMA call.

(b) The identification of the called customer's line.

(c) The identification of the CAMA trunk as to its directory number, type of treatment required i.e. operator or automatic, rate class and associated recorder.

(d) Service treatment screening of called codes for CAMA and Non CAMA.

(e) Association with foreign area translator for six digit XOX/X1X dialing.

(f) Selection of a CAMA Sender.

(g) Connecting incoming trunk to the CAMA SDR.

(h) Complete toll test board test calls.

(i) Route non CAMA calls to intercept.

(j) Prepare associated circuits for trunk service observing.

(k) Release the marker and associated circuits.

The first marker usage functions for a CAMA incoming trunk operation are similar to the marker functions required for a pulse conversion call. When a subscriber in the distant office is connected to the CAMA incoming trunk an incoming register, via its incoming register link, will function. The incoming register will record the digits associated with the called number; the number of the trunk link frame to which the incoming trunk is connected; the trunk number and the CAMA class. The incoming register will transmit this information to the marker through its associated incoming register marker connector.

8.01 Operation of the Incoming Register Marker Connector Relays

The incoming register marker connector relays will be operated in a manner similar to that described for a terminating call in Section 12.11.

8.02 Marker Control Relays CKG-1/7, TLC-1/3, LLC-1/2, ONW and MCB-1/6 Relays and the CB Relays in the Marker Connector Circuits

The marker off-normal battery and ground supply relays CKG-1/7, TLC-1/3, LLC-1/2 and ONW and the marker MCB-1/6 relays will be operated similar to the description for a pulse conversion call in Section 17.1. The CB relays in the marker connector circuits will be operated similar to the description for a pulse conversion call in Section 17.13.

8.03 AC-0/7, BC-0/7 and CC-0/7 Code Digit Relays

The grounded "AC-0/7", "BC-0/7" and "CC-0/7" leads from the incoming register marker connector circuit will operate similarly designated relays to record the directory code or area code associated with the called subscriber.

8.04 FG-0/1, TF-0/7, CFG-0/1, CTF-0/7, HN-, T-, and U- trunk link frame and Trunk Number Identifying Relays

The grounded "FG-0/1" and "TF-0/7" leads from the incoming register marker connector circuit will operate the FG-0/1, CFG-0/1, TF-0/7, and CTF-0/7 relays to record the number of the trunk link frame associated with the CAMA incoming trunk. The CFG- and CTF- relays perform a translation function for associating a CAMA Sender group with a trunk link frame.

The trunk number is obtained over the HT-, TT- and UT- leads from the incoming register by way of the inc. reg. mkr. conn. The information is stored on the HN-, T-, and U- relays.

8.05 TCB, TSC6 and TSC7 Relays for CAMA Trunk Class

On CAMA Function calls, (first marker usage) the grounded "TCB" lead from the incoming register marker connector will operate trunk class relay TCB and the grounded "INC" or "PCR" lead will operate a respective trunk screening relay TSC6 or TSC7. If TAN trunk supervision is required, the TSC6 relay is operated and if TOL trunk supervision is required, the TSC7 relay is operated.

8.06 TCA, TSC6 and TSC7 Relays for Non CAMA Trunk Class

On non-CAMA class calls the grounded "TCA" lead from the incoming register marker connector will operate trunk control relay TCA and the grounded "INC" or "PCR" lead will operate a respective TSC6 or TSC7 relay. With relay TCA and one TSC6 or TSC7

relay operated, the INC or PCR relay will operate to perform non-CAMA functions.

8.07 TC7 Three Digit Translator Relay

The grounded "LT" or TT lead from the incoming register marker connector will be cross-connected to operated relay TC7 for subsequent ABX code translation.

8.08 CMFO-4 CAMA First Usage Relays

The operated TCB and TSC6 relays will operate the CAMA first marker usage relay CMFO if TAN trunk supervision is required. If TOL trunk supervision is required, the operated TCB and TSC7 relays will operate the CMF1 relay.

The operated TCB relay and either the TSC6 or TSC7 relay will operate the CMF-2/4 relays.

8.09 AT-, BT-, A and B digit Translator Relays

The operated TCB, TSC6 or TSC7, AC-0/7, and TC7 relays will operate the AT-2/9 relay.

The operated AT- and BC- relays will operate a BT-00/99 relay. The operated BT- and CC- relays will ground a "C000-999" code point.

8.10 S200-202, PSA, PSB, PSAO-1, PSBO-1 Service Treatment Relays

The operated TCB and TSC6 or TSC7 relays will operate the S200-202 relays for CAMA service treatment. If the presort feature is not provided, the "SB20" cross-connecting terminal will be cross-connected to the "CSB" cross-connecting terminal.

If the presort feature is provided the ground extended through the windings of the S200-202 relays to the "CSB" cross-connecting terminal will be cross-connected to the "AG" or "BG" cross-connecting terminal associated with the winding of the PSA or PSB relay respectively, to operate the S200-202 and PSA or PSB relays in series.

The operated PSA or PSB relay will operate the PSAO-1 or PSBO-1 relays respectively.

The service treatment relays are used to screen the code point field to filter out working CAMA, toll test, vacant, free or denied codes.

8.11 CMRO and CAMA Route R- Relay

8.111 Seven Digit ABX Calls to Offices in the Marker Group

Various methods can be arranged for cross-connecting the ABX code point to operate a route and route series relay. As an example, if the code digits dialed represent a No. 5 Crossbar office in the marker group associated with the CAMA equipment, although the code point will be cross-connected as required to the winding of a LPA, LPB, LTA, LTB, LEA or LEB relay, these relays will not operate due to a high resistance path in their battery supply. This path is extended to an "SC-" cross-connecting terminal associated with the operated S- relays. If the presort feature is provided, the path is extended to a "PSC-" cross-connecting terminal associated with the operated PSAO-1 or PSBO-1 relays.

The operated S-, PSA- or PSB- relays will extend the code point circuit thru the SC or PSC punching to an S or PS punching which will be cross-connected to operate the high resistance CAMA preroute relay CMRO.

The operated CMRO and CMFO or CMF1 relays will ground the "CTAR" or "CTOR" cross-connecting terminal. If TAN trunk supervision is required, the "CTAR" terminal will cross-connect to the "RC-" terminal to operate the TAN CAMA R- route relay. If TOL trunk supervision is required, the "CTOR" terminal will cross-connect to the "RC-" terminal to operate the TOL CAMA R- route relay. These route relays set the marker for the CAMA function.

8.112 Seven Digit ABX Calls to Offices Outside the Marker Group

If the grounded code point represents an office outside the marker group, it may cross-connect directly or thru the SC or PSC service treatment field to the CAMA R-route relay. The "R-" cross-connecting terminal of the R- route relay will be cross-connected either directly or thru the SC or PSC terminal field to operate the CMRO relay. The R- route relay will not operate in series with the CMRO relay. The operated CMRO relay will ground the "CTAR" or "CTOR" cross-connecting terminal in a manner similar to that described in the previous example to operate the required CAMA R- route relay.

8.113 Ten Digit XOX/XIX Calls

If the area dialed is not served by the marker group, its code point is routed thru the SC or PSC field to the CMRO relay as for a seven digit call. If the area dialed is served by the marker group along with one or two other areas the code point may be routed thru the SC or PSC field to the FAT- (A) terminal to start Foreign Area Translator Connector functions. The "CMF" lead, grounded by the operation of the CMF3 relay will start the Foreign Area Translator functions for CAMA first usage translation.

The Foreign Area Translator operation for a CAMA first usage translation is similar to that for an originating class call with the exception that the FAR- outputs will differ.

The Foreign Area Translator translates the ABX code as an acceptable CAMA working code, a denied access code, a vacant (non existent) office code or a free code (mis-dialed as a CAMA call). All codes other than the CAMA working codes are routed to some form of intercept over common or separate trunk groups as determined by the "FAR-" translated code outputs in the foreign area translator.

The "FAR-" translated code outputs representing CAMA routes will connect in general like the ABX code points to the R and CMRO relays either direct or thru the SC and PSC service treatment field. In the case of the intercepted codes connection is made to the "R" relay field representing the intercept trunk group as described later.

8.114 Toll Test Codes

In some cases where the CAMA incoming trunks are jointly used by CAMA customers and the maintenance people at a toll center, means are provided for completing toll test codes. Such codes are screened thru the service treatment relays and directed to R relays representing the test code. These are completed as straight "TOG" thru switch type calls.

8.115 Intercepted Codes

Means are provided to reroute denied, vacant or free codes to intercept for instruction purposes as well as to reduce the non-productive work load on the CAMA operators and equipment.

In the case of ABX dialed calls these miscellaneous codes are withdrawn from the CAMA field thru the service treatment relays. Where the CAMA equipment serves more than one numbering plan area identical codes in the various areas must receive the same treatment in all areas to permit such screening, otherwise they must be presented to the CAMA equipment as CAMA working routes and screened at that point.

The primary use of the foreign area translator in the incoming CAMA function is to screen out the miscellaneous non CAMA codes on an area basis for proper instructions and to keep them out of the CAMA equipment.

The various intercepted codes are connected to R relays representing intercept trunks on the trunk link frame. These connections are either thru the SC, PSC field or as translated FAR- outputs of the foreign area translator. The calls are completed as straight "TOG" thru switch type calls.

8.12 CAMA Sender

8.121 General

To complete the CAMA function, the marker must connect to an idle CAMA sender. The circuitry is similar to that used to connect to other types of senders. On this call the marker must transmit the called number, the trunk and trunk link frame number associated with the incoming CAMA trunk, the type of identification, the originating rate class, a TAN or TOL trunk supervision signal, the associated recorder number and a service observing signal. When the CAMA sender has received the required information, the marker will make a registration check and then release.

8.122 CAMA Sender Group Selection and Operation of the OSG-0/9 and OSA-0/9 Relays

The operation of the R- relay will ground its associated "OS-" cross connecting terminal. When a single CAMA sender group serves the incoming CAMA calls the "OS-" cross connecting terminal will be cross connected to the "OSC-" cross connecting terminal to operate the required OSG-0/9 and OSA-0/9 relays. If more than one sender group is provided to serve incoming CAMA calls, the CAMA sender will be selected on a trunk link frame basis. The "OS-" cross-connecting terminal will be cross-connected to the "CSG" cross-connecting terminal and the output of the trunk link frame number "CMS-00/19" cross-connecting terminal will be cross-connected to operate the required OSG-0/9 and OSA-0/9 relays.

8.123 Out Sender Connector and CAMA Sender Selection

Selection and control of the out sender connector and CAMA sender is similar to that described in Sections 11.42 and 11.43.

However the CMC- class relays operate in place of the SOG relays to mark the call as CAMA. They also close thru to the sender by way of the out sender connector the various information required for this call.

8.124 Route Relay Transfer Checker

Various information is transmitted to the CAMA sender as the result of cross-connections on the route relay. The operation is similar to that described in Section 11.44. Specific route relay cross connections used for CAMA are as follows:

Route Relay Punching	To PCHG	Mkr. Relays Operated	Leads Closed to OSC and CAMA Sdr.	For
CR	CR1OP	CR1O,CRK3, CRP	CL1	LT-TAN
CL	CL4S	CL4,CLS, CLK1	CL5	LT-TAN
or				
CR	CR1OS	CR1O,CRS	-	TT-TOL
CL	CL4P	CL4,CLP, CLK1,CLK3	CL2,CL5	TT-TOL
DL	DLOP	DLO,DLP	-	Local Mkr. Check Out.

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	ORCO	ORCO	Customer
NN	ORC1	ORC1	Originating
HF	ORC2	ORC2	Rate Class
AD	AD	AD	Type of CAMA
OD	OD	OD	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.

The LV-2/9 and LC-0/9 relays of the trunk link and connector will be operated as described in Section 17.55.

8.34 The OD or AD, ORC-0/2 and Recorder Number Information Relays

The operated LF relay in the incoming CAMA trunk will ground the "OD" lead to the trunk link and connector circuit. The operated connector relay of the trunk link and connector will extend the "OD" lead to the marker to operate the CAMA operator type identification of calling customer line relay OD. When automatic identification is provided, the "AD" lead will be grounded in a similar manner to operate the automatic type identification relay AD.

The grounded "NT", "NN" or "HF" leads from the operated LF relay of the trunk will be extended through the trunk link and connector circuit to operate the originating rate class ORC0, ORC1 or ORC2 relays respectively.

On non-CAMA class calls the "NT", "NN" and "HF" leads will perform their special test and PBX functions.

The operated FB- relay of the trunk link and connector circuit will ground one of the "0NN", "1SE," "2SA," "3NA," "4NE," "5ST," "6NT," "7RN," "8SP" or "9NP" leads to operate a similarly designated relay to identify the recorder number with which the incoming CAMA trunk is associated. The operation of one of the ONN through 9NP relays will operate the RN-0/7 relays on a two-out-of-five basis and also ground the "RN-0/7" leads to register the recorder number in the CAMA sender.

Through the operated out sender connector relays the "OD" or "AD" and "NT", "NN" or "HF" leads will be extended to operate relays in the CAMA sender.

8.35 The RNT1, RNT and the RNT2 Relays and the Release of the ORC and RN Relays

The RNT1 relay will operate from the grounded "TSR" lead in the out sender connector or the operated OST2 relay. The RNT1 relay will lock operated to the operated ORC or RN relay.

The RNT relay will be operated similar to the description for a pulse conversion call in Section 17.58. The operated RNT relay will transfer the "TSR" lead ground to the operated RNT1 relay to operate relay RNT2. The operation of the RNT2 relay will release the ORC and RN relays.

8.36 The RNK1-2 Relays and Release of the RNT1 and RNT Relays

The release of the ORC and RN relays will release the RNT1 relay. The RNT relay will be released similar to the description for a pulse conversion call in Section 17.59.

The release of the RNT relay will cause the RNK1 and RNK2 relays to operate.

8.37 Checking the Called Number, Trunk and Trunk Link Frame Number, Operator Identification and Originating Rate Class

The called number information transferred to and registered in the CAMA sender will be checked in a manner similar to the description for a subscriber outgoing call in Section 11.4454. The release of relays KHJ and KKL will remove the marker ground from the "H-0/7", "J-0/7", "K-0/7", and "L-0/7" leads if ten digits were registered. If the CAMA sender has registered the required called number digit information, the marker two-out-of-five A-through L- relays will remain operated.

If the CAMA sender has registered the trunk and trunk link frame information the grounded "AR-," "BR-," "CR-," "FT-," and "FU-," leads will hold the HN-, T-, U- or HNA-, TNA-, UA-, FT- and FU- relays operated when the TRN, TRN1 and CTGS relays release. The CAMA sender registration of the type of identification is checked by the AD or OD relay remaining operated when the ORC relay releases. If the originating class information is registered in the CAMA sender, the grounded "ORC-" lead will maintain the ORC- relay operated when the ORC relay releases.

8.38 CAMA Sender Connection to the Incoming CAMA Trunk

The CAMA sender connection to the incoming CAMA trunk is accomplished in a manner similar to that described in Section 11.45, with the exception that the operated LF relay of the incoming CAMA trunk will perform the function described for the F relay and the operation of relay SLK2 will operate the S1K relay.

8.39 The RSC relay and Release of the Out Sender Connector

The release of the OST relay will operate the RSC relay. Release of the OSC relay will release the Outgoing Sender Connector relays.

The release of the OSC relay in the marker and the outgoing sender connector relays is similar to the release of these relays for a subscriber outgoing call described in Section 11.462.

8.40 Release of the FT-, FU-, MBA-, CLK-, RN-, OD or AD, ORC-, HN-, T-, U- or HNA-, TNA-, UA- Relays and the Called Number Digit Registration Relays

The release of the connector relays of the outgoing sender connector circuit

will release the FT-, FU-, MBA, CLK-, RN-, OD or AD, ORC-, HN-, T-, U-, HNA-, TNA-, UA- and the A- through L- relays.

8.41 Advance Indication to the CAMA Sender

The marker advance indication to the CAMA sender is similar to the description for a pulse conversion call in Section 17.47, except that operated relays CMC2, AMA5 and MBK5 are included as part of the operating path for the CAMA sender AV relay and the marker AVK relay.

8.42 Release of the Marker and Associated Circuits

The release of the marker and associated circuits is similar to the general description for a pulse conversion call in Section 17.6.

8.43 Release of the Identification of Call Functions

The release of the incoming register marker connector will release the TC7, TCB, TSC6 or TSC7 and CKG1-3 relays. The release of relay CKG2 will release the CMF0 or CMF1 relays and release of relay CKG1 will release the CMR0 relay. The release of the TSC6 or TSC7 relay will release the CMF2-4 relays.

8.44 Release of the R-, OSG-, OSA- and CMC1-3 Relays

The release of relay CKG1 will release the R-relay and the R-relay releasing will cause the OSG- and OSA- relays to release.

The release of relay OSG- will release the CMC1-3 relays.

8.45 Release of the PCL1-3, CMCA, CMCB, CMCC Relays and if Figure BQ is Provided the CTNA and CTNB Relays

The release of the CMC2 relay will release the PCL1-3, CMCA, CMCB, CMCC relays and if Figure BQ is provided the CTNA and CTNB relays.

8.46 Release of the GTU, RNT3, AMA3 and AMA5 Relays

The release of relay CMC3 will release the GTU and RNT3 relays. The RNT3 will release the AMA3 and AMA5 relays.

8.47 Release of the Registration of Information From the Incoming Register. Functions

The release of the incoming register marker connector will release the marker relays which recorded the information from the incoming register.

8.48 Release of the AC-0/7, BC-0/7, CC-0/7, TF-0/7 and FG-0/1 Relays

The release of the incoming register marker connector relays will release the AC-0/7, BC-0/7, CC-0/7, TF-0/7 and FG-0/1 relays.

8.49 Release of the CAMA Sender Selection and Connection Functions

The release of the SON, DL-, CL-, DLP, CLS or CLP, CR- and CRS or CRP relays is similar to the description for a subscriber outgoing call in Section 11.84.

The release of the SON relay will release the OS- and OSK relays and the release of the CKG6 relay will release the OGC relay and the outgoing sender connector S- relay.

8.50 Release of the Trunk Link Frame and CAMA Trunk

The release of the trunk link and connector relays and trunk relays is similar to the description for a pulse conversion call in Section 17.651.

8.51 Release of the TFK3, MAK1 and MDK Relays

The release of the TFK3, MAK1 and MDK relays is similar to the description for a pulse conversion call in Section 17.652.

8.52 Release of the CAMA Trunk TF and LF Relays and the Trunk Link and Connector FB-, LV- and LC- Relays

The release of the TLC1 relay will release the TF and LF relays in the incoming CAMA trunk. The trunk LF relay will release the FB- relay in the trunk link and connector circuit. The release of the FB- relay will release the LV- and LC- relays in the trunk link and connector circuit.

8.53 Release of the ONN, 1SE, 2SA, 3NA, 4NE, 5ST, 6NT, 7RN, 8SP or 9NP Relays

The release of the FA-, FB- relay in the trunk link and connector circuit will remove the ground from the "ONN", "1SE", "2SA", "3NA", "4NE", "5ST", "6NT", "7RN", "8SP" or "9NP" lead.

9. CAMA JUNCTOR CALL (CAMA FUNCTION)

9.01 General Description

The CAMA junctor and associated CAMA equipment provides a method of obtaining automatic machine accounting for non-AMA and multi-party customers associated with the CAMA marker group in No. 5 Crossbar offices.

In order to complete a CAMA junctor call the marker will be required to function twice. The "CAMA FUNCTIONS" usage (first marker usage) is similar to the marker operations required for a subscriber outgoing call described in Section 11, except that a CAMA sender and CAMA junctor are used instead of an outgoing sender and outgoing trunk.

When a marker is required for the "COMPLETING FUNCTIONS" (second marker usage), the marker will function in a manner similar to the operations required for a CAMA incoming trunk.

The marker circuit when establishing the CAMA junctor call will perform or assist in the performance of seven major functions as follows:

a. Registration of information from the originating register required to establish a CAMA junctor call.

b. The identification of the type of connection which the marker will assist.

c. The selection and connection of a CAMA sender to the marker and the selected CAMA junctor circuit.

d. Registration of recorder number information from the trunk link connector circuit.

e. The selection of an idle connecting path between the calling customer line and the selected CAMA junctor circuit.

f. Connecting the calling customer line to the selected CAMA junctor circuit through the selected connecting path.

g. Release of the marker and associated circuits after the marker has completed the "CAMA FUNCTION" of the junctor call.

9.02 Seizure of the Marker by the Originating Register

The seizure of the marker by the originating register for a CAMA junctor call is similar to the seizure of the marker by the originating register for a subscriber outgoing call described in Section 11.1 except for the operation of the GTL relay.

The operation of the OR or FAC relay will operate the subscriber originating SOR relay. The operated SOR relay will operate the GTL relay.

9.03 Registration of Information from the Originating Register

The registration of information from the originating register for a CAMA junctor call is similar to the registration of information from the originating register for a subscriber outgoing call as described in Section 11.2.

9.04 The LCDO, LCD1 or LCD2 Relays

The ground potential which operated the multi-party class of service S- relays will also operate one of the LCD-0/2 relays to designate in which of the three numbering plan areas the call originated. This information is used to establish connection to the R relay representing a CAMA junctor serving the calling area. Separate junctors may be required to manufacture the proper recorder number information for CAMA transverter use. This recorder information is translated into a calling area mark.

9.05 Identification of the Basic Call

The general information for the identification of the basic call as applied to a CAMA junctor call is similar to the general information for a subscriber outgoing call in Section 11.3.

9.06 The TC7 Relay

The grounded "LT" lead from the originating register marker connector is cross-connected to operate the TC7 relay for translation.

9.07 The AT-2/9 and BT-20/99 Relays

The operation of the AT-2/9 and BT-20/99 relays is similar to the description for a subscriber outgoing call in Sections 11.32 and 11.33.

9.08 The CMRO or CMR1 Relays

If the grounded code point is cross-connected to the winding of an R- relay representing a route requiring TAN trunk supervision, the operated S-, PSAO-1 or PSBO-1 relay will extend the ground to the winding of the CAMA preroute CMRO relay.

If the grounded code point is cross-connected to the winding of an R- relay representing a route requiring TOL trunk supervision, the operated S-, PSAO-1 or PSBO-1 relay will extend the ground to the winding of the CMR1 relay.

The CMRO or CMR1 relay will operate, but its high resistance will prevent the R- relay from operating.

9.09 The CMJ and R- Relays on Calls not Requiring Foreign Area Translation

The operation of the CMRO relay will operate the CAMA junctor route series relay, CMJ, and an R- relay associated with tandem CAMA junctors. The operation of the CMR1 relay will operate the CMJ relay and an R- relay associated with the toll CAMA junctors.

9.10 The CMJ and R- relays on Calls Requiring Foreign Area Translation

The foreign area translator is brought into play on CAMA junctor calls to screen the CAMA working codes from vacant, free or denied codes. Where 10 digit area dialed codes are not served by the foreign area translator this screening of ANY codes must take place at a distant point.

The working codes are connected to CAMA junctors, the others routed to tone trunks or intercept trunks on the trunk link frame.

The operation of the R- relay is similar to the description for a subscriber outgoing call in Section 11.342 except that the operating circuit comes from an FAR-code point out of the translator. Also the CMJ relay will operate as the route series relay.

9.11 CAMA Sender Subgroup Selection

When the R- relay operates, the marker will select and connect to a CAMA sender in a manner similar to the description for a subscriber outgoing call in Section 11.41 to 11.415. The operation of the OGC relay will operate the service call SCC relay and the TGS2 relay operation will operate the MBK4 relay.

9.12 RNT3, AMA3 and AMA5 Relays

The operation of the CMJ relay will operate the RNT3 relay which will operate the AMA3 and AMA5 relays.

9.13 The ORC, RN and MBK5 Relays

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

The operation of the RN relay will operate the MBK5 relay.

9.14 CAMA Sender Selection

The selection and connection to a CAMA sender for a CAMA junctor call is similar to the selection and connection to an outgoing sender for a subscriber outgoing call described in Section 11.42 to 11.432. One CAMA sender group serves all the junctors. Access to a second group is available by use of the allotter or on a route advance basis.

9.15 Transfer of Information From the Marker to the CAMA Sender

The marker will transmit to the CAMA sender the following information:

a. The office code and numericals of the called line.

b. The CAMA trunk class (TAN or TOL) information required for setting the proper trunk supervision.

c. The originating rate class information required by the CAMA equipment for establishing rates.

d. The recorder number required by the CAMA equipment to identify the calling area.

e. The service call information for test circuit operation.

f. Service observing signal.

9.16 Transfer of Office Code and Numericals of the Called Number

The transfer of office code and numericals of the called number to the CAMA sender for a CAMA junctor call is similar to the description for a CAMA incoming trunk call.

9.17 The ST7, ORK1 and ORK2 Relays

The operation of the ST7 relay is similar to the description for a subscriber outgoing call in Section 11.4413.

If the H-0/7, J-0/7 and K-0/7 relays are operated on a two-out-of-five basis as part of the ten digit dialing, the "L7" lead will be grounded to operate the ST7 relay.

The operation of the ST7 relay will operate the ORK1 and ORK2 relays if the A-0/7 through G-0/7 relays are operated on a two-out-of-five basis for seven digit dialing or the A-0/7 through K-0/7 relays are operated on a two-out-of-five basis for ten digit dialing.

9.18 The DLO, DLP and DLK1 Relays

The operation of the R- relay for a CAMA junctor call will operate the DLO and DLP relays. The operation of the TGS1 relay as described in Section 11.412 will operate the DLK1 relay.

9.19 The CR10, CRP or CRS, CL4 and CLP or CLS Relays

The operation of the R- relay for a CAMA junctor call will operate the CR10, CRP or CRS, CL4 and CLP or CLS relays to transmit the required supervision signals to the CAMA sender.

The operated CR10, CRP, CL4 and CLS relays will send the CL1 and CL5 signals to the CAMA sender for LT and TAN trunk supervision signals. For the TT and TOL supervision signals, the CL4, CLP, CR10 and CRS relays will be operated to send the CL2 and CL5 signals to the CAMA sender. The grounded

"CL5" and "CL1" or "CL2" leads will operate similarly designated relays in the CAMA sender.

9.20 The OD and ORC-0/2 Relays

The operation of the ORC relay will operate the operator type identification OD relay and one of the originating rate class ORC-0/2 relays in the marker and similar relays in the CAMA sender.

9.21 The ONN, 1SE, 2SA, 3NA, 4NE, 5ST, 6NT, 7RN, 8SP or 9NP Relays

The CAMA junctor selection, has been proceeding while the CAMA sender was being selected. Ground potential on one of the "ONN" through "9NP" leads from the junctor thru the trunk link and connector circuit will operate a similarly designated relay in the marker.

The operated ONN, 1SE, 2SA, 3NA, 4NE, 5ST, 6NT, 7RN, 8SP or 9NP relay will operate the RN-0/7 relays in the marker and recorder number relays in the CAMA sender.

9.22 The RNT1, RNT and RNT2 Relays

The operated RN-0/7 relays will complete the operating path from the grounded "TSR" lead or the OST2 relay to operate the RNT1 relay.

The RNT1 relay will lock operated to the operated ORC or RN relay ground and will operate the RNT relay similar to the description in Section 17.58.

The operated RNT relay will transfer the grounded "TSR" lead operating path to operate the RNT2 relay.

9.23 Release of the RN and ORC Relays

The operation of the RNT2 relay will release the RN and ORC relays.

9.24 Checking the Information Transferred to the CAMA Sender

The general method of checking the information transferred to the CAMA sender is similar to that used for checking the information transferred to the outgoing sender as described in Section 11.445.

9.25 The OST1, OST and OST2 Relays

The operation of the OST1, OST and OST2 relays for a CAMA junctor call is similar to the description for a subscriber outgoing call in Section 11.4451 except for the addition of the operated RNT3 and AMA3 relays in the operating path.

9.26 Release of the TGS-1/3, KG, KA, KBC, KDE, KFG, KHJ, KKL and KK Relays

The release of the TGS-1/3, KG, KA, KBC, KDE, KFG and KK relays is similar to the description in Section 11.4452. The release of relay KG will release the KHJ and KKL relays.

9.27 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.

9.28 Checking the Office Code and Numericals of the Called Number Transferred to the CAMA Sender

The checking of the office code and numericals of the called number which have been transferred to the CAMA sender is similar to the description for a subscriber outgoing call in Section 11.4454.

9.29 Checking the CAMA Class (TAN or TOL) Information Transferred to the CAMA Sender

The release of relay TGS1 will remove the operating ground from the CLK1/3 and CRK3 relays. If the "CL1" and "CL5" leads for TAN supervision or the "CL2" and "CL5" leads for TOL supervision have been grounded by the CAMA sender, the CLK 1/3 and CRK3 relays will remain operated.

9.30 Checking the Operator Identification Information Transferred to the CAMA Sender

The release of the ORC relay will remove the operating ground from the winding of the OD relay. If the CAMA sender identification has applied locking ground to the "OD" lead the OD relay will remain operated.

9.31 Checking the Originating Class Information Transferred to the CAMA Sender

The release of the ORC relay will remove the operating ground from the winding of the ORC- relay. If the CAMA sender ORC- relay has applied locking ground to the "ORC-" lead the ORC- relay will remain operated.

9.32 Checking the Recorder Number Information Transferred to the CAMA Sender

The release of the RN relay will remove the operating ground from the RN-0/7 relays. If the CAMA sender relays have applied locking ground to the "RN-0/7" leads, the RN-0/7 relays will remain operated.

9.33 Release of the RNT1 and RNT Relays

The release of the ORC and RN relays will release the RNT1 relay. The release of the RNT1 relay will release the RNT relay.

9.34 The RNK1 and RNK2 Relays

The release of the RNT relay will operate the RNK1 and RNK2 relays to check that the recorder number, originating rate class, operator identification information, and service observing signal represented by the operated RN-, ORC-, OD and OBS or NOB relays, respectively, has been registered in the CAMA sender.

9.35 CAMA Sender Connection to the CAMA Junctor

The CAMA sender connection to the CAMA junctor is similar to the outgoing sender connection to the outgoing trunk in Section 11.45 except that the CAMA sender uses two verticals on the out sender link switch. One vertical carries the usual connections which are used on an incoming trunk connection and the second (auxiliary) vertical provides the trunk link frame number for the connected CAMA junctor and a trunk number. This feature of the outsender link circuit requires the marker to operate two hold magnets in parallel in the outsender link.

9.36 Release of the Outgoing Sender Connector

The release of the outgoing sender connector for a CAMA junctor call is similar to the release of the outgoing sender connector for a subscriber outgoing call described in Section 11.46.

9.37 The RSC Relay

The operation of the RSC relay after the CAMA Sender has been primed is similar to that described in Section 11.461 except for the addition of the AMA3, AMA4, RNT3 and MBK4 relays in the operating path.

9.38 Release of the OSC Relay and the Outgoing Sender Connector Relays

The release of the OSC relay and the connector relays in the outgoing sender connector circuit is similar to the description for a subscriber outgoing call in Section 11.462.

9.39 CAMA Junctor Selection

The selection of a CAMA junctor is similar to the selection of an outgoing trunk described in Sections 11.5 to 11.56. The FO relay of the CAMA junctor will perform the functions described for the outgoing trunk F relay.

9.40 Selection of the Connecting Path

The selection of the connecting path between the calling line and the CAMA junctor through the line link and trunk line frames is similar to the selection of the connecting path between the calling line and the trunk circuit described in Section 8.11.

9.41 Setting up the Selected Connecting Path

The setting up of the selected connecting path for a CAMA junctor call is similar to the description in Section 11.7, to 11.733 for a subscriber outgoing call.

9.42 Advance Indication to the CAMA Sender

The operation of the AV relay in the CAMA sender and the AVK and AVK1 relays in the marker is similar to the description for a subscriber outgoing call in Sections 11.74 to 11.742.

9.43 Transfer of the Connecting Path Supervision to the CAMA Junctor

The transfer of the connecting path supervision to the CAMA junctor is similar to the description for a subscriber outgoing call in Section 11.75.

9.44 Release of the Marker and Associated Circuits

The release of the marker and associated circuits for a CAMA junctor call is similar to the description for a subscriber outgoing call in Sections 11.8 to 11.87 inclusive.

9.441 Release of the LCD-O/2, CMRO or CMR1 and CMJ Relays

The release of the CTA- and CU- relays will release the LCD- relay and the release of the CKG1 relay will release the CMRO or CMR1 relay. The release of the CKG6 relay will release the CMJ relay.

9.442 Release of the RNT3, AMA3, and AMA5 Relays

The release of the CMJ relay will release the RNT3 relay. The AMA3 and AMA5 relays will be released by the RNT3 releasing.

9.443 Release of the OD and ORC- Relays

The release of the outgoing sender connector circuit S relay will release the OD and ORC- relays.

10. CAMA INTERMARKER GROUP CONNECTION

10.01 General Information

When a No. 5 Crossbar office is equipped with more than one marker group,

the CAMA intermarker group connection provides a method of obtaining automatic machine accounting for non-AMA multi-party customers in the marker groups other than the one marker group directly associated with the CAMA equipment.

The marker in the originating marker group, after receiving the necessary information from the originating register, will select and connect to an idle intermarker group sender and CAMA intermarker group trunk. After connecting the intermarker group sender to the CAMA intermarker group trunk through the outgoing sender link, the marker will establish a connecting path from the calling line to the CAMA intermarker group trunk.

The intermarker group sender will function similar to an incoming register and transmit the necessary information to a marker in the CAMA marker group. The marker will then select a CAMA sender and connect the CAMA intermarker group trunk to the CAMA sender through an outgoing sender link. After checking that the necessary functions have been completed, the CAMA marker will send an advance signal to the CAMA sender and release. The CAMA sender will perform its required functions and after receiving a regular release signal from the transverter, the CAMA sender will connect to a CAMA marker for the completing functions.

10.02 Seizure of the Marker in the Calling Marker Group

The seizure of the marker in the calling marker group by the originating register is similar to the description for a subscriber outgoing call in paragraph 11.1 except for the operation of relay GTL. The operation of the OR or FAC relay will operate the subscriber originating SOR relay. The operated SOR relay will operate the GTL relay.

10.03 Registration of Information from the Originating Register

The registration of information from the originating register is similar to the subscriber outgoing call in Section 11.2.

10.04 Identification of the Basic Call or Connection

The identification of the basic call or connection is similar to a subscriber outgoing call 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 the CAMA intermarker group trunks. The operated R- relay will operate relays to send a CAMA class (TAN or TOL) indication to the intermarker group sender similar to the description for a CAMA incoming trunk connection as previously described.

10.05 Selection and Connection of an Intermarker Group Sender

The selection and connection of an intermarker group sender is similar to the subscriber outgoing call as described in Section 11.4.

10.06 Intermarker Group Sender Connection to the CAMA Intermarker Group Trunk

The intermarker group sender connection to the CAMA intermarker group trunk is similar to the outgoing sender connection to the outgoing trunk in Section 11.45 except that the intermarker group sender uses two verticals on the link switch. One vertical carries the usual connections which are used on an intermarker group trunk connection and the secondary (auxiliary) vertical provides the trunk link frame number and trunk number associated with the CAMA intermarker group trunk. This feature of the outsender link circuit requires the marker to operate two hold magnets in parallel on the out sender link.

10.07 CAMA Intermarker Group Trunk Selection

The selection of a CAMA intermarker group trunk is similar to the selection of an outgoing trunk for a subscriber outgoing call, as described in Section 11.5.

The ABX code points are screened through the "S" field for working, vacant, free or denied codes. Disposition is as described for CAMA junctor except that on working codes a CAMA intermarker trunk is selected.

On ten digit XOX/X1X calls served by the foreign area translator the ABX codes are screened in the translator. Working CAMA codes connect through FAR- code punchings to the CAMA intermarker route relay. The other types are routed to tone or intercept trunks on the trunk link frame.

Where ten digit codes are not served by the foreign area translator the screening of ABX codes must take place in the CAMA equipment or at a distant point.

10.08 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 Section 11.6.

10.09 Setting Up the Selected Connecting Path

The setting up of the selected connecting path is similar to setting up the path for a subscriber outgoing call, as described in Section 11.7. The intermarker group sender will wait until the marker in the calling office is released and will then initiate the seizure of a marker in the called office.

10.10 Seizure of the Marker in the CAMA Marker Group

The intermarker group sender will connect to the called marker in the CAMA

marker group via an incoming register marker connector and transfer all the information necessary to continue the call. The marker in the CAMA marker group will function similar to a CAMA incoming trunk connection previously described.

11. CAMA COMPLETING FUNCTION

11.1 Call Terminating in the Home Marker Group

The marker when assisting in the completion of a CAMA call terminating in the local marker groupperforms 8 major functions as follows:

(a) Registration of information from the CAMA sender 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 called customer's line with equipment location obtained from the number group.

(d) The called customer line busy test.

(e) The selection of an idle connecting path between the called customer line and the CAMA type trunk.

(f) Connecting the called customer line to the CAMA type trunk through the selected connecting path.

(g) Setting up the selected ringing code for the called customer's line.

(h) Release of the marker and associated circuits after the marker has completed its functions.

The marker when functioning on a CAMA completing usage terminating call will perform basically the same as a marker assisting a terminating call entering the office over a tandem or toll trunk. Translation of the office code digits will indicate to the marker that the call is to terminate in this office.

Completion of seven digit calls is provided for but no means have been built into the system for completing XOX area type dialed calls to offices in the CAMA marker group.

11.11 Seizure of the Marker by the CAMA Sender

When the CAMA sender has completed its functions and is ready to complete the call, it will seize a marker through an incoming register marker connector. This seizure is similar to the seizure of the marker by an incoming register as described in Section 12.1.

11.12 Registration of Information from the CAMA Sender

After seizing a marker, the CAMA sender will transfer to the marker the called office code, the customer's line number, the trunk link frame number on which the CAMA type trunk appears, the area in which the calling customer is located whether the dialed code is a working code, a vacant code, a denied code or a free code.

11.13 Office Code and Number of Called Line

The office code and numericals of the called line will be transferred to the marker from the CAMA sender over groups of lead A0/7--G0/7. The registration of the digits in the marker will be similar to the description in paragraphs 13.21, 13.211 and 13.212.

11.14 Identification of the Trunk Link Frame Associated with the CAMA Type Trunk

In order to set up the connection between the called customer's line and the CAMA type trunk, it is necessary for the trunk link frame number associated with the CAMA type trunk to be recorded in the marker. The trunk link frame number is recorded by the operation of the FG-0/1 and TF-0/7 relays in a manner similar to that described in paragraph 12.22.

11.15 Identification of the Basic Call or Connection

In order to identify this call as a CAMA completing usage terminating call, it is necessary to operate one of the CMSO-1 relays and the TER 1-4 relays in the marker. The CMSO relay identifies the call as a CAMA completing usage call that entered the office over a CAMA trunk requiring TAN supervision. The CMS1 relay identifies the call as a CAMA completing usage call that entered the office over a CAMA trunk requiring TOL type supervision. The type of supervision required is information that the CAMA sender has stored from the CAMA first usage. In that usage, the marker sent this information to the CAMA sender over the "CL1" and "CL5" leads to indicate TAN supervision or over the "CL2" and "CL5" leads to indicate TOL supervision. On the CAMA completing usage, this information is sent back to the marker over leads "TCB" and "TSC8" for TAN supervision or leads "TCB" and "TSC9" for TOL supervision. The "TCB", "TSC8" and "TSC9" leads each operate similarly designated relays in the

marker. A combination of TCB and TSC8 relays operated will operate the CMS0 relay while a combination of TCB and TSC9 will operate the CMS1 relay in the marker.

The operation of the TCB and TSC8 relays will operate three relays, S203-205. In a like manner, the operation of the TCB and TSC9 relays will operate relays S206--208. These relays provide a code point screening field for the CMS0 and CMS1 call classes.

The marker determines whether the call is to terminate in this office or if it is to be extended to some distant office by translating the code digits. This translation is done by the marker translator or by the foreign area translator.

The "LCDO-2" indications received from the CAMA sender are indications of the number of digits dialed by the calling subscriber and the area in which the calling subscriber is located. If seven digits have been dialed, the CAMA sender will so indicate by grounding one of the "LCDO-2" leads to the marker through the incoming register marker connector. Grounding these leads will operate the respective relays in the marker. The particular "LCDO-2" lead grounded will depend on the area in which the calling subscriber is located: "LCDO" representing the home area and "LCD1-2" representing the remaining two areas.

The CAMA sender will also ground the "WKC" lead to the marker if the dialed code is a working code. Ground on the "WKC" lead will operate the WKC relay in the marker.

11.16 The TER1/4 Relays

The operation of one of the local completion relays with an operated CMS0 or 1 relay will cause the operation of the TER1/4 relays in a manner similar to that explained in Section 13.36. Operation of these relays will identify the call as terminating to a customer in the CAMA marker group.

11.17 Completion of the Call

After identifying the call as a CAMA completing usage terminating call, the marker will proceed to complete the call in the same manner it completes other terminating calls. The operation is similar to that explained in Sections 12.4, 12.5, 12.6, 12.7, 12.8 and 12.9.

11.2 Call Directed to a Distant Office

The marker in establishing a CAMA completing usage call which is to complete in a distant office will function in a similar manner to a marker establishing a tandem or intertoll connection. The major functions performed are:

(a) Registration of information from the CAMA sender which the marker requires in assisting a call to be switched through to another office.

(b) The identification of the call or connection.

(c) The identification of the location of the appearance of the CAMA type trunk on the line frame obtained from the number group.

(d) Selection and connection of an outgoing sender.

(e) The selection of an available outgoing trunk circuit.

(f) The selection of an idle connecting path between the selected outgoing trunk circuit and the CAMA type trunk.

(g) Connection of the outgoing trunk to the CAMA type trunk through the selected connecting path.

(h) Release of the marker and associated circuits after the call is completed.

CAMA type trunks are arranged for line link frame and trunk link frame access or line link frame access only. For the CAMA completing usage call that is to be extended to a distant office, the marker must choose an outgoing trunk and set up a connecting path between the outgoing trunk appearance on the trunk link frame and the appearance of the CAMA trunk on the line link frame.

11.21 Seizure of the Marker by the CAMA Sender

After the CAMA sender has completed its functions and is ready to complete the call it will connect to a marker through an incoming register marker connector. This connection is similar to that described in paragraph 12.1.

11.22 Registration of Information from the CAMA Sender

After seizing a marker, the CAMA sender will transfer to the marker, through the incoming register marker connector, the code and numerical digits of the called number as well as the trunk number to identify the CAMA type trunk involved in the call.

By translating the code digits, the marker will determine that the call is to be terminated in some distant office.

11.23 Code Digits and Number of the Called Line

CAMA completing usage calls which are to terminate in some distant office may contain seven or ten digits depending on whether an XOX/X1X area code has been dialed. These digits will be recorded on the ACO/7, BCO/7, CCO/7, DO/7-KO/7 relays, depending on the number of digits involved.

11.24 Identification of the CAMA Type Trunk

To identify the equipment location of the CAMA trunk on the line link frame, the marker must record the trunk number. This information is received from the CAMA sender over leads "HTO/7", "TTO/7", "UTO/7" indicating hundreds, tens, and units digits respectively. These leads will operate correspondingly numbered HNO/7, TO/7, UO/7 and HNAO/7, TNAO/7 and UAO/7 relays thereby recording the trunk number in the marker. This information is relayed to the number group frame for translation into line equipment number.

11.25 Identification of the Basic Call or Connection

In order to identify this call as a CAMA completing usage call, it is necessary to operate one of the CMSO-1 relays in the marker. The CMSO relay identifies the call as a CAMA completing usage call that entered the office over a CAMA trunk requiring TAN supervision. The CMS1 relay identifies the call as a CAMA completing usage call that entered the office over a CAMA trunk requiring TOL type supervision. The type of supervision required is information that the CAMA sender has stored from the previous marker usage. In that usage, the marker sent this information to the CAMA sender over the "CL1" and "CL5" leads to indicate TAN supervision or over the "CL2" and "CL5" leads to indicate TOL supervision. On the CAMA completing usage, this information is sent back to the marker over leads "TCB" and "TSC8" for TAN supervision or leads "TCB" and "TSC9" for TOL supervision. The "TCB", "TSC8" and "TSC9" leads each operate similarly designated relays in the marker. A combination of TCB and TSC8 relays operated will operate the CMSO relay while a combination of TCB and TSC9 will operate the CMS1 relay in tne marker.

The operation of the TCB and TSC8 relays will operate three relays, S203--205. In a like manner, the operation of the TCB and TSC9 relays will operate relays S206--208. These relays provide a code point screening field for the CMSO and CMS1 call classes.

The marker determines that the call is to be extended to some distant office by translating the code digits. This translation is done by the marker translator or by the foreign area translator.

The "LCDO-2" and the "ACD" indications received from the CAMA sender are indications of the number of digits dialed by the calling customer and the area in which the calling and called customers are located. If seven digits have been dialed, the CAMA sender will so indicate by grounding one of the "LCDO-2" leads to the marker through the incoming register marker connector. Grounding these leads will operate the respective relays in the marker. The particular "LCDO-2" lead grounded will depend on the area in which the call is located: "LCDO" representing the home area and "LCD1-2" representing the remaining two areas. If ten digits have been dialed, the "ACD" lead will be grounded regardless of the originating area.

The CAMA sender will also ground the "WKC" lead to the marker if the dialed code is a working code in the area to which the call is directed. Ground on the "WKC" lead will operate the "WKC" relay in the marker.

Operation of the ACD relay with WKC operated will enable the marker translator to choose the proper foreign area translator for translation of the ABX code digits.

Depending on the cross connections at the "LCDO-2" punchings, translation of the ABX digits of seven digit calls will be accomplished by the marker or foreign area translator.

11.26 The R- Relay

The marker translator or foreign area translator output associated with the ABX code will be cross connected to operate the appropriate R-relay for proper routing of this call.

11.27 Selection of an Outgoing Sender

The selection and connection of an outgoing sender for a CAMA completing connection is similar to the selection and connection of an outgoing sender for a tandem connection as described in paragraph 14.4 except that relays TOG1-3 will be operated through CMSO-1 contacts rather than TAN relay contacts. Also, the TOG2 relay will operate relay TOG4.

11.28 Completion of the Call

After identifying the call as a CAMA completing usage call that is to be extended to a distant office by operating one of the CMSO-1 relays and the TOG1-4 relays, the marker will complete the call in substantially the same manner it completes a tandem call. The operation is similar to that explained in Sections 14.4, 14.5, 14.6, 14.7, 14.8 and 14.9.

11.3 CAMA Completing Usage Calls Encountering Non-Working Codes

On seven digit calls it is impossible in the CAMA function to detect codes that

are non-working in some but not all areas served by the CAMA center. Such codes are detected by the billing indexer or by the foreign area translator on the CAMA completing function.

If the billing indexer recognizes a non-working code, the CAMA sender will indicate this fact to the marker by grounding one of the "VTC", "DNC", or "FC" leads. These leads indicate that a vacant terminating code, a denied code, or a free code has been dialed rather than a working code. Operation of the VTC, DNC, or FC relays from the corresponding leads will disable the marker translator and close circuits to the "VTC", "DNC" or "FRC" punchings which are cross-connected to operate the proper route relays for the desired intercept treatment.

The foreign area translator may also recognize a non-working code on the CAMA completing function. If the foreign area translator identifies the code as a vacant code, it will ground the "FAR-" code point assigned to vacant codes. This code point will be cross-connected to the "VCG" terminal. Intercept can then vary on a class of call basis.

Free codes and denied codes recognized in the foreign area translator will be indicated by grounding one of the "FAR-" leads assigned to free or denied codes. The "FAR-" punchings will be cross-connected in the marker to give the desired intercept treatments.

12. CAMA TESTING

Tests for the CAMA sender and CAMA trunks have been provided and the procedures necessary to make these tests can be found in the test circuits. In addition, a trunk test relay associated with the CAMA feature has been added to the marker.

When the marker operates to complete a CAMA test call to an outgoing trunk, the automatic progression trunk test circuit or the master test control circuit, will operate the trunk test auxiliary TTA relay.

The operated TTA relay will operate the OTT and MD1 relays, aid in the subsequent operation of the DIS1 and DIS2 relays and provide preference lock-out paths from the test circuits, to the trunk link frame associated with the trunk under test.

If the automatic progression trunk test circuit is making a trunk test, the operated OTT relay will operate the TTA relay in the associated trunk link frame and prevent the master test control circuit from gaining access to this same trunk link frame.

In a similar manner if the master test control circuit is making a trunk test, the TTM relay in the trunk link frame will operate and "lock-out" the automatic progression trunk test circuit.

13. TRUNK SERVICE OBSERVING ON CAMA CALLS

The trunk service observing feature provides a means for observing customer, operator and equipment performance on CAMA calls.

Trunk service observing on CAMA calls can only be accomplished during the marker CAMA function, (i.e. when a CAMA junctor is chosen, when the CAMA intermarker trunk is connected to a CAMA sender, or when an incoming CAMA trunk calls for the services of a marker.)

When observing on CAMA calls is desired, the "CAMA" lead to the marker from the service observing trunk selection and control circuit will be grounded. With this lead grounded, if the marker is called on to perform a CAMA function, (connect to a CAMA sender) the TOBS relay will be operated. Operation of the TOBS relay indicates that the call being served is of the type upon which trunk service observing is desired.

After the call has proceeded to the point where the trunk link frame is seized, the marker will inspect the "NH" lead from the trunk link and connector circuit to determine whether or not the particular CAMA junctor, CAMA intermarker or CAMA incoming trunk is requesting service observing. Ground on the "NH" lead will indicate that the junctor, intermarker or incoming trunk is requesting service observing and the absence of ground will indicate that there is no service observing request.

If ground is present on the "NH" lead, relay TOB in the marker will be operated. On CAMA junctor calls this ground will operate TOB directly while on intermarker or incoming CAMA calls, the ground will first operate relay CTOB which in turn will operate TOB.

The operation of the TOB relay in the marker will operate the connector relays in the service observing register connector circuit. Operation of these connector relays will cut through the dialed number registration leads from the marker to the service observing register connector, transferring the dialed number to that circuit. Operation of the connector relays will also ground the "CK" lead to the marker to operate the OBS relay indicating that the call is being observed.

If, upon seizing the trunk link frame, no ground on the "NH" lead is present, relay TOB in the marker will not operate. With

TOB non-operated, relay NOB will be operated. On junctor calls, the operating circuit of NOB will be through CTOB and TOB non-operated, ORCO-2 and CHA operated. On intermaker or incoming CAMA calls, the operating circuit is through CTOB and TOB non-operated, ORCO-2 and CMF3 operated.

Operation of either the NOB or OBS relays will ground similarly designated leads to the CAMA sender to inform that circuit whether or not a service observing record is required. Check for the passage of this information to the CAMA sender is made under control of the RNT timer.

14. MISCELLANEOUS REQUESTS FROM THE INCOMING REGISTER

14.1 Reorder

A reorder request from an incoming register serving an incoming CAMA trunk or from a CAMA sender on a completing CAMA call operates the RO relay over the "RO" lead from the incoming register marker connector. The ROA, TER- and OV relays operate as on other incoming calls to set overflow in the CAMA incoming trunk.

14.2 LR and DCK Failures

Requests from the incoming register to take trouble records of incoming link release failures or double connections as indicated by ground over the "LR" and "DCK" leads from the incoming register marker connector are completed in the same manner as for other types of incoming trunks. These grounds operate the LR or DCK relays to prepare the marker for properly disposing the call.

15. RECYCLE AND ROUTE ADVANCE

15.1 Recycle

15.11 Incoming CAMA Function.

Since no channel (path) is established between the line link frame and trunk link frame, matching failures are non existent and therefore the recycle feature (RCY- relays) is not brought into play.

15.12 CAMA Junctor, CAMA Intermarker or CAMA Completing Function

Since a channel (path) is established between the line link frame and trunk link frame, matching failures are counted and the recycle RCY- relays function.

Operation on junctor and intermarker calls is similar to the SOG (outgoing) type call where recycle occurs after one matching failure (two matching attempts.)

Operation in the completing function is similar to TER (terminating) or TOG (tandem or toll outgoing) depending upon whether the call completes to an office in the home marker group or in a distant office.

15.2 Route Advance

15.21 Incoming CAMA Function

The route advance feature (RAV relays) functions when the "all CAMA Sender Busy" is encountered. Class advance to TER and establishment of reorder in the incoming trunk takes place as on a pulse conversion call.

15.22 CAMA Junctor or CAMA Intermarker Function

Route advance on "all trunks busy", "all senders busy" or after a matching failure (two matching attempts) takes place in the same manner as on an SOG type call. The call is then connected to some form of tone, machine announcement or intercept trunk appearing on the trunk link frame.

15.23 CAMA Completing

Route advance in the completing function is similar to TER or TOG depending upon whether the call is to complete to an office in the home marker group or is to terminate at a distant office.

16. CAMA CALLS ENCOUNTERING FAILURES

16.1 Marker Actions

The action taken by the marker serving a CAMA call on which a failure occurs will depend on the type of CAMA call involved, how far the call has progressed, and whether the call is a first or second trial.

On incoming CAMA or CAMA intermarker group (CAMA usage) calls, when failures occur, the marker will behave as follows:

Type of Call	Failure Occurs on 1st Trial	Failure Occurs on 2nd Trial	Progress of Call Before CAMA Sdr. (AV) Operates	Progress of Call After CAMA Sdr. (AV) Operates	Mkr. Action
CAMA Incoming or CAMA Intermarker grp. (CAMA Usage)	✓		✓		1. Releases sdr & outsdr link. 2. Request 2nd trial.
				✓	1. Releases sdr. & outsdr link.
			✓		2. Sets reorder in trunk
		✓		✓	

As shown in the table, if a failure occurs on a first trial, second trial will be requested only if failure occurs before the AV relay in the CAMA sender operates. Beyond this point, the marker will set reorder in the trunk. This difference in operation is due to the introduction of the automatic identification feature. Where this feature is provided, the sender AV relay will operate a relay in the trunk to signal the automatic identification circuits in the distant office to start pulsing. Once this point is reached, it is impractical to restore the circuits to their original condition for a second trial attempt.

On CAMA completing usage calls encountering failures, the marker will function as it does on TAN or TOL class calls encountering similar failures.

On CAMA junctor calls or CAMA intermarker group calls (SOG usage), if a trouble is encountered, the marker will treat the call in the manner similar to the treatment given SOG non-CAMA calls.

16.2 CAMA Trouble Recorder Indications

The following is a list of trouble card indications and meanings changed or added as part of the CAMA features.

Pchg. Desig.	Lead from Mkr. to MTFC	Meaning of Pchg.
CAMF	CAMF	(With "CAMA" pchg. - CAMA function (With "TOG" pchg. - Through switch call from CAMA trk.
CAMS	CAMS	CAMA completing function
ORC0	NT)	
ORC1	NN)	Originating rate class Input from T.L.F.
ORC2	HF)	
ORC'0-2	ORC'0-2	Originating rate class output to sender
AD	AD	Automatic identification (input from T.L.F.)
AD'	AD'	Automatic identification (output to sender)
OD	OD	Operator identification (input from T.L.F.)
OD'	OD'	Operator identification (output to sender)
CAMA	CAMA	Call requiring CAMA sender
HT0/7	HT0/7	Trunk number hundreds digit (input from IRMC)
HT'0/7	AR0/7	Trunk number hundreds digit (output to sdr)
TT0/7	TT0/7	Trunk number tens digit (input from IRMC)
TT'0/7	BR0/7	Trunk number tens digit (output to sdr)
UT0/7	UT0/7	Trunk number units digit (input from IRMC)
UT'0/7	CR0/7	Trunk number units digit (output to sdr)
FG0-1	FG0-1	Trunk frame tens digit (input from IRMC)
FG'0-1	FT'0-1	Trunk frame tens digit (output to sdr)
TF0/7	TF0/7	Trunk frame units digit (input from IRMC)
TF'0/7	FU'0/7	Trunk frame units digit (output to sdr)
FC	FC	Free code
WKC	WKC	Working code
VTC	VTC	Vacant terminating code
DNC	DNC	Denied code
LCD0-2	LCD0-2	Seven digit dialed
ACD	ACD	Ten digit dialed

17. TRAFFIC REGISTERS

Traffic peg count "PC" or "IPC" of offered CAMA calls may be obtained in the standard manner from the R- relay assigned to a CAMA junctor, CAMA intermarker or CAMA incoming trunk group.

Traffic peg count "PC" or "IPC" of offered calls to outgoing trunks on the completing usage may also be obtained in the standard manner from the R- relay serving the outgoing trunk group.

CAMA sender group busy "ASB" or peg count is determined by the peg count practice existing in the office for other sender groups as follows:

Marker Issue	Traffic Register	Provided
Prior to Issue 23B	Sdr. Grp. Peg. Count	1 per Sdr. Grp. per all mkrs.
	Sdr. Grp. Busy	1 per Sdr. Grp. per all mkrs.
Issue 23B or later	Sdr. Grp. Peg Count	1 per Sdr. Grp. per mkr.
	Sdr. Grp. Over Flow	1 per Sdr. Grp.

Originating matching loss "FM" peg will score on CAMA junctor and CAMA intermarker calls as on other SOG classes.

Incoming matching failure peg "IFM" will score on the CAMA completing usage where the call is completing to customers in offices in the home marker group.

Line link and trunk link frame failure to match pegs "OF" function as on other failure to match calls.

Line link and trunk link frame "TER" and "INC" frame load pegs will be activated in the standard manner on calls to customers in those offices served by the marker group.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2312-FCK-REH-GH

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

The following apply to combined or completing markers only:

A.1 A traffic peg count samplying of selected channels is added. An individual peg count register per marker is provided for in the traffic register circuit. The count is made on all calls set up to line link and trunk link frame channels 0 and 5 except dial tone and test calls.

A.2 The marker is arranged to accept single digit toll codes. Note 347 is changed to specify cross-connection punching information giving access to the "FVD" translator on toll calls.

D. DESCRIPTION OF CIRCUIT CHANGES

The following apply to combined or completing markers only:

D.1 A traffic peg count samplying of selected channels is added. An individual peg count register per marker is provided for in the traffic register circuit. The count is made on all calls set up to line link and trunk link frame channels 0 and 5 except dial tone and test calls.

Marker changes consist of the following:

(a) The addition of the "PCSC" lead to the traffic register circuit for transmitting the peg count signal.

(b) Wiring changes at relays CHO-9, PEG, DT1, DT3 and TR2.

(c) Fig. BW is added as an after date standard for the dial tone marker. It is rated Mfg. Disc. for the combined and completing markers.

Fig. BX is added as an after date standard for the completing market.

Fig. BY consisting of the DT4 - U829 relay and associated contact protection is added as an after date standard for the combined marker.

The DT4 network of Fig. BY is included in the B11 ground supply shown in Note 101F and in contact protection Note 104.

Forty-eight volt battery supply for Fig. BY has been added at fuse A57 in Note 101A.

(d) Note 132 is added. It specifies that for sample channel peg count, combined or completing markers manufactured prior to Issue 34D, Fig. BW must be replaced by the following:

Completing marker - Fig. BX

Combined marker - Fig. BY

D.2 The marker is arranged to accept single digit toll codes. Note 347 is changed to specify cross-connection punching information giving access to the "FVD" translator on toll calls.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2312-NPS-REH-LM

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

The following apply to combined and completing markers only:

A.1 The "PSR" trouble recorder punch feature is removed where markers are equipped with Fig. AH. This figure provides "WT," "SDT" and "LDT" time out trouble record punches which eliminate the need for the "PSR" punch.

A.2 A check is provided for the operation of the 2 through 9 select magnets of the ringing switch on overflow, line busy, intercept, free and blank number calls. The change controls operation of the 0 and 1 select magnets through the operated RSK relay. This relay in turn is operated by the 2 - 9 select magnets.

A.3 The marker is changed to eliminate a nonproductive trouble record card on ringer test calls where the dialed numerical digits represent a blank number.

A.4 The marker is arranged to eliminate nonproductive trouble record cards in ten or twenty trunk link frame size offices. This may occur when both a line link frame line busy signal and a failure to match occur on an intraoffice PBX terminal hunting call.

A.5 Trouble recorder card punches "TOBS" and "TOB" are added to identify the progress of a trunk service observed call. The circuits for the punch marks are obtained from the marker over existing "OBS1" and "OBS2" leads by way of the master test frame connector.

Additional test facilities are added for the trunk service observing feature. These permit testing with either home or foreign area dialed calls (seven or ten digit) or foreign area dialed calls only (ten digit). Tests are made over added "HFA" and "FAD" leads connecting to the master test frame connector circuit.

A.6 The addition of wire-spring number group or line link frames to an office introduces a losing relay race in the special markers on "no test" calls where the markers are equipped with "RD" option. The faster operating wire-spring general purpose and multicontact relays cause the "U" marker NTT relay to operate before the NTR relay. This falsely operates the LK1 relay and prematurely disconnects the marker.

The following apply to dial tone and combined markers only:

A.7 Momentary line starts on dial tone calls, aggravated on open-wire lines, may cause nonproductive trouble record cards identified as "NO VGT" failures. This occurs if certain sequences of events take place such that the operating and locking circuits for a VGT-relay are momentarily opened at the instant the vertical group selection is being completed.

A.8 Magnetic interference from the TR2 and TR2C relays on second trial may prevent operation of the OC1 relay.

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

The following apply to combined and completing markers only:

C.1 To conform with the standard method of adjusting 276A and 276B relays the "after soak" current requirement for nonoperate and release has been removed for the following relays: FTNO-3, FUNO-9, HGNO-9, RCN1-15, VFNO-4, VGNO-11, JCKO-1, LBT, SBO-9, RCLA, SKA1, SKB1 and SLO-9.

C.2 The timing requirements information for the RNT relay is changed to permit testing in offices arranged for pulse conversion and non-AMA.

In the "test clip data" column for "conn W," 1B (RN) is removed and replaced by 8T (RNT1).

C.3 The code of the LR relay was incorrectly changed to U113 on a previous issue due to a drafting error. This has been corrected by showing the proper code U1113.

C.4 When adjusting the TFK3 relay, closure of its 9 and 10B contacts improperly places its winding in parallel with the TFK1 and 2 relay windings.

The TER1 relay is shown blocked operated when adjusting the TFK3 relay to open the TFK1 - 2 relay circuit.

The following apply to dial tone and combined and completing markers:

C.5 Field experience shows that a change in electrical characteristics occurs for the 276B relays that are associated with the sleeve circuits of line link and trunk link frame crossbar switches. The change is due to high negative surge voltages encountered when the hold magnets release. This changes the magnetic characteristics of the relay.

To counteract the effect, the current flow requirements have been increased for the following relays: TLLO-9, TJO-9, and TTLO-9.

D. DESCRIPTION OF CIRCUIT CHANGES

The following apply to combined and completing markers only:

D.1 A permanent signal call in most cases can be identified and handled by the marker over two punch positions on the trouble card. The "PS" punch indicates ground on the PS lead from the originating register and will be present on all permanent signal calls. The "PSR" punch indicates that the marker handled a permanent signal call without encountering trouble in disposing of it. Therefore, both the "PS" and "PSR" punches indicate a "good" permanent signal call. The absence of the "PSR" punch indicates that a trouble record was taken due to a trouble.

When Fig. AH was equipped in the U and Y marker circuit SD-25550-01, Issue 23-B, arrangements were made to provide work timer (WT), short delay timer (SDT), and long delay timer (LDT) trouble recorder punches. With these added features the "PSR" punch became superfluous. On "good," permanent signal calls the "PS" punch alone will indicate the type of call and when trouble is encountered one of the timer punches would be present. Therefore, the "PSR" trouble recorder punch feature is removed when markers are equipped with Fig. AH.

Marker changes consist of the following:

(a) Wiring option Fig. BP is added as an after date standard replacing wiring option Fig. BO which is rated Mfr. Disc.

(b) Note 127 is added requiring the use of Fig. BP when the "PSR" feature is omitted. Coordinate with Issue 20-D of SD-25805-01 - Master Test Frame Connector Circuit.

D.2 The marker is arranged to check the operation of the 2 through 9 select magnets of the ringing switch on overflow, line busy, intercept, free and blank number calls. The change controls operation of the 0 and 1 select magnets through the operated RSK relay. This relay in turn is operated by the 2-9 select magnets.

Although no apparent race exists, this change will give the select finger on the ringing selection switch more time to settle in the trapping zone before the hold magnet operates and eliminates the possibility of any race.

Marker changes consist of the following:

(a) Wiring option "NF" is added as an after date standard and replaces wiring option "NE" which is rated Mfr. Disc.

(b) Wiring changes are associated with relays FNB, RSK, RCT1-15, RV3, FLG, and ONX.

(c) Note 125 is added. It calls for the removal of the "TO" option in markers manufactured prior to Issue 18-B, when "NF" option is furnished.

D.3 The marker was changed to eliminate a nonproductive trouble record card on ringer test calls where the dialed numerical digits represent a blank number.

This arrangement will cause the register to return busy tone when during a ringer test call the dialed numerical digits correspond to a blank number, instead of the marker being blocked and producing a trouble record card.

Marker changes consist of the following:

(a) Wiring option "NI" is added as an after date standard and is associated with relays BNTH and RGTA.

(b) Note 126 is added specifying the use of "SD" option when "NI" option is furni

D.4 The marker is arranged to eliminate nonproductive trouble record cards in ten or twenty trunk link frame size offices. This may occur when both a line link frame line busy signal and a failure to match occur on an intraoffice terminal hunting call.

The change delays recognition of the line busy signal until after channel selection has been completed, which of course, does not occur if a matching failure is encountered.

The marker changes consist of the following:

(a) Wiring option "NS" is added as an after date standard replacing wiring option "NR" which is rated Mfr. Disc.

(b) Wiring changes are associated with relays RCY2, RCY4, FLG, as well as the CHA relay Fig. BJ.

(c) Note 131 is added specifying the use of "NS" option and Fig. BJ for this change.

D.5 Trouble recorder card punches "TOBS" and "TOB" are added to identify the progress of a trunk service observed call. The circuits for the punch marks are obtained from the marker over existing "OBS1" and "OBS2" leads by way of the master test frame connector.

Additional test facilities are added for the trunk service observing feature. These permit testing with either home or foreign area dialed calls (seven or ten digit) or foreign area dialed calls only (ten digit). Tests are made over added "HFA" and "FAD" leads connecting to the master test frame connector circuit.

Marker changes consist of the following:

(a) Fig. CB (wiring only) is added as an after date standard replacing Fig. CA which is rated Mfr. Disc.

(b) Note 102, Paragraph 120 is changed to include Fig. CB for trunk service observing.

(c) The changes must be coordinated with Issue 20-D of master test frame connector circuit, SD-25805-01.

D.6 The addition of wire-spring number group or line link frames to an office introduces a losing relay race in the special markers on "no test" calls where the markers are equipped with "RD" option. The faster operating wire-spring general purpose and multicontact relays cause the "U" marker NTT relay to operate before the NTR relay. This falsely operates the LK1 relay and prematurely disconnects the marker.

Marker change is as follows:

Note 133 is added requiring the use of "RE" option (added on Issue 23-B as an after date standard) whenever wire-spring number group or line link frames are added. This change requires the operation of the NTT and LNT relays as well as both the operation and release of the NTR relay before the LK1 relay circuit is closed.

The following apply to dial tone and combined markers only:

D.7 Momentary line starts on dial tone calls, aggravated on open-wire lines, may cause nonproductive trouble record cards identified as "NO-VGT-" failures. This occurs if certain sequences of events take place such that the operating and locking circuits for a VGT- relay are momentarily opened at the instant the vertical group selection is being completed.

Marker changes are as follows:

(a) Wiring option "NH" is added as an after date standard replacing wiring option "NG" rated Mfr. Disc. The wiring changes are associated with relays GK, MCBO-1, VGG1-2, VGT and VTK.

D.8 Magnetic interference from the TR2 and TR2C relays on second trial may prevent operation of the OC1 relay.

The marker change is as follows:

(a) Equipment specification J28754CA Sk. C. is changed to specify the U4 cover for the OC1 relay.

D.9 The following circuit drawing changes and miscellaneous note changes are made to correct errors in the marker SD drawing, to clarify notes and to bring the circuit into agreement with the manufacturing drawing:

(a) The "LLC" lead to trunk, link circuits was corrected to read "LCC" in Fig. 287.

(b) Location reference for the "ANK," "NG" and "NG1" leads to the number group circuits was corrected in the lead index.

(c) Figs. BT, BU and BV which were added on Issue 32-D are now shown in the options used column.

(d) The circuit figure location for Fig. 51 should read C262 in the options used column.

(e) At the "NS" punching, Fig. 97 reference to Note 347D is added.

(f) In Fig. 61 the "SC" punching shown connecting to "SCG" Fig. 79, is changed to "SCG" Fig. AI. Likewise for the "S" punching connection to "MTR" Fig. 79 is changed to "MTR" Fig. AI.

(g) The "N55" cross connection of Note 347 for nontoll six - seven digit area is corrected to read "NS5."

(h) In Fig. 68 cross connection of the "BN" and "RI" punchings to the "TI" punching of Fig. AV is added.

(i) Ground is shown at 6T of the 4NE relay of Fig. 126. This was omitted on a previous issue due to a drafting error.

(j) 48-volt and 130-volt battery symbols and voltage ranges are shown.

(k) Contacts 4T - 5T of the TOB relay of Fig. 144 are shown looped to provide continuity when the figure is not furnished. The "OBST" lead of Fig. 144 shown connecting to the master test frame connector circuit is shifted to Fig. BH to provide continuity when Fig. 144 is omitted.

(l) Record Note 103C is added. It is used to rerate options applied on previous issues.

(m) In record Note 103B under "in Note 102 see Paragraph No." reference to Paragraph 72 and 93 for the "XT" option shown on Issue 16-A is removed. In the same column, reference to Paragraph 119 for the ST and QS options shown on Issue 24-D is removed.

(n) Option "QT" is shown standard and "SA" is shown as Mfr. Disc. for the completing marker Issue 21-B.

(o) In Note 318 cross connections are shown for the "RC" punching of Fig. 51 connecting to the "FAR" punching of Fig. 140 and the "C" punchings of Fig. 123.

(p) Note 120 is changed removing reference to line link frame sizes that require the "ON" option. The note now specifies that "ON" option must be provided when wire-spring supplementary frames are added for line link frames. Reference to the number of line link frame select magnets that may be operated in parallel as well as the various usable combinations of line frame sizes is covered on Issue 5-B of SD-26030-01, Line Link Circuit.

All other headings, no change.

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DEPT. 2312-NPS-REH-BS

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The marker is arranged to route advance from intertoll routes not requiring class information, to intertoll routes requiring class information over the "RC" lead.

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

C.1

(CAA) Relay	(PNC) Relay
(MBSO-9) Relay	(PPX) Relay
(NCCN) Relay	(TCNC) Relay
(NCNC) Relay	(TOS) Relay
(PCN) Relay	

D. DESCRIPTION OF CIRCUIT CHANGES

The following changes apply to dial tone, combined or completing markers.

D.1 The marker SD drawing is changed to bring it into agreement with the shop drawings for Issues 28-B, 29-D, 30-B and 31-D.

D.2 The marker is arranged to route advance from intertoll routes not requiring class information to intertoll routes requiring class information over the "RC" lead. This is a new marker feature.

(a) Wiring changes associated with relay (TOS) are designated "NK" Option (Std.).

(b) Wiring changes associated with relay (NCNC) are designated Options "NK" (Std.) and "NJ" (Mfr. Disc.).

D.3 Figures BT (A&M Only), BU (STD) and BV (STD) are added to bring the circuit in line with the equipment information for the number group "ST-" leads.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2312-MK-REH-VH

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The marker is arranged to provide for the operation of one marker group with more than 20,000 numbers.

B. CHANGES IN APPARATUS

B.1 The code of relays (OA) and (OB) is changed from U1367 or UB17 to U1396.

B.2 Relays (OAN) and (OBN) are removed from Figure 108 and shown in new Figure BK (Mfr. Disc.).

B.3 New Figure 149 is added consisting of relays (AST), U886 and (ASTA), U1354.

B.4 Relays (NSSO-1), U1381, (RGTO-1), U1392, (RGT), U6117, associated contact protection networks, relay (XNS), S68, and resistance lamp (NSS), 13J are added in new Figure 147 (Std.).

B.5 Relays (NSS2-5), U1381, (RGT2-5), U1392, and associated contact protection networks are added in new Figure 148 (Std.).

D. DESCRIPTION OF CIRCUIT CHANGES

The following changes apply to combined or completing markers.

D.1 The marker is arranged to provide for the operation of one marker group with more than 20,000 numbers. Six number series serving six offices are provided where two such series were provided previously. The capability of a marker group is increased to 40,000 numbers assigned in blocks of maximum 10,000 numbers per office.

To provide this feature, marker changes consist of the following:

(a) Relays (OAN) and (OBN) are removed from Figure 48 and are shown in new Figure BL (Mfr. Disc.).

(b) Relays (OAN) and (OBN) are removed from Figure 108 and are shown in new Figure BK (Mfr. Disc.).

(c) Relays (OA) and (OB) are removed from Figure 38 and are shown in new Figure BM, (Mfr. Disc.) and BN (Std.). In Figure BN, the code of the relays is U1396.

(d) Figure 62 is rated (A&M Only).

(e) Figure 125 is rated (A&M Only).

(f) Figure 149 is added and rated (Std.). This figure consists of relays (AST), U886 and (ASTA), U1354. Relay (ASTA) is designated "OZ" Option.

(g) Relays (NSSO-1), U1381, (RGTO-1), U1392, (RGT), U6117, associated contact protection networks, relay (XNS), S68, and (NSS), 13J resistance lamp, are added in new Figure 147, (Std.).

(h) Relays (NSS2-5), U1381, (RGT2-5), U1392, and associated contact protection networks are added in new Figure 148 (Std.).

(i) Wiring changes associated with (ISE), (2SA), (3NA), (4NE), (5ST), (6NT), (8SP), (9NP), are designated "ND" Option (Std.). Wiring changes associated with the (1TB), (2MB), (3FB), (4TT), (5MT), (6FT), (7TP), (8MP), (9FP), (LPA), (LPB), (LTA), (LTB), (LEA), (LEB), (INC), relays are shown in Figures BM and BN.

(j) Notes 123 and 363 are added.

(k) Notes 304 and 305 and 354 are rated (A&M).

(l) Cross connection terminals "BAN", "AAN", "BPN", "APN", "ATN", "BTN", "AEN", "BEN", "BSA", BSA1", "STUO-39" are added in Figure BN.

(m) Cross connection terminals "NSSO-5", "STO-9", "ASTO-5", and "TRO-5" are added in Figures 147 and 148.

(n) Cross connection terminals "TRB" and "RGT" are added in Figure 147.

All other headings, no change.

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

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

C.1 (LDT) Timer
(SDT) Timer
(SFT) Timer
(RNT) Timer
(HMT) Relay
(PCCL) Relay
(LP) Relay
(RCT9) Relay
(MT19) Relay
(LXP) Relay
(XLR) Relay
(XF) Relay
(XJG) Relay
(XJC) Relay
(XPTN) Relay
(XLC) Relay
(LR) Relay

BELL TELEPHONE LABORATORIES, INCORPORATED

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The marker is arranged to complete to intercept, calls for temporarily disconnected lines having only the "L" cross connection removed in the number group.

A.2 The marker is arranged to provide discrimination between local and area code partial dials and vacant codes.

A.3 Trunk service observing features are added to the marker.

A.4 The marker is arranged to operate with the Outgoing Sender Group Release circuit to release stuck senders under all senders busy conditions.

A.5 The marker is arranged to permit the use of two tandem classes without the addition of the Tandem Code Screening bay.

A.6 The marker is arranged to operate with the Traffic Usage Recorder Circuit.

B. CHANGES IN APPARATUS

B.01 The code of the (OR) relay is changed from U1368 or UB18 to U1325 or UB12. This relay is now shown in figures BC (Mfr. Disc.) and BD (Std) instead of in figure 43.

B.02 Relay (FAC), U1396 is added in figure BD.

B.03 Figure 144 is added consisting of relays (TOBS), U1355 or UB15, (SOB), U1364, (TOB), U1013, and contact protection network (TOBS) and (SOB).

B.04 Relay (NOB), U1346 or UB14 is changed to U1355 or UB15. Relay (OBS), U1354 is changed to U1386. These relays have been removed from figure 67 and are now shown in figures BG (Mfr. Disc.) and BH (Std.)

B.05 Relay (SNO), U1364 is added in figure BH.

B.06 The code of the (CHA) relay is changed from U1379 to U1404. This relay is removed from figure 31 and is shown in figure BI (Std) and BJ (Std).

B.07 The (NTO) resistor, 18FC, is added in figure BJ.

B.08 Relay (TAN1), U1325 or UB12, and its contact protection network is added as new figure 145 (Std).

B.09 Relay (TUR), 280BM, is added to figure 73.

B.10 Resistors (TUR), 18CB, and (MAK), 18FH are added to figure 73.

D. DESCRIPTION OF CIRCUIT CHANGES

The following apply to combined and completing markers only.

D.01 The marker is arranged to complete to intercept, calls for temporarily disconnected lines having only the "L" cross connection removed in the number group.

(a) Wiring changes associated with relays (RCT10), (HTUK), (RCL), (CKR), (VFL), (HGL), (FTL) are designated options "OK". (Mfr. Disc.) and "OL" (Std.)

(b) Notes 326 and 359 are changed.

(c) Cross connection terminal "T1" is added as "OL" option in Figures AU and AV.

(d) Cross connection terminal "TP1" is added as "OL" option in figure AU.

This feature should be used only as a temporary expedient because a single trouble condition, preventing operation of relays (FUL) and (FTL) will incorrectly route good calls to intercept.

D.02 As part of the FACD national dialing program, the marker is arranged to provide different treatment for partial dials or vacant codes depending on whether the code involved is a local or foreign area code and whether the subscriber is or is not permitted to dial foreign area codes.

(a) The code of the (OR) relay is changed from U1368 or UB18 to U1325 or UB12. The (OR) relay is now shown in figure BC, (Mfr. Disc.) and figure BD, (Std) instead of in figure 43.

(b) The (FAC) relay, U1396, and contact protection networks are added in figure BD.

(c) Cross connection terminals "PD1", "FCVC", "VCP", "VCR", and "PDP" are added in figure BD.

(d) Note 330 is changed.

(e) Figure 97 is rated (Mfr Disc).

D.03 As part of the FACD national dialing program trunk service observing features are added to the marker. This feature permits service observing on trunks carrying 7 digit home area or 10 digit foreign area calls.

(a) Figure 144 is added consisting of relays (TOBSO, U1355 or UB15, (SOB), U1364, (TOB), U1013 and contact protection networks (TOBS) and (SOB).

(b) Relay (NOB), U1346 or UB14 is changed to U1355 or UB15 Relay (OBS), U1354 is changed to U1386. These relays have been removed from figure 67 and are now shown in new figures BG (Mfr Disc) and BH (Std).

(c) Relay (SNO), U1364, is added in figure BH.

(d) Wiring changes associated with relays (MBSO-9) are designated options "OW" (Mfr Disc) and "OX" (Std).

(e) Multiple of leads "AO/7", "BO/7", "CO/7", "DO/7", "EO/7", "FO/7", "GO/7", "HO/7", "JO/7", "KO/7", "LO/7", and "M7" from the Originating Register Marker Connector are run to the Service Observing Register Connector Circuit.

(f) The code of the (CHA) relay is changed from U1379 to U1404. This relay is removed from figure 31 and is shown in figure BI (Std) and figure BJ (Std).

(g) The (NTO) resistor, 18FC, is added as part of figure BJ.

(h) Wiring changes associated with (RN), (RNK1), (FN), (NTH), (RYC), (TBK), (RV1), (RV2), (SPL1), (NH), (SOG1) relays are designated options "OX" (Std) and "OW", (Mfr Disc).

(i) Wiring changes associated with (11X), (FAC), (OR) relays are designated "OY" option (Std). This wiring is necessary where "11" area codes are used.

(j) Wiring changes associated with relays (TVA), (TGS2), (MBK4), (MBK5), (CPK2), (PCL2), (RNT1), (TNT2), (OR), (FAC) relays are shown in figures BG, BH, BD, and 144.

(k) Notes 124 and 362 are added.

(l) Cross connection terminals "SVD1-9" "SNO", and "SOB", are added in figures 56, BH, and 144 respectively.

D.04 The Marker is arranged to signal the outsender group release circuit when an all senders busy condition is encountered. This signal is necessary for Marker Operation with wire spring outgoing senders which are equipped with intersender timing. The signal will cause the outsender group release circuit to release all senders in the group in which the intersender timing interval has elapsed.

(a) Wiring changes associated with the (ASB) and (OSAO-9) relays designated "OM" option (Std).

(b) Options "XT", "VF", "VG" are rated (Mfr Disc).

(c) One "AO-9" lead per sender group is run to the Outsender Group Release circuit.

(d) Cross connection punchings "IMGA", "OSGR", and "GOSO-9" are added.

(e) Note 337 is changed.

D.05 Changes are made in the marker to provide a second tandem class relay on the basic frame. This change provides two tandem screening fields for code points and permits the use of two tandem classes without the addition of the Tandem Code Screening bay.

(a) Figure 145 consisting of relay (TAN1), U1325 or UB12 and its contact protection network is added.

(b) Wiring changes associated with relay (TAN) are designated options "NA", (Mfr Disc) and "NB", (Std).

(c) Cross connection terminals "TNX1-4" and "SWTX" are added.

(d) Note 342 is changed.

D.06 Changes in note 334 provide a "TOL-TT" signal to the Intermarker Group Sender. This signal is used on subscriber-to-trunk Intermarker Group calls where the Intermarker Group Trunk completes to intertoll trunks that also complete calls from incoming tandem trunks through junctors. The signal is required in the second (or Tandem) marker group to associate a code point with either a junctor route or directly with the outgoing intertoll route.

D.07 The marker is arranged to operate with Auxiliary Outgoing trunks that permit direct subscriber access, tandem access and intertoll access to intertoll trunks.

a. Paragraph 90 of note 103 is changed.

D.08 The marker is arranged to send intra-office calls from multiparty lines (4 or more parties) to a CAMA center for automatic message unit charging.

a. New appearances of cross connection terminals "AP," "BP", "AT", "BT", "AE", "BE" are added to provide for cross connections to the "S-" terminals.

The following apply to combined, completing, and dial tone markers.

D.09 Changes are shown in the cross connecting nomenclature on sheets 1 and 2 of the drawing to include connecting information to wire spring circuits.

D.10 The marker is arranged to signal the Traffic Usage Recorder circuit when the marker is busy on normal usage or for maintenance.

a. (TUR) relay, 28OBM, is added to figure 73.

b. Resistors (TUR) 18CB and (MAK), 18FH are added to figure 73.

c. Wiring changes associated with relays (MCB1), (MAK), (CKG3) and (MB) relays designated options "OG" (Mfr Disc) and "OH", (Std).

d. Leads "MB" and "MBM" run to the Traffic Usage Recorder circuit.

D.11 Note 310 is changed to include the use of the "CL1" signal to dial pulse and multifrequency senders as an indication to add a "11" prefix or the first two digits of an XXX code. The first two XX digits are fixed in the sender and the third digit of the XXX code is obtained from the "CR" signal.

D.12 The rating of the drawing is changed as follows:

Dial tone marker is rated (Mfr Disc), replaced by SD-26001-01, Wire-Spring Dial Tone Marker.

Completing marker is rated (Mfr Disc), replaced by SD-26002-02, Wire-Spring Completing Marker

Combined marker is rated (A&M Only).

All other headings, no change

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2312-JAC-REH-DV

CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

B. CHANGES IN APPARATUS

B.1 (LSA) Resistance lamp, 13J, is added to Fig. 91.

B.2 Relay (AVK2), U86 and its contact protection network are added as a new Fig. BB.

B.3 Code of the (TEA) relay is changed from U1406 to U1017.

B.4 Code of the (GT3) relay is changed from U1018 to Y204.

B.5 Code of the (GT) relay is changed from 280AU to 280FN.

B.6 (GT1) and (GT3) resistors are removed from the circuit.

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

C.1 (RGTA) relay.

D. DESCRIPTION OF CIRCUIT CHANGES

The following apply to combined and completing markers only:

D.01 The marker is modified to prevent false XT5 trouble records. These may result in several ways. The first case occurs when working with "U" type outsender connectors. Relay races during the route advance function after a second failure to match or an all-trunks busy condition allow the marker route information transfer relays to release prior to the release of the outsender connector relays. This action closes ground from the outsender through to the marker (XT1) and (XT2) relays causing an (XT5) failure. The second case occurs when working with wire-spring outgoing sender connectors where the "CL2,3,5" leads from the sender are controlled by the connector (S) relay. The marker (CL-) relays release prior to the connector (S) relay. Therefore, the locking ground from the sender (CL2,3,5) relays is closed through the marker (CL-) relay back contacts, operating the (XT1) relay, causing an (XT5) failure. This second case cannot occur in "U" type outsender connectors because a separate connector relay, (AMA) or (PC), controlling leads "CL2,3,4", releases to open them before the marker cross-detecting relays are closed through the (CL-) relay contacts.

The marker changes consist of the following:

(a) Relay (AVK2), U86 and its contact protection network are added as a new Fig. BB (Std.).

(b) Fig. BA, consisting of wiring, is added and rated (Mfr. Disc.).

(c) Wiring changes associated with relays (AVK1), (TG), (TGT), and (DISA) are designated options "OR" and "OQ." Both options are rated (Std.). "OR" option is provided when class information is required by the senders and "OQ" option is provided when such information is not required by the senders.

(d) Wiring changes associated with the (CL1-5), (CRP) and (CLP) relays are shown in Figs. BA and BB.

(e) Wiring changes associated with relays (RYC), (STX), (MXT), (XT1), (XT2), (OSC), (SKB), (SKA), (SZ) relays are designated options "OE" (Mfr. Disc.) and "OF," (Std.).

D.02 On Issue 18-B, option "UJ" was added to the marker to take a trouble record on a reverting call if the (RV3) relay did not operate which resulted in a failure to set ringing in the reverting trunk. The addition of this option did not provide for the operation of the (NSO) relay in markers equipped with (Mfr. Disc.) Fig. E. To permit the operation of relay (NSO) of Fig. E option "OC" (Std.) is provided and note 340 is changed.

D.03 On a pulse conversion call, if the marker encounters a trouble, it should take a trouble record, route and class advance to TER class and set reorder in the pulse conversion trunk. However, due to relay races, the marker may block or give an improper "XTS1" trouble record. The block results if, during route advance and prior to the release of

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the (RAV1,2) relays the (SNK) relay releases and reoperates. The (RAV1,2) relays will then remain operated and prevent class advance. The "XTS1" trouble record is produced during route and class advance if the (PCL1) relay releases prior to the operation of (TER1). When this happens, (TSE1) is operated falsely, connecting (XTS1) to the Trunk Link Frame select magnets, operating that relay.

To correct these conditions, the following changes are made in the marker:

(a) The code of the (TEA) relay is changed from U1406 to U1017. This relay and its contact protection is removed from Fig. 82 and shown in new Figs. AY, (Mfr. Disc.), and AZ (Std.).

(b) Wiring changes associated with relays (PCL1), (TFK1), (TER1) are shown in Figs. AY and AZ.

D.04 If an "LR," Link Release, failure signal is received over the "LR" and "DCK" leads from an incoming register, through the incoming register marker connector on calls involving an "ONN" trunk class mark, the marker, in error, will establish reorder instead of taking a trouble record. This is caused by a circuit through (TER4) and (ONN) relay contacts which operates relay (TEA) to start the reorder functions.

To prevent this trouble, wiring associated with relays (TEA), (RCY), (ONN), (RN), (TER4) is changed and designated options "OO" (Mfr. Disc.) and "OP" (Std.). Existing option "UV" is rated (Mfr. Disc.) and must be removed when option "OP" is added to markers already installed.

D.05 The marker is changed to lengthen the pulse over the "OOF" lead to the Number Group connector on subscriber line overflow during an intraoffice call. The pulse must be lengthened to insure scoring the subscriber line overflow register when the marker is used with wire-spring number group frames.

The marker changes consist of wiring changes associated with the (LB), (OFK), (TER1) relays, designated options "OI" (Mfr. Disc.) and "OJ" (Std.).

D.06 The line link per cent load feature, shown as "ST" option on Issue 24-D of this circuit must be provided to give traffic data of busy links on a line link frame basis whether or not the Line Insulation Test Control Circuit is equipped in the office. For this reason, the option has been provided in all combined and completing markers. To bring the SD drawings into agreement with the shop drawings, paragraph 119 of note 102 is removed and "QS" option is rated (Mfr. Disc.).

D.07 Excessively high induced ac on rural subscriber lines may cause the line ground test, (GT) relay, in the marker to buzz. Marker changes are added to reduce this condition to a minimum.

The changes are as follows:

(a) The code of the (GT3) relay is changed from U1018 to Y204. U1018 is designated option "OU," (Mfr. Disc.) and Y204 is designated option "OV," (Std.).

(b) (GT1) and (GT3) resistors are removed from the circuit.

(c) The code of the (GT) relay is changed from 280AU to 280FN. This relay is removed from Fig. 30 and is now shown in new Figs. BE (Mfr. Disc.) and BF (Std.).

(d) Wiring changes associated with the (CKG4), (TLC1), (TLC3) relays are shown in Figs. BE and BF.

(e) Note 122 is added.

The following apply to combined, completing and dial tone markers:

D.08 Cross-connection Figs. 371, 372, 373, 374, 375, 376, 377 and 378 are changed to agree with wire-spring connector frame information shown on SD-26022-01, Line Link Marker Connector, SD-26023-01, Originating Register Marker Connector, SD-26025-01, Incoming Register Marker Connector, SD-26031-01, Line Link Connector, SD-26033-01, Trunk Link Connector, SD-26035-01, Number Group Connector, SD-26059-01, Outgoing Sender Connector.

D.09 Note 103 has been changed to separate records of options and figures on a Dial Tone, Combined, or Completing marker basis.

D.10 With the standardization of Line Link Frame where subscriber line units are added in 50 line increments, the marker is required, for certain frame sizes, to operate seven select magnets simultaneously. Under adverse conditions, this excessive load increases the Line Link Frame select magnet operate times to such a point that the hold magnets fail to trap the select finger.

The following line link frame sizes introduce this condition:

440 line size - composed of a basic 290 line wire-spring frame

with one 50 line and one 100 line supplementary frame.

440 line size - composed of a basic 390 line "U" type frame with one 50 line supplementary frame.

490 line size - composed of a basic 390 line "U" type frame with one 100 line supplementary frame.

540 line size - composed of a basic 290 line wire-spring frame with one 50 line and one 200 line supplementary frame.

540 line size - composed of a basic 490 line "U" type frame with one 50 line supplementary frame.

590 line size - composed of a basic 290 line wire-spring frame with one 100 line and one 200 line supplementary frame.

590 line size - composed of a basic 490 line "U" type frame with one 100 line supplementary frame.

To insure proper marker operation when seven line frame select magnets are operated, the (LSA), 13J resistance lamp is added in multiple with the existing "LS" lamp. The (LSA) lamp is supplied by the "A52" fuse and the (LC) lamp formerly supplied by this fuse is now supplied by the "B0" fuse. These changes are designated options "OD" (Mfr. Disc." and "ON" (Std.).

D.11 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 the shop drawings:

(a) Note references at "AT0-9," "BT00-99," and 2DT are changed.

(b) "11X" codes are included in paragraph 37, note 102.

(c) "CL2" and "CL6" lead information in note 310 is changed to conform with Dial Pulse Outgoing Sender notes.

(d) "PK" option is removed from wiring at 6T(ITR3) and 6T(TER3).

(e) Code UB21 is specified for (RGTA) relay.

(f) In note 102, paragraph 74, Figs. 73 and 74 are specified on a marker connector basis.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

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CROSSBAR SYSTEMS
NO. 5
MARKER CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The marker is arranged to provide facilities for operating with a maximum of 10 sender groups and 8 sender connectors.

A.2 The marker is arranged to provide "CN", "TP", and "TC" signals to ringer test trunks.

A.3 The marker is arranged to expand the office A-physical, office A-theoretical, office B-physical, and office B-theoretical treatments to incorporate two additional office units - office A-extra theoretical and office B-extra theoretical.

A.4 The marker equipment is arranged for subsequent connection to wire spring marker connectors and frame connectors.

A.5 Where tandem screening is not provided, the marker is arranged to route misdialed calls to reorder. These calls may be received from incoming trunks marked "INC" class with "LT" or "2DT" translation marks, where such trunks are exposed to misdialing of 2 or 3 digit tandem codes at the originating office.

B. CHANGES IN APPARATUS

B.1 Relays (OSG5-9) and (OSA5-9) and their associated contact protecting networks are added to Figure 70.

B.2 Relays (SCBA3) and (SCBB3) are added to Figure 71.

B.3 The code of the (RCK3) relay is changed from U1389 or UB19 to U1392.

B.4 Relays (LEA), U1394, designated "PG" option, and (LEB), U1394, designated "PH" option are added to Figure 44.

B.5 Contact protection networks (LEA) designated "PG" option and (LEB), designated "PH" option are added to Figure 144.

B.6 Relays (ASTA), U1354, designated "PI" option and (BSTA), U1354, designated "PJ" option are added to Figure 125.

B.7 Relays (LIN) and (TIN), U1317, and associated contact protection networks are removed from Figure 75 and added in new Figure (AU), rated (A&M).

B.8 New Figure 126 is added consisting of relays (PTN), (TN), (EN), (PN), U1355 or UB15; (PHC), (THC), U1367 or UB17; (2SA), (1SE), (5ST), (8SP), (3NA), (4NE), (6NT), (9NP), (7RN), U1366 or UB16; (ONN), U1346 or UB14; (RN), U1349 or UB21; (RNO/7), U1387; (RNK1,2), U6034 and associated contact protection networks.

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

C.1 The following relay requirements are changed:

(AST)
(BST)

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The following changes apply to combined and completing markers.

(a) More Figures 70 are provided to expand the number of (OSG-) and (OSA-) relays from 5 to 10 to serve a maximum of 10 sender groups. More Figures 71 are provided to expand the number of sender connector busy relays, (SCBA-) and (SCBB-) to serve a maximum of 8 sender connectors.

(b) Notes 314, 337, and 350 are changed to provide for marker operation with 10 sender groups.

D.2 The marker is arranged to provide "CN", "TC", and "TP" signals to the ringer test trunk circuit. The "CN" signal permits the use of a common group of ringer test trunks for both coin and non-coin lines. The "TP" and "TC" signals permit the trunk to transmit a distinctive tone to the test man at a subscriber's line to identify tip party stations.

(a) The present (RCK3) relay code, U1389 or UB19, is designated "PA" option, (Mfr. Disc.), and is replaced by code U1392, designated "PB" option, (Std.).

(b) Wiring associated with the (RCK3) relay is changed and designated options "PA", (Mfr. Disc.. and "PB", (Std.).

(c) Cross-connecting information is changed at terminals "TRSO-1", "RGTO-1", Fig. 62, "RB", Figure 53, "SC", Figure 61, and "PSC", Figure 135.

(d) Note 335 is changed.

D.3 The marker is arranged to expand the office A-physical, office A-theoretical, office B-physical and B-theoretical treatments to incorporate two additional office units - office A-extra theoretical and office B-extra theoretical.

(a) Figure 65 is rated (A&M) and is replaced by new Figure 126. Figure 126 is comprised of the same coded apparatus as Figure 65 with the addition of relay (EN), U1355 or UB15 and its contact protection network. Options "PC", "PD", "PE", and "PF" are added in Figure 126 and rated (Std.).

(b) Relay (LEA), U1394, and its contact protection network is added to Figure 44 and designated "PG" option (Std.). Relay (LEB), U1394, and its contact protection network is also added to Figure 44 and designated "PH" option, (Std.).

(c) Relays (ASTA), U1354, designated "PI" option, (Std.) and (BSTA), U1354, designated "PJ" option (Std.) are added to Figure 125.

(d) Relays (LIN) and (TIN), U1317, and their associated contact protection networks are removed from Figure 75 and now constitute new Figure AU (A&M).

(e) Figure AV, consisting of wiring is added and rated (Std.).

(f) Wiring associated with relays (ITR3) and (TER3) is changed and designated option "PK", (A&M). Wiring associated with relay (SNG1) is added and designated option "PC", (Std.).

(g) Option "ZS" is rated (A&M).

(h) Notes 101(a), 101(f), 102, 103, 104, 303, 315, 318, 326, 342, 346, and 347(b) are changed. New note 359 is added.

D.4 Revisions in note 310, covering marker cross-connections, provide for grounding the "CL2" and "CL6" leads to the Dial Pulse Sender Circuit on subscriber dialed calls that complete over CX intertoll or CX-2 way trunks. Note 310 no longer provides for grounding the "CL6" lead to the Dial Pulse Sender on calls completed by trunks associated with outgoing repeaters requiring loop compensation.

D.5 The marker equipment is changed to provide for subsequent operation with wire spring marker connectors and frame connectors.

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

(a) Information Figure 101 is changed.

(b) Figure 85 is changed and rated (A&M). Figure 127 is added.

(c) Connecting lead information is changed at the (MCB1-6) relays of Figures 73 and 74.

(d) Note 360 is added.

(e) Cabling diagram information is changed in Figure 272.

(f) New cabling diagram Figures 371, 372, 373, 374, 375, 376, 377, 378, 379, and 380 are added.

D.6 Where tandem screening is not provided, and where the Incoming Dial Pulse Register is arranged to give the "LT" or "2DT" translator signal for trunks marked "INC", a marker change is required to set reorder in the incoming trunk if two or three digit tandem outgoing codes received in error from these trunks which are entitled to terminating service only.

The changes introduced in the marker to provide this feature are:

(a) Wiring changes associated with the (INC) and (TAN) relays are added and designated options "PO" and "PP", (Std.).

(b) Option "YQ" is rated (Mfr. Disc.).

(c) Changes are made in Notes 102, 103, and 342.

The following changes apply to the dial tones marker:

D.7 Except for the changes in Figure 272 and the addition of Figures 375, 376, and 377, the changes outlined in paragraph D.5 are applied to dial tone markers to permit operation with the wire spring marker connectors and frame connectors.