

CROSSBAR SYSTEMS  
NO. 3  
PERMANENT SIGNAL TO OPERATOR  
PLUG-ENDED TRUNK  
CIRCUIT  
E AND M LEAD SUPERVISION

## CHANGES

B. Changes in Apparatus

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B.1 Superseded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Superseded By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

D. Description of Changes

D.1 The FS1 has been revised to show the addition of Y option. Option Z was not designated. Circuit Note 104 has been changed to reflect the addition of Y option.

D.2 The FS1 and CAD 2 reference to "Transmission and Signaling Facilities with Type I Interface" is added.

F. Changes in CD Sections

## SECTION II

F.1 Change 5.02 to read:

5.02 A 533A diode is connected from the M lead to ground to stabilize the off-hook (battery) signal applied to the M lead.

## SECTION III

F.2 Change 3.14 to read:

3.14 Provides a 533A diode to stabilize the off-hook (battery) signal applied to the M lead.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25820-JRF-GWC-BT



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2. <u>GENERAL DESCRIPTION OF OPERATION</u>		<u>2. GENERAL DESCRIPTION OF OPERATION</u>
SEIZURE . . . . .	1	SEIZURE
OPERATOR ANSWERS . . . . .	1	2.01 When the marker determines that a trunk of this type is required, it makes tests to find an idle trunk on an idle trunk switch and connector circuit. The marker then operates the F relay of the selected trunk.
OPERATOR DISCONNECTS . . . . .	1	2.02 The F relay operates the S1 relay, which in turn operates the BY relay to set the busy condition. After the marker determines that the connections to the trunk are in order, the marker releases the F relay and then releases, leaving the customers line connected to the tip and ring of this circuit.
<u>SECTION II - DETAILED DESCRIPTION</u> . .	2	2.03 Relay L operates over the line loop, provides a holding, path for relay S1, and operates relay L1. Relay L1 connects battery to the M lead as a seizure signal to the distant switchboard. The call is now established to the distant switchboard.
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<u>SECTION I - GENERAL DESCRIPTION</u>		
1. <u>PURPOSE OF CIRCUIT</u>		
1.01 This circuit is used to connect a line, which is in a permanent signal state, to an operator initially. This permits the operator to converse with a possible incapacitated customer who may be in need of		

OPERATOR DISCONNECTS

2.06 Having performed the emergency function, or more likely having found the line to be in a permanent signal state, the operator disconnects which releases the E relay. This causes the release of relays L, Ll, Sl, TK, and BY returning the trunk to the idle state.

2.07 The line will drop to the lockout state and remain in the lockout state as long as the permanent signal condition exists.

SECTION II - DETAILED DESCRIPTION

1. SEIZURE

1.01 After the marker has determined that a trunk of this type is required, it finds and selects an idle trunk in the following manner.

- (a) Ground supplied by the trunk over the FT lead indicates to the marker that at least one trunk in the required group on the associated trunk switch and connector circuit is idle.
- (b) Ground supplied by the marker is looped through the trunk on leads TG and TT and is directed by the marker connector, trunk block, and trunk group relays to operate one of 12 TT- relays.
- (c) Battery supplied by the marker and directed by the marker connector, trunk block, and TT- relay through lead TF operates the F relay in the trunk.
- (d) The operation of F:
  - (1) Locks the F relay directly to lead TF.
  - (2) Grounds the SW and JC leads to operate the associated SW and JC relays in the trunk switch and connector circuits.
  - (3) Transfers the incoming T, R, and S leads from the trunk to the marker (Tl, Rl, and Sl leads, respectively) for test purposes.
  - (4) Operates the Sl relay.
- (e) The operation of Sl:
  - (1) Supplies ground to the S lead, after the F relay releases, to hold the switch connections and to activate the TUR circuit.
  - (2) Supplies its own holding ground.

- (3) Supplies a holding ground for later use by the TK relay.
- (4) Opens the MB lead to the test circuit.
- (5) Operates the BY relay.
- (f) The operation of BY:
  - (1) Opens the FT lead.
  - (2) Opens the loop through the TG and TT leads.
  - (3) Opens the operate path of the F relay.
- (g) When the marker has connected the line through the network to the trunk it:
  - (1) Tests the tip and ring leads for continuity.
  - (2) Tests the sleeve lead for a false ground.
  - (3) If the above tests are successful, it releases the F relay which transfers the incoming T, R, and S leads back to this trunk.
  - (4) Releases.

1.02 Connection of the trunk to the line causes the following operations.

- (a) Relay L operates over the T and R leads to the customers line and:
  - (1) Closes the holding path for the Sl relay.
  - (2) Operates the Ll relay.
- (b) The operation of Ll:
  - (1) Opens the idle circuit termination across the T and R leads to the distant switchboard.
  - (2) Connects this trunk to the T and R leads to the distant switchboard.
  - (3) Replaces ground with battery on the M lead as an off-hook signal to the distant operator.

2. OPERATOR ANSWERS

2.01 When the distant operator answers, the following operations are instigated by ground on the E lead:

- (a) Relay E operates which:

- (1) Opens the already open FT lead.
  - (2) Opens the already open loop through the TG and TT leads.
  - (3) Closes another holding path for the S1 relay.
  - (4) Closes a holding path for the L relay.
  - (5) Operates the TK relay.
- (b) The operation of TK:
- (1) Closes its own holding path through a contact on the S1 relay.
  - (2) Opens the original holding path of the S1 relay.
  - (3) Opens the operating path of the L relay.
- (c) The operator can now talk to a possible incapacitated customer on the line. If this is the case, the operator can summon and direct emergency assistance to the premises of the customer.

### 3. OPERATOR DISCONNECTS

3.01 Having performed the emergency functions, or more likely having found the line to be in a permanent signal state, the operator disconnects resulting in the following sequence of operations:

- (a) Relay E releases which:
  - (1) Releases relay L.
  - (2) Releases slow-release relay S1.
- (b) Release of L:
  - (1) Releases relay L1.
- (c) Release of L1:
  - (1) Replaces battery with ground on the M lead as an on-hook signal.
  - (2) Disconnects this trunk from the T and R leads to the distant switchboard.
  - (3) Connects the idle circuit termination across the T and R leads to the distant switchboard.
- (d) Release of S1:
  - (1) Removes ground from the S lead to release the line to trunk channel in the network and to deactivate the TUR circuit.

- (2) Releases relay TK.
- (3) Releases relay BY.
- (e) The trunk is now in its normal idle state.

3.02 Release of the network channel causes the customers line to drop to the lockout state where it will remain as long as the permanent signal condition exists.

### 4. TESTING

4.01 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 to the distant operator in the same manner as for a regular service call.

### 5. MISCELLANEOUS

5.01 A 900-ohm resistor is connected across the outgoing T and R leads when the L1 relay is normal as an idle circuit termination.

5.02 A 1000-ohm resistor is connected from the M lead to ground to stabilize the off-hook (battery) signal applied to the M lead.

5.03 A 185A network is connected from the S lead to ground to protect the diodes in the line circuits.

5.04 A 185A network is connected across the winding of the E relay to limit voltage surges on the E lead.

### SECTION III - REFERENCE DATA

#### 1. WORKING LIMITS

1.01 See the No. 3 crossbar keysheet for customer line supervision limits.

#### 2. FUNCTIONAL DESIGNATIONS

##### 2.01 Relays

<u>Designation</u>	<u>Meaning</u>
BY	Busy
E	Ear (Receive)
F	Frame (Marker Function)
L	Line (Calling Supervisory)
L1	Line Auxiliary

<u>Designation</u>	<u>Meaning</u>
SL	Sleeve
TK	Talk

### 3. FUNCTIONS

3.01 When this circuit is idle, it provides a ground on lead FT to indicate to the marker that there is an idle trunk in the required group on the associated trunk switch and connector circuit.

3.02 When this circuit is idle, it provides a loop through leads TG and TT which the marker uses to operate the associated TT- relay.

3.03 An F relay associated with lead TF is provided and is operated by the marker when this trunk is seized. The F relay grounds leads SW and JC to operate the associated SW and JC relays in the trunk switch and connector circuit. It also transfers the incoming T, R, and S leads from the trunk to the marker (T1, R1, and SL leads) so that the marker can perform line tip and ring continuity and sleeve lead false ground tests. The F relay also operates the SL relay, which in turn operates the BY relay.

3.04 Provides for removal of ground from the FT lead, opening of the loop between the TG and TT leads, and opening of the F relay operating path when this circuit is busy.

3.05 When the marker has connected the line through the network to the trunk, it tests the tip and ring leads for continuity and the sleeve lead for a false ground. After successful completion of these tests, the marker releases the F relay and then releases itself. Release of the F relay, reconnects the incoming T, R, and S leads to this trunk.

3.06 Provides a ground on the S lead to hold the switch connections and to activate the TUR circuit.

3.07 An L supervisory relay is provided to detect off-hook or on-hook line conditions.

3.08 An Ll line auxiliary relay is provided to disconnect the idle circuit termination; connect this circuit through to the distant switchboard, and to control the off-hook and on-hook signals to the distant switchboard.

3.09 An E relay is provided to direct off-hook and on-hook signals from the distant switchboard.

3.10 A TK relay is provided to place the L and SL relays under the control of the E relay.

3.11 Provides a means of restoring the circuit to its idle state when the:

- (a) Distant operator disconnects.
- (b) Line returns to on-hook before or after the operator answers.

3.12 Provides a means of making this circuit busy from the test frame or from a remote location if the remote make-busy facilities are provided.

3.13 Provides a 900-ohm idle circuit termination for the outgoing T and R leads.

3.14 Provides a 1000-ohm ground to stabilize the off-hook (battery) signal applied to the M lead.

3.15 Provides a 185A network on the S lead to protect the diodes in the line circuits.

3.16 Provides a 185A network across the E relay winding to limit voltage surges on the E lead.

### 4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a key-sheet, the connecting information thereon 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) Carrier Application Schematic - SD-95121-01, (Typical).
- (e) Line and Balancing Composite Set and Repeating Coil Circuit - SD-95004-01.

### 5. MANUFACTURING TESTING REQUIREMENTS

5.01 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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