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CROSSBAR SYSTEMS
NO. 3
OUTGOING PLUG-ENDED TRUNK
FOR USE WITH
AUTOMATIC INTERCEPT SERVICE

CHANGES

B. Changes in Apparatus

B.1	<u>Superseded</u>	<u>Superseded By</u>
	M - 18BH Resistor - Fig. 3, Option Z	M - 533A Diode - Fig. 3, Option Y

D. Description of Changes

D.1 The FSI and CAD 2 reference to "Transmission and Signaling Facilities with Type I Interface" is added.

D.2 The FSI has been revised to show the addition of Y option. Option Z was not formerly designated and is rated Mfr Disc.

D.3 Circuit Note 104 is revised.

F. Changes in CD SECTION II

F.1 In 8.07 change the reference to "The M resistor" to read: "The M diode"

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25820-JRF-GWC-BT

NOTICE

This document is either
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Pursuant to Judge Greene's Order of August 5, 1983, beginning on January 1, 1984, AT&T will cease to use "Bell" and the Bell symbol, with the exceptions as set forth in that Order. Pursuant thereto, any reference to "BELL" and/or the BELL symbol in this document is hereby deleted and "expunged".

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CROSSBAR SYSTEM
NO. 3
OUTGOING PLUG-ENDED TRUNK
CIRCUIT
FOR USE WITH
AUTOMATIC INTERCEPT SERVICE

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This trunk circuit is used to connect a line to the automatic intercept center. The circuit is arranged for both reverse battery supervision and E and M lead supervision.

2. GENERAL DESCRIPTION OF OPERATION

2.01 Normal operation:

- (a) When a call to an intercepted line is originated, the originating register (intraoffice call) or incoming register (incoming call) seizes the marker and transmits the called number to it.
- (b) The marker consults the line number translator and receives the intercept indication.
- (c) The marker seizes an outgoing sender and transfers the called number and the intercept digit to it.
- (d) The marker connects the outgoing sender to this trunk through the outgoing sender link.
- (e) The marker connects this trunk to the associated intraoffice or incoming trunk.
- (f) The marker connects the intraoffice trunk to the calling line, if this is an intraoffice call.
- (g) The outgoing sender reconstructs the office code, if this is an incoming call, and then pulses the intercept digit plus the called number to the automatic intercept center.

(h) The outgoing sender drops off and the calling customer is cut through to the automatic intercept center.

(i) The automatic intercept center sends an appropriate recorded announcement back to the calling customer.

(j) If the calling customer fails to hang up shortly after hearing the recorded announcement, the call is transferred to an operator at the automatic intercept center.

(k) The circuit is restored to its idle state when the calling customer hangs up.

2.02 Reorder:

(a) If the outgoing sender is unable to perform its function, it will time out and cause this trunk to send overflow tone to the calling customer, as a signal to hang up and start over.

2.03 Make busy by AIC:

(a) When this trunk is idle, an off-hook signal initiated at the automatic intercept center will make this trunk busy. It will remain in the busy state as long as the off-hook signal is active.

SECTION II - DETAILED DESCRIPTION

1. NORMAL OPERATION - REVERSE BATTERY SUPERVISION (OPTION 2) SC1

1.01 When a call to an intercepted line is originated, the originating register (intraoffice call) or incoming register (incoming call) seizes the marker and transmits the called number to it.

1.02 The marker consults the line number translator and receives one of the following intercept digit indications:

- (a) "0" for blank number (BN).
- (b) "1" for trouble intercept (TI).
- (c) "3" for regular intercept (RI).

1.03 The marker seizes an outgoing sender and transfers the called number and the intercept digit to it.

1.04 The marker tests the S lead of this trunk to determine its busy-idle state, and if idle, it grounds the N lead operating the F relay.

1.05 The operation of relay F:

- (a) Connects lead SSB1 to lead SS.
- (b) Grounds the VG lead.
- (c) Connects its own winding directly to the N lead.
- (d) Opens the R lead connection to the MB relay and A inductor (option 2).
- (e) Grounds the M lead regardless of the state of the D and/or SL relays (option 3).
- (f) Grounds the AB lead and prevents the operation of the OF relay.

1.06 The marker connects the outgoing sender to this trunk through the outgoing sender link.

1.07 The outgoing sender operates the D relay.

1.08 The operation of relay D:

- (a) Transfers the OF relay winding from the AB lead to the SL lead.
- (b) Grounds the M lead regardless of the state of the SL relay (option 3).
- (c) Transfers the outgoing T and R leads from the incoming circuit to the outgoing sender, and also (option 3) to the SA relay windings.

1.09 The marker connects this trunk to the associated intraoffice or incoming trunk, and connects the intraoffice trunk to the calling line if this is an intraoffice call. This operates the SL relay over the S lead.

1.10 The operation of relay SL:

- (a) Closes resistance battery to the winding of the OF relay, but ground through the AB and SL lead loop prevents its operation.

- (b) Operates the BY relay.
 - (c) Grounds the S lead to the TUR circuit.
 - (d) Transfers the T lead from the MB relay to the A inductor (option 2).
 - (e) Connects its own winding directly to the S lead.
 - (f) Removes the idle termination from across the T and R leads (option 3).
 - (g) Replaces ground with battery for later use as an off-hook signal on the M lead (option 3).
 - (h) Grounds the AB lead.
- 1.11 The operation of relay BY:
- (a) Opens the operating path of the SL relay.
 - (b) Opens the operating path of the F relay.
- 1.12 The marker releases the F relay and then disconnects itself.
- 1.13 The release of relay F connects the A inductor across the T and R leads for later use as an off-hook signal to the automatic intercept center.
- 1.14 The outgoing sender sends an off-hook signal to the AIC.
- 1.15 The AIC sends a stop dial signal followed by a start dial signal to the outgoing sender.
- 1.16 The outgoing sender reconstructs the office code, if this is an incoming call, and then pulses the intercept digit plus the called number to the AIC.
- 1.17 The outgoing sender releases the D relay and then disconnects itself.
- 1.18 The release of relay D cuts the calling customer through to the AIC, which returns audible ringing to the calling customer.
- 1.19 The AIC removes audible ringing and then sends an appropriate recorded announcement back to the calling customer.
- 1.20 If the calling customer fails to hang up shortly after hearing the recorded announcement, the call is transferred to an operator at the AIC, who can then supply any additional information required by the calling customer.
- 1.21 When the calling customer hangs up, relay SL releases.
- 1.22 The release of relay SL:
- (a) Releases the BY relay.
 - (b) Sends an on-hook signal to the AIC.
- 1.23 The release of relay BY restores the trunk to its idle state.
2. NORMAL OPERATION - E AND M LEAD SUPERVISION (OPTION 3) SC2
- 2.01 When a call to an intercepted line is originated, the originating register (intraoffice call) or incoming register (incoming call) seizes the marker and transmits the called number to it.
- 2.02 The marker consults the line number translator and receives one of the following intercept digit indications:
- (a) "0" for blank number (BN).
 - (b) "1" for trouble intercept (TI).
 - (c) "3" for regular intercept (RI).
- 2.03 The marker seizes an outgoing sender and transfers the called number and the intercept digit to it.
- 2.04 The marker tests the S lead of this trunk to determine its busy-idle state, and if idle, it grounds the N lead operating the F relay.
- 2.05 The operation of relay F:
- (a) Connects lead SSB1 to lead SS.
 - (b) Grounds the VG lead.
 - (c) Connects its own winding directly to the N lead.
 - (d) Opens the R lead connection to the MB relay and A inductor (option 2).
 - (e) Grounds the M lead regardless of the state of the D and/or SL relay (option 3).
 - (f) Grounds the AB lead and prevents the operation of the OF relay.
- 2.06 The marker connects the outgoing sender to this trunk through the outgoing sender link.
- 2.07 The outgoing sender operates the D relay.

- 2.08 The operation of relay D:
- (a) Transfers the OF relay winding from the AB lead to the SL lead.
 - (b) Grounds the M lead regardless of the state of the SL relay (option 3).
 - (c) Transfers the outgoing T and R leads from the incoming circuit to the outgoing sender, and also (option 3) to the SA relay windings.
- 2.09 The marker connects this trunk to the associated intraoffice or incoming trunk and connects the intraoffice trunk to the calling line if this is an intraoffice call. This operates the SL relay over the S lead.
- 2.10 The operation of relay SL:
- (a) Closes resistance battery to the winding of the OF relay, but ground through the AB and SL lead loop prevents its operation.
 - (b) Operates the BY relay.
 - (c) Grounds the S lead to the TUR circuit.
 - (d) Transfers the T lead from the MB relay to the A inductor (option 2).
 - (e) Connects its own winding directly to the S lead.
 - (f) Removes the idle termination from across the T and R leads (option 3).
 - (g) Replaces ground with battery for later use as an off-hook signal on the M lead (option 3).
 - (h) Grounds the AB lead.
- 2.11 The operation of relay BY:
- (a) Opens the operating path of the SL relay.
 - (b) Opens the operating path of the F relay.
- 2.12 The marker releases the F relay and then disconnects itself.
- 2.13 The SA relay is provided to convert E and M leads signals between the AIC and this trunk to loop signals between this trunk and the outgoing sender. Initially, with the SA and E relays normal, an on-hook signal is presented to the outgoing sender when the D relay operates. After the marker has released and the AV relay in the outgoing sender has operated, the SA relay operates.
- 2.14 The operation of relay SA replaces ground with battery on the M lead as an off-hook signal to the AIC.
- 2.15 The AIC attaches its MF receiver and returns an off-hook (stop dial) signal which operates the E relay.
- 2.16 The operation of relay E transverts the off-hook signal on to the outgoing sender.
- 2.17 When the MF receiver is ready to receive digits, an on-hook (start dial) signal is sent by the AIC, which releases the E relay.
- 2.18 The release of relay E transverts the on-hook signal on to the outgoing sender.
- 2.19 The outgoing sender reconstructs the office code, if this is an incoming call, and then pulses the intercept digit plus the called number to the AIC.
- 2.20 The outgoing sender releases the D relay and then disconnects itself, which releases the SA relay.
- 2.21 The release of the D and SA relays returns control of the M lead to the SL relay, and the release of the D relay also cuts the calling customer through to the AIC which returns audible ringing to the calling customer.
- 2.22 The AIC removes audible ringing, sends an off-hook signal operating the E relay (which provides an alternate operate path for the BY relay), and sends an appropriate recorded announcement back to the calling customer.
- 2.23 The announcement trunk disconnects and the AIC sends an on-hook signal releasing the E relay.
- 2.24 If the calling customer fails to hang up shortly after hearing the recorded announcement, the call is transferred to an operator at the AIC, who can then supply any additional information required by the calling customer. The AIC also sends an off-hook signal operating the E relay.
- 2.25 When the operator disconnects, the AIC sends an on-hook signal releasing the E relay.
- 2.26 When the calling customer hangs up, relay SL releases.
- 2.27 The release of relay SL:
- (a) Releases the BY relay.

- (b) Sends an on-hook signal to the AIC.
- 2.28 The release of relay BY restores the trunk to its idle state.

3. REORDER - SC3

- 3.01 When a call to an intercepted line is originated, the originating register (intraoffice call) or incoming register (incoming call) seizes the marker and transmits the called number to it.
- 3.02 The marker consults the line number translator and receives one of the following intercept digit indications:
- (a) "0" for blank number (BN).
 - (b) "1" for trouble intercept (TI).
 - (c) "3" for regular intercept (RI).
- 3.03 The marker seizes an outgoing sender and transfers the called number and the intercept digit to it.
- 3.04 The marker tests the S lead of this trunk to determine its busy-idle state, and if idle, it grounds the N lead operating the F relay.
- 3.05 The operation of relay F:
- (a) Connects lead SSB1 to lead SS.
 - (b) Grounds the VG lead.
 - (c) Connects its own winding directly to the N lead.
 - (d) Opens the R lead connection to the MB relay and A inductor (option 2).
 - (e) Grounds the M lead regardless of the state of the D and/or SL relay (option 3).
 - (f) Grounds the AB lead and prevents the operation of the OF relay.
- 3.06 The marker connects the outgoing sender to this trunk through the outgoing sender link.
- 3.07 The outgoing sender operates the D relay.
- 3.08 The operation of relay D:
- (a) Transfers the OF relay winding from the AB lead to the SL lead.
 - (b) Grounds the M lead regardless of the state of the SL relay (option 3).

- (c) Transfers the outgoing T and R leads from the incoming circuit to the outgoing sender, and also (option 3) to the SA relay windings.

3.09 The marker connects this trunk to the associated intraoffice or incoming trunk and connects the intraoffice trunk to the calling line if this is an intraoffice call. This operates the SL relay over the S lead.

3.10 The operation of relay SL:

- (a) Closes resistance battery to the winding of the OF relay, but ground through the AB and SL lead loop prevents its operation.
- (b) Operates the BY relay.
- (c) Grounds the S lead to the TUR circuit.
- (d) Transfers the T lead from the MB relay to the A inductor (option 2).
- (e) Connects its own winding directly to the S lead.
- (f) Removes the idle termination from across the T and R leads (option 3).
- (g) Replaces ground with battery for later use as an off-hook signal on the M lead (option 3).
- (h) Grounds the AB lead.

3.11 The operation of relay BY:

- (a) Opens the operating path of the SL relay.
- (b) Opens the operating path of the F relay.

3.12 The marker releases the F relay and then disconnects itself.

3.13 If the outgoing sender is unable to perform its function, it will time out and operate its own RO relay. This removes the ground, through the AB and SL lead loop, from the winding of the OF relay, permitting the OF relay to operate.

3.14 The operation of relay OF:

- (a) Grounds the ST lead to the interrupter circuit.
- (b) Connects overflow tone to the T lead.
- (c) Disconnects the OF relay winding from the SL and AB leads.
- (d) Locks the D relay operated.

- 3.15 When the calling customer hangs up, relay SL releases.
- 3.16 The release of relay SL:
- (a) Releases the OF relay.
 - (b) Releases the BY relay.
- 3.17 The release of relay OF releases the D relay.
- 3.18 The trunk is now in its idle state.
4. ABANDONED CALL DURING SENDER FUNCTION - SC4
- 4.01 When a call to an intercepted line is originated, the originating register (intraoffice call) or incoming register (incoming call) seizes the marker and transmits the called number to it.
- 4.02 The marker consults the line number translator and receives one of the following intercept digit indications:
- (a) "0" for blank number (BN).
 - (b) "1" for trouble intercept (TI).
 - (c) "3" for regular intercept (RI).
- 4.03 The marker seizes an outgoing sender and transfers the called number and the intercept digit to it.
- 4.04 The marker tests the S lead of this trunk to determine its busy-idle state, and if idle, it grounds the N lead operating the F relay.
- 4.05 The operation of relay F:
- (a) Connects lead SSB1 to lead SS.
 - (b) Grounds the VG lead.
 - (c) Connects its own winding directly to the N lead.
 - (d) Opens the R lead connection to the MB relay and A inductor (option 2).
 - (e) Grounds the M lead regardless of the state of the D and/or SL relay (option 3).
 - (f) Grounds the AB lead and prevents the operation of the OF relay.
- 4.06 The marker connects the outgoing sender to this trunk through the outgoing sender link.
- 4.07 The outgoing sender operates the D relay.
- 4.08 The operation of relay D:
- (a) Transfers the OF relay winding from the AB lead to the SL lead.
 - (b) Grounds the M lead regardless of the state of the SL relay (option 3).
 - (c) Transfers the outgoing T and R leads from the incoming circuit to the outgoing sender, and also (option 3) to the SA relay windings.
- 4.09 The marker connects this trunk to the associated intraoffice or incoming trunk and connects the intraoffice trunk to the calling line if this is an intraoffice call. This operates the SL relay over the S lead.
- 4.10 The operation of relay SL:
- (a) Closes resistance battery to the winding of the OF relay, but ground through the AB and SL lead loop prevents its operation.
 - (b) Operates the BY relay.
 - (c) Grounds the S lead to the TUR circuit.
 - (d) Transfers the T lead from the MB relay to the A inductor (option 2).
 - (e) Connects its own winding directly to the S lead.
 - (f) Removes the idle termination from across the T and R leads (option 3).
 - (g) Replaces ground with battery for later use as an off-hook signal on the M lead (option 3).
 - (h) Grounds the AB lead.
- 4.11 The operation of relay BY:
- (a) Opens the operating path of the SL relay.
 - (b) Opens the operating path of the F relay.
- 4.12 The marker releases the F relay and then disconnects itself.
- 4.13 If the calling customer hangs up, the SL relay releases.

- 4.14 The release of relay SL:
 - (a) Releases the LR relay in the outgoing sender.
 - (b) Releases the BY relay.
- 4.15 The outgoing sender releases and re-releases the D relay.
- 4.16 The trunk is now in its idle state.

5. MAKE BUSY BY AIC - REVERSE BATTERY SUPERVISION (OPTION 2) SC5

- 5.01 If this trunk is idle, an off-hook signal from the AIC will operate the MB relay.
- 5.02 The operation of relay MB operates the BY relay, which makes the trunk busy.
- 5.03 Removal of the off-hook signal from the AIC will release the MB and BY relays in tandem, returning the trunk to its idle state.

6. MAKE BUSY BY AIC - E AND M LEAD SUPERVISION (OPTION 3) SC6

- 6.01 If this trunk is idle, an off-hook signal from the AIC will operate the E relay.
- 6.02 The operation of relay E operates the BY relay, which makes the trunk busy.
- 6.03 Removal of the off-hook signal from the AIC will release the E and BY relays in tandem, returning the trunk to its idle state.

7. TESTING

- 7.01 Testing of this trunk is performed by setting up a test connection to this trunk from a test line. Routine operations are performed from the test line in the same manner as for a regular service call.

8. MISCELLANEOUS

- 8.01 Capacitors T and R are provided to isolate the incoming and outgoing circuits.
- 8.02 Capacitor OF is provided to isolate the overflow tone circuit.
- 8.03 The OF resistor is provided to enable a ground to remove the battery supply from the OF relay without blowing a fuse.

8.04 The A resistor and inductor are provided to provide an off-hook signal toward the AIC (option 2).

8.05 The MB resistor and diode are provided to limit the magnitude and direction of the current through the MB relay (option 2).

8.06 The MB network is provided to limit the voltage surge generated when the MS relay is released (option 2).

8.07 The M resistor and lamp are provided to control the on-hook signal applied to the M lead (option 3).

8.08 The E network is provided to limit the voltage surge generated when the E relay is released (option 3).

8.09 The TG resistor and capacitor are provided as an idle termination for the T and R leads (option 3).

SECTION III - REFERENCE DATA

1. WORKING LIMITS

- 1.01 Reverse battery supervision:
 - (a) Maximum external circuit loop - 4000 ohms.
 - (b) Minimum insulation resistance - 30,000 ohms.

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

<u>Designation</u>	<u>Meaning</u>
BY	Busy
D	Divert
E	Ear
F	Frame
MB	Make Busy
OF	Overflow
SA	Sender Attached
SL	Sleeve

3. FUNCTIONS

- 3.01 See SECTIONS I and II for functions of this circuit.

5. CONNECTING CIRCUITS

.01 When this circuit is listed on a key-sheet, the connecting information hereon shall be followed.

- (a) Trunk Switch and Connector Circuit - SD-26383-01.
- (b) Traffic Usage Recorder Circuit - SD-96494-01.
- (c) Test Circuit - SD-26411-01.
- (d) Outgoing Sender Link Circuit - SD-26395-01.
- (e) Interrupter Circuit - SD-26407-01.
- (f) Signaling Compatibility with Switching Circuits - SD-99421-01.

6. MANUFACTURING TESTING REQUIREMENTS

.01 This circuit shall be capable of performing all the functions listed in

this Circuit Description and meeting the requirements listed in the Circuit Requirements Tables.

6. TAKING EQUIPMENT OUT OF SERVICE

6.01 If it is desired to remove this trunk from service for trouble or other reasons, the test circuit is arranged to ground the MB lead which operates the BY relay. This sets the trunk in the busy state.

6.02 The test circuit can ground the MB lead by either of the following methods:

- (a) Insertion of a make-busy plug in the associated TRK-MB jack.
- (b) Operation of the remote make-busy facilities if they are provided.

6.03 Removal of ground from the MB lead will restore this circuit to service.

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