

5

CROSSBAR SYSTEMS  
NO. 3  
OUTGOING PLUG-ENDED TRUNK  
CIRCUIT  
DIAL PULSING  
E AND M LEAD SUPERVISION

TABLE OF CONTENTS	PAGE	SECTION I - GENERAL DESCRIPTION
<u>SECTION I - GENERAL DESCRIPTION</u> . . . .	1	<u>1. PURPOSE OF CIRCUIT</u>
<u>1. PURPOSE OF CIRCUIT</u> . . . . .	1	1.01 This circuit is used to complete outgoing calls from a crossbar No. 3 office to a distant office using DP pulsing and E and M lead supervision.
<u>2. GENERAL DESCRIPTION OF OPERATION</u> .	1	<u>2. GENERAL DESCRIPTION OF OPERATION</u>
SELECTION OF TRUNK . . . . .	1	SELECTION OF TRUNK
SENDER FUNCTIONS . . . . .	1	2.01 When the marker receives an indication that an outgoing trunk is required, it selects an idle trunk switch and connector circuit, an idle trunk on that circuit associated with the desired route, and a sender. After the marker completes certain tests, the selected trunk is connected to the calling customer.
CALLED CUSTOMER ANSWERS. . . . .	1	SENDER FUNCTIONS
CALLER CUSTOMER DISCONNECTS FIRST. .	1	2.02 After the marker disconnects, the sender transmits the called number to the distant office. The sender disconnects when it has completed transmitting.
CALLING CUSTOMER DISCONNECTS FIRST .	1	CALLER CUSTOMER ANSWERS
ABANDONED CALLS. . . . .	2	2.03 When the called customer answers, the trunk prepares itself for subsequent disconnect. No other functions are performed at this time.
<u>SECTION II - DETAILED DESCRIPTION</u> . . .	2	CALLER CUSTOMER DISCONNECTS FIRST
<u>1. TRUNK SELECTION AND SEIZURE BY THE MARKER</u> . . . . .	2	2.04 After a timed interval, the off-hook signal toward the called office is removed and the path through the switches is opened. The trunk is now normal and available for service.
SETTING UP CONNECTION TO CALLING CUSTOMER AND SENDER FUNCTIONS. . .	2	CALLING CUSTOMER DISCONNECTS FIRST
CALLER CUSTOMER ANSWERS. . . . .	3	2.05 Under this condition the off-hook signal toward the called office is immediately removed and the path through the switches is opened.
CALLER CUSTOMER DISCONNECTS FIRST. .	3	
CALLING CUSTOMER DISCONNECTS FIRST .	4	
<u>SECTION III - REFERENCE DATA</u> . . . . .	4	
<u>1. WORKING LIMITS</u> . . . . .	4	
<u>2. FUNCTIONAL DESIGNATIONS</u> . . . . .	4	
<u>3. FUNCTIONS</u> . . . . .	4	
<u>4. CONNECTING CIRCUITS</u> . . . . .	5	
<u>5. MANUFACTURING TESTING REQUIREMENTS</u>	5	
<u>6. TAKING EQUIPMENT OUT OF SERVICE</u> . .	5	

## ABANDONED CALLS

2.06 The trunk is arranged to release if the originating customer abandons the call at any time after the marker disconnects. If the sender is still attached, the trunk cannot be selected for another call until the sender releases.

## SECTION II - DETAILED DESCRIPTION

### 1. TRUNK SELECTION AND SEIZURE BY THE MARKER

1.01 There is one FT lead per trunk switch and connector circuit per route associated with the trunks arranged for calls originating at noncoin stations. If there is at least one idle trunk on a particular trunk switch and connector circuit associated with the desired route, there will be a ground on the FT lead to the trunk switch and connector circuit. The marker determines which circuits have access to an idle sender and then selects one of these trunk switch and connector circuits which is ready to take a call. Ground is supplied to the TT lead to the trunks for this route on the selected circuit. The marker determines which of the trunks are idle by looking for this ground over the individual TG leads. The marker selects one of the idle trunks and then operates the F relay by applying battery to the TF lead. The F relay operated:

- (a) Transfers the T, R, and S leads from this trunk to the marker for tests via leads T1, R1, and S1, respectively.
- (b) Provides its own holding path via 6M F relay.
- (c) Grounds leads JC and SW to the trunk switch and connector circuit.
- (d) Operates TP relay when tip party identification is required.
- (e) Grounds lead VG to the outsender link and trunk identifier circuit.
- (f) Operates the S1 relay.

The S1 relay operated:

- (g) Opens the path from the TT lead to the TG lead which prevents any subsequent seizure by the marker while the call is in progress.

(h) Opens the FT lead which makes this trunk appear busy to the trunk switch and connector circuit.

(i) Operates the MRP relay (Z option provided).

(j) Locks the TP relay operated when tip party is to be charged (Z option provided).

(k) Opens the MB lead to the test circuit to prevent this trunk from being seized by the test circuit while a call is in progress.

(l) Removes the idle circuit termination network from across the tip and ring.

(m) Prepares an operate path for the CH relay.

(n) Grounds the S lead to the traffic usage recorder.

### SETTING UP CONNECTION TO A CALLING CUSTOMER AND SENDER FUNCTIONS

1.02 At the same time that the above operation is taking place, the marker selects an idle sender and operates the select magnet of the link switch for the level on which that trunk appears. A select magnet operated connects ground on the SSB lead to this trunk and the ground is extended through the operated F relay to the SS lead operating the associated hold magnet of the link switch associated with the desired sender. The hold magnet is held under control of the sender which then operates the D relay. The D relay operated:

- (a) Opens a path from TT to TG lead in an additional place.
- (b) Opens the FT lead to the trunk switch and connector circuit in an additional place.
- (c) Grounds the AB lead to the outsender link circuit via 1 make of the S1 relay.
- (d) Grounds the T lead to the TM timer to prevent the timer from functioning while the E relay is being used to receive signaling from the distant office.

(e) Opens the operate path of the RL relay to prevent a premature timed release.

(f) Extends the sleeve to the sender to allow the sender to control the channel jointly with the trunk during its functions.

1.04 When the marker has completed the functions with this trunk and the assigned sender, it releases the F relay. The F relay released releases a relay in the trunk switch and connector circuit which causes the customer line to be connected to the S relay causing it to operate unless the customer has abandoned the call. The S1 relay is slow to release to hold over from the time the marker removes ground from the S1 lead until the S relay operates over the customer loop.

1.05 Before the marker releases it causes the sender to close a loop between the T and R leads from the trunk. This causes P relay to operate over the loop through the sender to battery on the B resistor. The operated P relay transfers resistance battery through the M resistance lamp to the M lead of the signaling circuit to send off-hook seizure forward to the distant office. Transfer contacts 2 and 11 of the E relay pass the supervisory signals from the far end to the sender. When the sender dial outpulses the P relay releases from each dial pulse and transfers them to the E and M signaling circuit for transmission to the distant office. At the conclusion of pulsing the sender releases releasing the D relay, which places the P relay under control of the S relay, thus maintaining off-hook supervision forward until the calling party releases or is released.

1.06 If the calling customer abandons the call before the sender has completed its functions, the S and S1 relays release. The S1 relay released removes ground from the AB lead to the sender indicating to it that the call is abandoned and causing it to start releasing. The operated D relay makes the trunk still look busy by holding the TT, TG, and FT leads open. However, when the sender releases releasing the D relay the circuit returns to normal and is ready for a new call.

#### CALLED CUSTOMER ANSWERS

1.07 The E and M lead supervisory signal indicating that the far end is off-hook is the operated E relay in the local office. Therefore, when the called customer answers (goes off-hook) the E relay operates. With the E relay operated and the D relay normal, ground is removed from the I lead of the TM timer which starts timing.

1.08 When ground is removed from the charging network of the TM timer, the voltage at the C lead becomes approximately -96 volts which reverse biases diode CRL in the timer. The A capacitor then discharges into the timer through the I lead, through the Q1 transistor from base to emitter, out of the timer on B lead to battery, and from ground through A resistor back to the other side of the A capacitor. When the A capacitor is discharged, the Q1 transistor turns off which turns on the Q2 transistor, which operates the CH relay. The time constant of the A capacitor and the A resistor determine the time (0.685 to 0.800 seconds) before Q1 transistor turns off. The CH relay operated:

(a) Locks under control of the S1 relay by opening the charge path of the A capacitor.

(b) Prepares operate path for RL relay.

(c) Opens operate path for MRP relay. During the 225 to 830 millisecond slow-release interval of the MRP relay the message register is pegged (option Z provided).

#### CALLED CUSTOMER DISCONNECTS FIRST

1.09 When the called customer goes on-hook before the calling customer, the E relay releases which applies ground to and energizes the RL thermal relay.

1.10 Thermal relay RL operates after a minimum of 13 seconds and operates the D relay. The D relay operated:

(a) Grounds the M lead to send an on-hook signal to the distant end.

(b) Opens S sleeve lead to the trunk switch and connector circuit which causes the channel to the calling customer to release. This prevents a calling customer from holding a called line out of service indefinitely.

(c) Releases the S1 relay.

The released S1 relay releases the CH relay, as soon as the RL cools sufficiently to release, the D relay is released and the trunk is returned to normal and ready for another call.

#### CALLING CUSTOMER DISCONNECTS FIRST

1.11 When the calling customer disconnects the connection to the calling line is opened, on-hook is sent to the incoming trunk at the terminating office and the circuit restores to normal.

#### SECTION III - REFERENCE DATA

##### 1. WORKING LIMITS

1.01 See keysheet for customer line working limits.

##### 2. FUNCTIONAL DESIGNATIONS

##### 2.01 Relays

<u>Designation</u>	<u>Meaning</u>
CH	Charge-Call Established
D	Traditional
E	Traditional
F	Frame - Trunk Seized by Marker
MRP	Message Register Pulse
P	Traditional - Pulsing
RL	Release
S	Traditional - Supervisory
S1	Traditional - Sleeve
TP	Tip Party

##### 3. FUNCTIONS

3.01 To service outgoing traffic.

3.02 To appear idle to a marker by the presence of ground on the FT lead.

3.03 To allow a marker to seize this trunk by providing continuity from the TT lead to its TG lead and when busy to prevent subsequent seizure by opening the continuity between the TT and TG leads.

3.04 To appear busy to subsequent originating traffic by absence of ground on the FT lead when handling a call or when made busy.

3.05 To give an indication to the traffic usage recorder when this circuit is serving a call.

3.06 To send and receive supervisory signals on an E and M lead basis.

3.07 To send a seizure (off-hook) signal forward when an outgoing sender is attached and to provide a DP pulsing path for the sender.

3.08 To provide a means to pass supervisory signals to the sender.

3.09 To recognize an abandoned call and to cause the sender to release and to release the connection to the customer line.

3.10 To provide a means to time release the connection to the customers line when the called party releases first.

3.11 To provide an idle circuit terminating network for the carrier equipment.

3.12 To provide access for the test equipment.

3.13 To provide means for the test circuit to perform test calls through this trunk.

3.14 To serve 2-party message rate or coin line traffic in addition to regular flat rate traffic (Z option provided).

3.15 To provide tip party charging when required on message rate lines (Z option provided).

3.16 To provide a means to signal an auxiliary coin line circuit to collect or return coins on a call originated by a local coin station (Z option provided).

3.17 To provide for pegging a customers message register for calls originated by message rate lines (Z option provided).

#### 4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a key-sheet the information thereon is to be followed:

- (a) Trunk Switch and Connector Circuit - SD-26383-01.
- (b) Outgoing Sender Link and Trunk Identifier Circuit - SD-26395-01.
- (c) Message Register Power Supply Circuit - SD-26408-01.
- (d) Test Circuit - SD-26411-01.
- (e) Power Ringing and Tone Distributing Circuit - SD-26414-01.
- (f) Traffic Usage Recorder Circuit - SD-96494-01.
- (g) Time Delay Control Circuit - SD-94820-01.
- (h) CX Set and Repeat Coil Circuit - SD-95004-01.
- (i) N1 Carrier Applique Schematic Circuit - SD-95121-01.

#### 5. MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall be capable of performing all the functions listed in this Circuit Description and the requirements listed in the Circuit Requirements Tables.

#### 6. TAKING EQUIPMENT OUT OF SERVICE

6.01 A jack per trunk is provided at the test circuit for making the trunk busy. When a sleeve-ring shorting plug is inserted, ground through a normal contact of relay TST in that test circuit is passed over lead MB to the trunk. If the trunk is not in use relay D will operate and open leads FT, TT, and TG to the marker. If the trunk is in use relay D will not operate until the trunk returns to normal (relay S1 released). Insertion of the plug does not interfere with a call which may be in progress.

6.02 When testing this trunk, the test circuit will operate its TST relay releasing the operated make-busy relays (D relay in this trunk) associated with that trunk switch and connector circuit. The trunk is then seized normally by the marker as directed by the test circuit set up.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-LCB

WE DEPT 355-JLS-KLF-DM

