

12

CROSSBAR SYSTEMS  
NO. 3  
TRUNK SWITCH AND CONNECTOR  
CIRCUIT

| TABLE OF CONTENTS   | PAGE | TABLE OF CONTENTS (CONT)  | PAGE |
|---|------|---|------|
| <u>SECTION I - GENERAL DESCRIPTION.</u> . . . .   | 2    | JUNCTOR SEIZURE. . . . .  | 7    |
| 1. <u>PURPOSE OF CIRCUIT</u> . . . . .  | 2    | JUNCTOR DISTRIBUTION . . . . .                                    | 7    |
| LAYOUT . . . . .  | 2    | REORDER TONE . . . . .  | 7    |
| TYPES OF CALLS . . . . .  | 3    | LINE-BUSY TONE . . . . .  | 7    |
| ROUTES . . . . .  | 4    | REGULAR, TROUBLE, AND BLANK NUM-<br>BER INTERCEPT. . . . .        | 7    |
| 2. <u>GENERAL DESCRIPTION OF OPERATION</u>  | 4    | RELEASE OF TRUNK SWITCH AND CON-<br>NECTOR . . . . .              | 7    |
| DIAL TONE CALL . . . . .  | 4    | 2. <u>DIAL TONE CALL</u> . . . . .                                | 7    |
| INTRAOFFICE CALL . . . . .  | 4    | 3. <u>INTRAOFFICE CALL</u> . . . . .                              | 7    |
| OUTGOING CALLS . . . . .  | 4    | SELECTION OF TRUNK AND TS AND C.                                  | 7    |
| INCOMING CALLS . . . . .  | 4    | OPERATION OF SWITCH GROUP AND<br>JUNCTOR CONNECTOR RELAYS . . . . | 7    |
| <u>SECTION II - DETAILED DESCRIPTION.</u> . .   | 5    | 4. <u>OUTGOING CALL.</u> . . . . .                                | 8    |
| 1. <u>TRUNK SWITCH AND CONNECTOR</u><br><u>OPERATION.</u> . . . . .   | 5    | SELECTION OF TS AND C AND TRUNK.                                  | 8    |
| MARKER PREFERENCE AND CONNECTOR<br>CIRCUIT - FS3. . . . .   | 5    | CONNECTION BETWEEN SENDER AND<br>TRUNK. . . . .                   | 8    |
| BUSY CIRCUIT - FS4 . . . . .  | 5    | TESTING AND SETTING UP A JUNCTOR                                  | 8    |
| SELECTION OF TRUNK SWITCH AND CON-<br>NECTOR CIRCUIT WITH IDLE ORIGINA-<br>TING REGISTER OR TRUNK CIRCUIT -<br>FS1. . . . . | 5    | OUTGOING FROM SWITCHBOARD AND TS<br>AND C. . . . .                | 8    |
| SELECTION OF REGISTER OR TRUNK -<br>FS1. . . . .  | 6    | 5. <u>INCOMING CALLS</u> . . . . .                                | 8    |
| A. <u>Marking Trunks of a Route.</u> . .  | 6    | 6. <u>TWO WAY TRUNKS</u> . . . . .                                | 8    |
| B. <u>Cross-Connection of TF and G</u><br><u>Terminals.</u> . . . . .   | 6    | 7. <u>REVERTING CALLS.</u> . . . . .                              | 8    |
| C. <u>Cross Connection of TT and T</u><br><u>Terminals/TF and F Terminals</u> .   | 6    | 8. <u>SPECIAL CALLS.</u> . . . . .                                | 8    |
| D. <u>Testing and Seizure of Idle</u><br><u>Registers or Trunks of the</u><br><u>Desired Route.</u> . . . . .               | 6    | 9. <u>TEST CALLS</u> . . . . .                                    | 8    |
| E. <u>Limitations of Route Assign-</u><br><u>ments.</u> . . . . .   | 6    | 10. <u>TROUBLE RECORDER OPERATION - FS1</u>                       | 9    |
| OPERATION OF THE SWITCH GROUP AND<br>JUNCTOR CONNECTOR RELAYS - FS1 . .   | 6    | 11. <u>MAKE-BUSY FACILITIES</u> . . . . .                         | 9    |
|   |      | TS AND C MAKE BUSY . . . . .                                      | 9    |
|   |      | JUNCTOR MAKE BUSY. . . . .  | 9    |

| TABLE OF CONTENTS (Cont)                     | PAGE |
|--|------|
| <u>SECTION III - REFERENCE DATA.</u> . . . . | 9    |
| <u>1. WORKING LIMITS.</u> . . . . .          | 9    |
| <u>2. FUNCTIONAL DESIGNATIONS</u> . . . . .  | 9    |
| <u>3. FUNCTIONS</u> . . . . .                | 10   |
| <u>4. CONNECTING CIRCUITS</u> . . . . .      | 10   |
| <u>5. MANUFACTURING TESTING REQUIREMENTS</u> | 11   |
| <u>6. ALARM INFORMATION</u> . . . . .        | 11   |
| <u>7. TAKING EQUIPMENT OUT OF SERVICE</u> .  | 11   |
| <u>SECTION IV - REASON FOR REISSUE</u> . . . | 12   |

SECTION I - GENERAL DESCRIPTION1. PURPOSE OF CIRCUIT

1.01 The purpose of the trunk switch and connector (TS and C) circuit is to provide connection between the trunk or origination register and the junctions to the line, line switch, and connector (LL) circuit. In addition it provides switched termination of calls direct to intercept, line-busy, or reorder.

1.02 In conjunction with the line, line switch, and connector circuit, the trunk switch and connector circuit provides switching connections between every trunk and originating register on the trunk switch and connector circuit and every line of the line, line switch, and connector circuits. These connections may be in either direction; ie, from line to trunk or from trunk to line. These connections are selected and set up under control of the marker.

LAYOUT

1.03 There are ten physical crossbar switches consisting of 6 wires, 12 levels, and 20 verticals each per trunk switch and connector circuit. The verticals are divided into ten electrical trunk switches T0-9 with twenty verticals in each. Each verticals (0-7) for each of the ten electrical switches are basic and provided on trunk frame 0 (TFO), four verticals (8-11) are supplementary and provided on optional trunk frame 1 (TF1), and eight verticals (12-19) are also supplementary and provided on optional trunk frame 3 (TF3). Each two physical switches comprise a switch group and have an SW relay associated with them. These SW relays are controlled by trunks assigned to that switch group and in turn control the pattern of switch select magnets operated from the marker. The following portrays this relationship:

| <u>Switch Group</u> | <u>Quality of Physical Switches</u> | <u>Electrical Trunk Switches</u> | <u>Verticals</u>     | <u>Remarks</u>                         |
|---------------------|-------------------------------------|----------------------------------|----------------------|--|
| 0                   | 1                                   | T0, T1,<br>T4                    | 0 to 7<br>0 to 3     | Basic/TFO<br>Basic/TFO                 |
| 0                   | 1                                   | T2, T3,<br>T4                    | 0 to 7<br>4 to 7     | Basic/TFO<br>Basic/TFO                 |
| 1                   | 1                                   | T5, T6,<br>T9                    | 0 to 7<br>0 to 3     | Basic/TFO<br>Basic/TFO                 |
| 1                   | 1                                   | T7, T8,<br>T9                    | 0 to 7<br>4 to 7     | Basic/TFO<br>Basic/TFO                 |
| 2                   | 1                                   | T0 to T4                         | 8 to 11              | Supplementary/TF1                      |
| 2                   | 1                                   | T5 to T9                         | 8 to 11              | Supplementary/TF1                      |
| 3                   | 1                                   | T0, T1,<br>T4                    | 12 to 19<br>12 to 15 | Supplementary/TF3<br>Supplementary/TF3 |

| <u>Switch Group</u> | <u>Quality of Physical Switches</u> | <u>Electrical Trunk Switches</u> | <u>Verticals</u> | <u>Remarks</u>    |
|---------------------|-------------------------------------|----------------------------------|------------------|-------------------|
| 3                   | 1                                   | T2, T3,                          | 12 to 19         | Supplementary/TF3 |
|                     |                                     | T4                               | 16 to 19         | Supplementary/TF3 |
| 4                   | 1                                   | T5, T6,                          | 12 to 19         | Supplementary/TF3 |
|                     |                                     | T9                               | 12 to 15         | Supplementary/TF3 |
| 4                   | 1                                   | T7, T8,                          | 12 to 19         | Supplementary/TF3 |
|                     |                                     | T9                               | 16 to 19         | Supplementary/TF3 |

Also see Notes 303 and 304

1.04 Trunks and originating registers tip, ring, and sleeve leads are assigned to the hold magnets and A and B levels of each vertical. One vertical comprises one trunk or register appearance. A total of 200 such appearances are provided per circuit, 80 basic and 120 supplementary.

1.05 The two bottom switch levels are the directing levels and are designated TA and TB. The directing select magnets control the crosspoints which connect the tip, ring, and sleeve multiples and are associated with appearances A and B, respectively. The TA select magnets are called A appearances and TB select magnets, B appearances.

1.06 The junctors connect from channel switches on the line, line switch, and connector circuit to levels 0 to 7 of the ten trunk switches T0-9 of the TS and C circuit. Each of the ten trunk switches have 8 "A" junctors (A appearances) and 8 "B" junctors (B appearances) for a total of 160 junctors per circuit. The "A" junctors connect to circuit LLO channel switches and the "B" junctors connect to circuit LLl channel switches. The junctor spread is such that the trunk switch number is equivalent to the channel switch horizontal, and the trunk switch horizontal is equivalent to the channel switch number (see Note 302).

1.07 Trunk switch level 8 of all verticals of all ten trunk switches of the same TS and C circuit are multiplied common and wired to two plug-ended trunks which provide for regular, trouble, and blank number intercept. One intercept trunk is assigned to the "A" appearance of level 8 and the other is assigned to the "B" appearance. Calls over incoming or intraoffice trunks requiring this type disposition are set to level 8A or 8B by the marker.

1.08 Trunk switch level 9 is arranged to provide line-busy tone on the "A" appearance and reorder tone on the "B" appearance. Calls over incoming trunks requiring disposition to either line-busy or reorder and intraoffice trunks requiring disposition to line-busy are set to level 9A or 9B by the marker.

1.09 The switching connections provided by the TS and C under control of the marker can be classified into two basic categories. First, where the marker has information of the trunk location and line selection is required: and second, where the marker has information of the line location and trunk selection is required. Where the trunk location is known by the marker, the trunk calls in the TS and C. Where the line location is known by the marker, the selection of an idle trunk is accomplished via routing cross-connections in the TS and C circuit.

1.10 When senders are associated with outgoing trunks, access to the select magnets, hold magnet and vertical group check path of the outgoing sender link and trunk identifier are obtained through the TS and C circuit.

#### TYPES OF CALLS

1.11 The TS and C circuits and LL circuits are involved in dial tone, call back, and call forward stages of a call.

1.12 The dial tone stage is involved in connecting the customer to an originating register only. On intraoffice calls the call forward stage is involved in connecting the called customer to the intraoffice trunk over one channel and the call back stage is involved in connecting the calling customer to the intraoffice trunk over another channel.

On incoming calls from distant offices, switchboards, etc, only the call forward stage is involved. On outgoing calls to distant offices, switchboards, etc, the call back stage only is involved.

## ROUTES

1.13 Each TS and C circuit provides for 22 routes. A route may be identified by the combination of a TB number (corresponding to a TB relay number) and a TG number (corresponding to a TG lead number). There are a maximum of either seven or ten (Y option) TB relays and eight TG punchings furnished per TS and C circuit. Two of the 22 routes are predesignated in the marker as DTR for the dial tone route and the IRA/IRB for the intraoffice route. The other 20 routes are numbered 0 to 19. Dial tone is provided by originating registers which are always assigned to TBO/TGO. Intraoffice trunks are divided into four subgroups and are always assigned to TB1 and 3 are associated with route indicator lead IRA and TB2 and 4 are associated with IRB. Allotting between TB1 to 4/TGO is basic and hard wired in the marker. Intraoffice trunks should be distributed as evenly as possible over the four TB relays initially with additions following in the same sequence.

## 2. GENERAL DESCRIPTION OF OPERATION

2.01 In conjunction with the LL circuit, the TS and C circuit provides switching connections between every trunk or register on the TS and C circuit and every line of the LL circuit. These connections may be in either direction; ie: from line to trunk or register or from trunk to line. These connections are selected and set up under control of the marker.

2.02 Involved in each connection is a line link on the LL circuit, and a junctor between the LL circuit and the TS and C circuit.

2.03 The function of the TS and C circuit is to provide the connection between the trunk or register and the junctors and to provide the means of setting up these connections including marker access to the junctors.

## DIAL TONE CALL

2.04 On a dial tone call, the marker, after having been seized by a LL circuit

through a marker connector, seeks a TS and C circuit with an idle originating register, connects to the TS and C, selects a register, and sets up a connection between it and the line.

## INTRAOFFICE CALL

2.05 On intraoffice calls, the marker is seized by a register which has recorded the dialed number. The register gives the marker the line location of the calling line and the number of the called line. The marker uses the called number to connect to the line number translator to get the called line location. While it is doing this, it also seeks a TS and C circuit with an idle intraoffice trunk, connects to the TS and C, and selects an idle intraoffice trunk. Having obtained the line location from the line number translator, the marker connects to the LL circuit. With possession of the LL and the TS and C circuits, the marker sets up connection to the called line.

2.06 After setting up the connection to the called line, the marker releases the LL circuit with the called line and connects to the LL circuit with the calling line. It then causes the register to release its connection to the calling line and the trunk.

## OUTGOING CALL

2.07 If the calling customer dials the code of an outgoing trunk group, the register gives the marker this information. The outgoing trunk group may consist of one-way outgoing trunks or 2-way trunks. The marker selects the TS and C with an idle trunk of the desired route, selects an idle trunk, connects a sender to the trunk by means of the sender link, and sets up the channel between the calling line and the trunk after causing the release of the dial tone connection.

## INCOMING CALL

2.08 After the incoming register has received the called number, it connects to a marker and gives it the called number and the TS and C circuit number. The marker connects to the TS and C; connects to the line number translator to obtain the called line location; connects to the LL circuit with the called line; and then, sets up the connection between the trunk and the line.

SECTION II - DETAILED DESCRIPTION1. TRUNK SWITCH AND CONNECTOR OPERATIONMARKER PREFERENCE AND CONNECTOR CIRCUIT - FS3, SC1

1.01 The marker makes a request for the TS and C over the STA lead for the first trial and over the STB lead on a second trial. These leads provide resistance battery to operate either relay MPO for marker 0 or MP1 for marker 1. Operation of relay MPO opens the ground path from relay MP1 preventing a seizure of the same TS and C by marker 1 and also closes through a path which operates relay MO. The operation of this MO relay provides a check indication back to the marker that it has been seized over the TUK lead, provides a busy mark as described per 1.02, provides a ground over the TSUO or 1 lead to the test circuit indicating TS and C circuit in use, cuts through resistance battery to the originating register over the BS20 lead and finally closes a path for operation of the MAO-MDO relays by the marker. Operation of these MAO-MDO relays cuts through all other marker control leads with the exception of route indicator leads DTR, IRA, IRB, and FT00-19. The function of the MP1 relay is identical to the MPO relay with the exception that if marker 1 seizes the MP1 relay marker 0 will be blocked from getting a check indication back over the TUK lead from relay MO since it would be unoperated due to the open contacts of the MP1 relay in its operate path and would therefore cancel its request.

BUSY CIRCUIT - FS4

1.02 Seizure of the TS and C by a marker as described per 1.01 and operation of either the MO or M1 relay provides a

ground over the FBO or 1 lead to the other marker indicating which TS and C has been seized and marks it busy.

SELECTION OF TRUNK SWITCH AND CONNECTOR CIRCUIT WITH IDLE ORIGINATING REGISTER OR TRUNK CIRCUIT - FS1

1.03 When a register or trunk is idle it furnishes direct ground on its FT lead. Therefore, if there is any one register or trunk idle on a TS and C, there will be a ground on its associated route indicator lead DTR, IRA, IRB, or MFTO-19 to the marker.

1.04 One indicator lead from each TS and C with registers or from trunks of the same route will be connected into the marker frame test relays by route relays in the marker. The marker selects a TS and C which has an idle register or trunk that is not occupied by a marker, bids for it in competition with the other marker and is connected under control of the marker preference described per 1.01.

1.05 All of the FT leads on the TS and C associated with the originating registers or with trunks of the same route or allotted subgroup are connected to one of these route indicator leads DTR, IRA, IRB, or MFTO-19. All of the originating registers or trunks associated with one route indicator lead are also associated with one TB relay. Where trunks of a route are allotted between two subgroups, each subgroup is associated with a different TB relay but with the same route indicator.

1.06 Routes, TB relays, and trunk groups for originating registers and intraoffice trunks are preestablished in the marker and therefore require the following fixed association:

| <u>Circuit</u>                         | <u>Route Indicator Lead</u> | <u>TB Relay</u> | <u>TG Number</u> |
|--|-----------------------------|-----------------|------------------|
| Originating Registers                  | DTR                         | 0               | 0                |
| Intraoffice Trunks - Allotted Subgroup | IRA                         | 1               | 0                |
| Intraoffice Trunks - Allotted Subgroup | IRB                         | 2               | 0                |
| Intraoffice Trunks - Allotted Subgroup | IRA                         | 3               | 0                |
| Intraoffice Trunks - Allotted Subgroup | IRB                         | 4               | 0                |



## SELECTION OF REGISTER OR TRUNK - FS1

A. Marking Trunks of a Route

1.07 On each TS and C a maximum of 22 routes may be used. A particular route may be considered as identified by the combination of the TB number (corresponding to TB relay number) and the TG number (corresponding to TG lead number) associated with it. The marker marks the registers or trunks of a particular route by placing a battery on a TB lead and ground on a TG lead. The battery on the TB lead operates a TB relay of the same number.

B. Cross-Connection of TG and G Terminals

1.08 Each register or trunk has a TG lead. This lead is connected to a G terminal identified by the trunk switch and vertical number corresponding to the assignment of the associated tip, ring, and sleeve leads. All those G terminals corresponding to registers of the same type, or trunks which have the same TG number, are connected to the corresponding TG terminal. Refer to 1.06 for some preestablished TG assignments.

C. Cross-Connection of TT and T Terminals/  
TF and F Terminals

1.09 Each register or trunk has a TT and TF lead. These leads are connected to T and F terminals, respectively, and are also identified by the trunk switch and vertical number corresponding to the assignment of the associated tip, ring, and sleeve leads. In the register or trunk, each TG lead is connected through contacts which are closed while the circuit is idle then to the TT lead and T terminal. The TF lead and F terminal provides the operating path for the register or trunk F relay. The T and F terminals are cross-connected to TT and TF terminals, respectively, for association of registers and trunks to specific TB numbers. Refer to 1.06 for some preestablished TB assignments.

D. Testing and Seizure of Idle Registers or  
Trunks of the Desired Route

1.10 In testing for an idle register or trunk the marker operates the TB relay corresponding to the TB number of that route. It then grounds one TG lead. This results in the grounding of the G terminals and TG leads of all registers or trunks of the desired route as well as those of other routes of the same TG number. The ground on the TG

lead (in series with the normally closed contacts of the trunk or register) appears on the TT leads and T terminals. This ground at the T terminal is cross-connected to contacts of the TB relay via the TT terminals associated with the desired route. Since the TB relay has been operated by the marker, ground is cut through for all registers or trunks of the same group or subgroup which in turn operates the marker TT relays. From these the marker retains one which in turn controls the provision of resistance battery back over the TF lead through the same trunk block relay and TF to F cross-connection to operate the trunk F relay and seize the trunk.

E. Limitations of Route Assignments

1.11 The TB relay connects 12 or 13, with Y option TT and TF leads into the marker. Any part of these leads from 00 to 12 may be assigned to one route. However, it should be noted that originating registers are pre-established in the marker as TBO/TGO and intraoffice trunks divided into four subgroups and allotted initially into TB1 to 4/TGO. The remaining TT and TF leads of TBO to 4 and all of TB5 and 6 plus 7-to-9 with Y option are available to meet variable trunking arrangements.

1.12 Two allotters plus two additional with Y option are provided in the marker for applications where it is necessary to split trunk groups over more than one TB number. Only one of these allotters is available per trunk group and is limited to two TB relays each.

OPERATION OF THE SWITCH GROUP AND JUNCTOR -  
CONNECTOR RELAYS - FS1

1.13 When the F relay in the register or trunk is operated as described in 1.10, it operates as SW and JC relay as shown in FS1.

1.14 The operation of the SW- relay closes through a path for a set of select magnets TA, TB, and T0-9 for a pair of physical trunk switches which are then prepared for operation by the marker. The switch group and physical switch relationships are shown in the layout of 1.03 in SECTION I and by Note 303.

1.15 The operation of the JC- relay cuts through to the marker all trunk and register control leads for only those trunks and registers assigned to the same electrical trunk switch.

1.16 The JC relay operation along with an LJ relay corresponding to the line, line switch, and connector circuit number and associated relationship of 0 for A appearance and 1 for B appearance, establishes a path over leads JSO-7 for the marker to observe the status of the sleeve leads of the junctors on the involved trunk switch. With this access the marker is able to test and select an idle junctor.

#### JUNCTOR SEIZURE

1.17 The marker seizes a junctor by operation of four select magnets consisting of either TA or TB over the TSS lead and one numbered select TO-7 over the TSO-7 leads on each of the two physical trunk switches in the same switch group, and operation of one hold magnet over the SL and S lead to which vertical the register or trunk is assigned.

#### JUNCTOR DISTRIBUTION

1.18 The junctor distribution is as described in 1.06 of SECTION I and is pictorially represented in Note 302.

#### REORDER TONE

1.19 Where all junctors or paths are busy on an incoming call the marker will operate relay LJ1 and select magnets TB and T9 of the two physical trunk switches in the same switch group and the associated trunk hold magnet to return reorder tone to the calling customer. For intraoffice and outgoing calls encountering paths busy the marker will drop the call to line lockout from which the reorder tone is applied.

#### LINE-BUSY TONE

1.20 Calls over intraoffice or incoming trunks for which the marker detects a line-busy condition the marker will operate relay LJ0 and select magnets TA and T9 of the two physical trunk switches in the same switch group and the associated trunk hold magnet to return line-busy tone toward the calling customer.

#### REGULAR, TROUBLE, AND BLANK NUMBER INTERCEPT

1.21 On intraoffice and incoming calls where the marker receives a regular (RI), trouble (TI), or blank number (BN) indication from the line number translator the marker will operate either relay LJ0 or LJ1 and

select magnets TA or TB and T8 of the two physical trunk switches in the same switch group and the associated trunk hold magnet to provide a connection to a trunk to the local intercept announcement or a distant intercept operator or announcement or to an automatic intercept system.

#### RELEASE OF TRUNK SWITCH AND CONNECTOR

1.22 The F relay of the trunk or register is released after continuity tests, which in turn releases the JC and SW relays.

1.23 The trunk switch and connector is then released by the marker with the release of relays MP, M, MA to MD, TB, and LJ.

#### 2. DIAL TONE CALL

2.01 On a dial tone call the action is the same as described in 1. On this type of call the marker selects an idle register and sets up a connection between it and the line.

#### 3. INTRAOFFICE CALL

##### SELECTION OF TRUNK AND TS AND C

3.01 After a customer has dialed into an originating register, the register connects to a marker and gives the marker the line location of the calling line and the called number. If the called number is within the same marker group, the marker will select an intraoffice trunk to complete the call. The marker also connects to the line number translator to find the equipment location for the called customer. The selection of the TS and C and trunk is the same as described in 1.01 through 1.10.

##### OPERATION OF SWITCH GROUP AND JUNCTOR CONNECTOR RELAYS

3.02 The calling party end of an intraoffice trunk is associated with the lower numbered switch of a pair of electrical switches. The two appearances utilize the same vertical but are one electrical switch apart. Since the marker will set up the call forward connection first, it will have operated the trunk F relay which will in turn operate the TS and C SW and JC relays for the called end. After the call forward connection is made the called end SW- and JC- relays will release.

3.03 The call back connection will then be established by the marker with the operation of the trunk CB relay which will in turn operate the TS and C SW- and JC-relays associated with the calling end of the call. After the channel has been completed between the calling line and the trunk, the marker connector will release the originating register and dial tone connection.

#### 4. OUTGOING CALL

##### SELECTION OF TS AND C AND TRUNK

4.01 If the calling customer dials a code of an outgoing trunk group the marker, after receiving this information, will select an outgoing trunk. The outgoing trunk group may consist of outgoing trunks, or 2-way trunks.

4.02 The action of the marker in selecting one of these trunks is the same as described in 1.01 through 1.10.

##### CONNECTION BETWEEN SENDER AND TRUNK

4.03 After the marker has seized the TS and C by operating relays MP and M it will then start for a sender through the sender connector. The marker will seize an idle outgoing trunk to the proper destination and set up the crosspoint linkage of the outgoing sender link and trunk identifier through the TS and C, MD-, JC- and MA- relays using leads SSB, VGK, and HMO-4. This action establishes a connection between the sender and trunk with the sender maintaining control over the OSL crosspoint connection after the TS and C has released.

##### TESTING AND SETTING UP A JUNCTOR

4.04 The functions of the SW, LJO or 1, and JC in setting up the call are the same as described in 1.13 to 1.17.

##### OUTGOING FROM SWITCHBOARD AND TS AND C

4.05 With this type of trunk an individual trunk switch appearance is required for the outgoing calls through the TS and C circuit with no outpulsing via a sender required.

#### 5. INCOMING CALLS

5.01 On an incoming call the incoming register gives the marker the called num-

ber and the TS and C circuit number. The marker connects to the TS and C, connects to the line number translator to obtain the called line equipment location, connects to the line link and line block with the called line, and then sets up the connection between the trunk and line.

5.02 A main point of difference between a terminating and an originating type of call is that the marker operates the trunk F relay through the marker connector and the incoming register link rather than through the TS and C.

#### 6. TWO-WAY TRUNKS

6.01 Two-way trunks perform the function of both an outgoing trunk and an incoming trunk except that it can operate in only one of the two modes at any one time. It utilizes only one trunk switch appearance per trunk and will function as described in 4. or 5. depending upon direction of seizure.

#### 7. REVERTING CALLS

7.01 When a calling customer dials a number associated with the customers own line the marker recognizes that the equipment location of the calling and called line are alike and, therefore, the call is reverting.

7.02 A TS and C and a reverting call trunk are selected and the call is set up from the trunk to the calling line.

#### 8. SPECIAL CALLS

8.01 In case of no-hunt, no-test and "no-nothing" calls the marker knows that a special call is involved because it receives a special indication from the incoming register. It, therefore, expects ground on one of the NH, NT, or NN leads to determine the particular class of special call.

#### 9. TEST CALLS

9.01 On test calls the test circuit through its originating test line appearance on line link O-line block O establishes a



bid for an originating register and then an intraoffice, revertive call or outgoing trunk to the route desired by the code dialed just as in a regular customer call. However, in order to select a specific originating register or trunk the test circuit operates the marker TST relay which in turn transfers control of all marker TT relays to it from which it picks the circuit desired.

9.02 On testing of incoming trunks, the individual trunks are patched to the test circuit as desired for control and test.

#### 10. TROUBLE RECORDER OPERATION - FS1

10.01 When the marker finds it necessary to make a trouble record, resistance battery is applied from the test circuit on leads TRA 0 or 1 to operate the TRA and TRAl relays with Y option. Relay TRAl in turn sets up a path for the operation of relay TRA2 through TTL-10 to 19 diodes and grounding from the associated trunk. Operation of these relays generate to the test circuit an indication of the trunk switch/junctor connector, line link/line junctor and switch vertical for incoming trunks involved in the call. With Z option, indications are on a 1-out-of-12 basis, and with Y option 1-out-of-10 for 0 to 9 plus a tens indication for 10 to 19.

#### 11. MAKE-BUSY FACILITIES

##### TS AND C MAKE BUSY

11.01 No manual make-busy facility is provided to make the TS and C circuit busy to originating traffic since there is normally a very low frequency of change. If a cross-connection change is required, block non-operated the FT- relay at both markers for the same TS and C circuit. Refer to FS4. This activity should be done only during light load periods.

11.02 It should be noted that incoming traffic will not be interfered with when the TS and C is made busy in this manner

11.03 If the last idle trunk of a given route are on this TS and C circuit which is made busy, a marker seeking a TS and C with a trunk of this route will cause an overflow registration.

#### JUNCTOR MAKE BUSY

11.04 Junctors may be taken out of service at the test frame by inserting a plug into a CHBO-7 jack.

#### SECTION III - REFERENCE DATA

##### 1. WORKING LIMITS

1.01 None

##### 2. FUNCTIONAL DESIGNATIONS

##### 2.01 Relays

| <u>Designation</u>               | <u>Meaning</u>    |
|----------------------------------|-------------------|
| JCO-9                            | Junctor Connector |
| LJO,1                            | Line Junctor      |
| MO,1; MAO,1; MBO,1; MC0,1; MD0,1 | Marker Connector  |
| MP0,1                            | Marker Preference |
| SWO-4                            | Switch Group      |
| TBO-9                            | Trunk Block       |
| TRA, TRAl, TRA2                  | Trouble Record    |

##### 2.02 Switches

| <u>Designation</u> | <u>Meaning</u> |
|--------------------|----------------|
| TO-9               | Trunk          |

##### 2.03 Switch Magners

| <u>Designation</u> | <u>Meaning</u>                             |
|--------------------|--|
| TO-7 (Hold)        | Trunk Hold Magnet (Basic Switches)         |
| T8-19 (Hold)       | Trunk Hold Magnet (Supplementary Switches) |
| TA (Select)        | A-Appearance Select Magnet                 |
| TB (Select)        | B-Appearance Select Magnet                 |
| TO-9 (Select)      | Trunk Select Magnet                        |

### 3. FUNCTIONS

- 3.01 Provides means of setting up a connection between a called line and:
  - (a) A 2-way trunk.
  - (b) An intraoffice trunk.
- 3.02 Provides means of setting up a connection between a calling line and:
  - (a) An originating register.
  - (b) A 2-way trunk.
  - (c) An intraoffice trunk.
  - (d) An outgoing trunk.
  - (e) An outgoing trunk to vacant code intercept announcement.
- 3.03 Provides means of setting up a connection between a line and a reverting call trunk.
- 3.04 Provides means of setting up a connection between an incoming trunk and:
  - (a) A line.
  - (b) Line-busy tone.
  - (c) Reorder tone.
  - (d) An intercept trunk for regular, trouble, and blank numbers.
- 3.05 Provides means of setting up a connection between an intraoffice trunk and:
  - (a) A called line.
  - (b) A calling line.
  - (c) Line-busy tone.
  - (d) An intercept trunk for regular, trouble, and blank numbers.
- 3.06 Provides means by which a trunk switch and connector circuit with an idle register can be selected.
- 3.07 Provides means by which a trunk switch and connector circuit with an idle trunk corresponding to a given route may be selected.
- 3.08 Provides means for selecting an idle register or trunk with a given route number.
- 3.09 Provides marker with access to the register or trunk circuit for operating a connector relay F therein.
- 3.10 Provides marker with access to trunk switch select magnets.
- 3.11 Provides connections between trunk switch crosspoints associated hold magnets and register or trunk.
- 3.12 Provides access to junctors.
- 3.13 Provides register or trunk with means of operating proper junctor connector and switch group relays.
- 3.14 Provides paths by which special incoming trunks can indicate which type of call is to be set up.
- 3.15 Provides means by which a marker can connect to the trunk switch and connector.
- 3.16 Indicates to the other marker seeking a trunk switch and connector when a marker is using a trunk switch and connector.
- 3.17 Provides means of indicating which trunk switch and connector is in use.
- 3.18 Provides means of indicating junctor connector, trunk switch, line junctor, line link circuit, and incoming trunk involved in a trouble record.

### 4. CONNECTING CIRCUITS

- 4.01 When this circuit is listed on a key-sheet, the connecting information thereon should be followed.
  - (a) Intraoffice Trunk Circuit - SD-26397-01.
  - (b) Reverting Call Trunk Circuit - SD-26415-01, SD-26443-01.
  - (c) Outgoing Trunk Circuit - SD-26398-01 (Typical).
  - (d) Incoming Trunk Circuit - SD-26399-01 (Typical).
  - (e) Two-Way Trunk Circuit - SD-26429-01 (Typical).
  - (f) Intercept Trunk Circuit - SD-26403-01, SD-26404-01, SD-26445-01.
  - (g) Outgoing Trunk Circuit to Vacant Code Announcement - SD-26446-01.

- (h) Originating Register Circuit - SD-26385-01.
- (i) Marker Circuit - SD-26384-01.
- (j) Line, Line Switch, and Connector Circuit - SD-26382-01.
- (k) Interrupter Circuit - SD-26407-01.
- (l) Test Circuit - SD-26411-01.
- (m) Outgoing Sender Link and Trunk Identifier Circuit - SD-26395-01.

## 5. MANUFACTURING TESTING REQUIREMENTS

- 5.01 This circuit shall be capable of performing all the functions listed in the Circuit Requirements Table.

## 6. ALARM INFORMATION

- 6.01 There are no alarms associated with the trunk switch and connector.

## 7. TAKING EQUIPMENT OUT OF SERVICE

- 7.01 Trunk Switch and Connector - The trunk switch and connector circuit may be taken out of service for a short time by blocking nonoperated the FT- relay at both markers for the same trunk switch and connector. This will make the trunk switch and connector busy to all originating traffic. Incoming trunks on the trunk switch and connector can be served while this circuit is made busy, therefore, these trunks should be made busy at the originating office. On originating calls, if the last idle trunks of a given route are on the trunk switch and connector which is made busy, a marker seeking a circuit with a trunk of this route will cause an overflow registration.
- 7.02 Trunk Switch - A physical trunk switch may be taken out of service by making busy all trunks and registers associated with the same switch group or SW- relay. If trunks of only the troubled switch are made busy the marker will fail on attempts to the second physical trunk switch since it always expects 300 ohms to be provided by two identically numbered 600-ohm select magnets. One of these on each physical switch of a pair operated in parallel and controlled by the same SW- relay. Make-busy incoming trunks at the originating office and all other trunks and registers at the test frame.

- 7.03 Trunk Select Magnets TA-B - The trunk select magnets TA and TB may be taken out of service in the same manner as described in 7.02 for the trunk switch.

- 7.04 Trunk Select Magnets TO-7 - The trunk select magnets TO-7 may be taken out of service by making busy the corresponding junctor at the CHBO-7 jacks in the test frame. Inserting a plug into one of these jacks will remove 20 juncctors from service. It consists of the same numbered junctor A and B appearance on each of the 10 electrical trunk switches TO-9.

- 7.05 Trunk Select Magnet T8 and 9 - The trunk select magnet T8 or 9 may be taken out of service by making busy all incoming and intraoffice trunks associated with the same group or SW- relay. This is similar to 7.02 except that only the incoming and intraoffice trunks are involved.

- 7.06 Trunk Hold Magnet TO-19 - A trunk hold magnet TO-19 may be taken out of service by making busy the assigned register or trunk.

- 7.07 Relays MP-, M-, MA- to MD- - These marker preference and connector relays may be taken out of service by making the associated marker busy using keys MMBO or 1 at the test frame.

- 7.08 Relay SW - The SW- relay may be taken out of service by making busy all associated trunks and registers. Make busy incoming trunks at the originating office and all other trunks and registers at the test frame.

- 7.09 Relay JC- - The JC- relay may be taken out of service by making busy all associated trunks and register. Make busy incoming trunks at the originating office and all other trunks and register at the test frame.

- 7.10 Relay TB- - The TB- relay may be taken out of service by making busy all trunks and registers associated with contacts of the relay via cross connections. Refer to 1.09 of SECTION II. Also parts of a TB relay may be removed from service in the following manner:

- (a) If the individual TT of TF lead of the trunks or registers is crossed on the movable contact side of the TB relay, the trunks or registers associated with only these contacts may be made busy.

7.11 Relay LJ- - The LJ- relay may be taken out of service in the same manner as described in 7.01 for the TS and C circuit.

7.12 Relays TRA, TRA1 and TRA2 - These relays may be taken out of service by blocking it nonoperated.

(a) Taking the TRA relay out of service will prevent the recording of the JC- and LJ- relay involved in a particular case of trouble on this circuit.

(b) Taking the TRA1 or TRA2 relay out of service will prevent the recording of the incoming trunk switch vertical involved in a particular case of trouble on this circuit.

#### SECTION IV - REASONS FOR REISSUE

##### B. Changes in Apparatus

###### B.1 Added

TB7-9 - 286H Relay - App Fig. 1, Opt Y  
 T0-9 (V12-19) - CF4 Switch - App Fig. 4  
 SW3, 4 - AJ507 Relay - App Fig. 5  
 SW3, 4 - 185A Network - App Fig. 5

###### B.2 Superseded

Z Wiring  
 Option

###### Superseded By

TRA2 - AF24 Relay  
 TRA2 - 185A Network  
 TT1 10-19 446K Diode  
 App Fig. 2, Option Y

##### D. Description of Changes

D.1 The capacity of this circuit was increased from 120 to 200 trunk appearances for use with a 200-1200 line application. The details are as follows:

(a) Four physical switches arranged for ten electrical switches to -9 are added with verticals 12 to 19.

(b) Switch groups 3 and 4 are added.

(c) Trunk blocks 7 to 9 are added, and TT and TF leads increased from 12 to 13 for all TB relays.

(d) Trouble recording of switch verticals on incoming trunks is changed from 1-out-of-12 to 1-out-of-10 for 0 to 9 plus a tens indication for 10 to 19.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25820-LHT-GWC-DM-VK