

6

CROSSBAR SYSTEMS  
NO. 3  
INTERCEPT TRUNK CIRCUIT  
PLUG-ENDED

TABLE OF CONTENTS	PAGE
<u>SECTION I - GENERAL DESCRIPTION</u> . . .	1
1. <u>PURPOSE OF CIRCUIT</u> . . . . .	1
2. <u>GENERAL DESCRIPTION OF OPERATION</u>	1
<u>SECTION II - DETAILED DESCRIPTION</u> . .	1
1. <u>SEIZE AND CONNECT</u> . . . . .	1
2. <u>DISCONNECT</u> . . . . .	3
3. <u>ANNOUNCEMENT MACHINE BYPASS</u> . . .	4
4. <u>TESTING</u> . . . . .	5
5. <u>MISCELLANEOUS</u> . . . . .	5
<u>SECTION III - REFERENCE DATA</u> . . . .	5
1. <u>WORKING LIMITS</u> . . . . .	5
2. <u>FUNCTIONAL DESIGNATIONS</u> . . . . .	5
3. <u>FUNCTIONS</u> . . . . .	5
4. <u>CONNECTING CIRCUITS</u> . . . . .	5
5. <u>MANUFACTURING TESTING REQUIREMENTS</u> . . . . .	6
6. <u>TAKING EQUIPMENT OUT OF SERVICE</u>	6

SECTION I - GENERAL DESCRIPTION1. PURPOSE OF CIRCUIT

1.01 This circuit provides trunk type supervision and transmission between a customer and an announcement machine. A transfer feature to an assistance operator is provided.

2. GENERAL DESCRIPTION OF OPERATION

2.01 This circuit, reached through levels 8A or 8B of the trunk switch circuit, connects blank number, regular intercept, and trouble intercept calls to a local announcement machine for a common intercept

announcement. Arrangements are provided for cut-through coordinated with the start of an announcement cycle, and to automatically transfer a holding customer to an assistance operator after either one or two announcement cycles. This circuit can also be used for other announcements for which no charge is to be made to the calling customer.

SECTION II - DETAILED DESCRIPTION1. SEIZE AND CONNECT

1.01 Blank number, regular intercept, and trouble intercept calls are handled by the marker as if being completed to a local customer. The marker applies ground to the S lead operating the SL relay and then proceeds to set up the associated intra-office or incoming trunk to apply ringing to the ring lead of this intercept trunk. The operation of the SL relay:

- (a) Grounds the S lead to the traffic usage recorder.
- (b) Provides its own locking path around a break-contact of the MB relay to prevent interference of a call in progress by the MB relay.
- (c) Provides a locking and release control path for later use by the LK relay.
- (d) Closes an operating path for later use by the P relay.

1.02 When the ringing voltage is applied, the RT tube fires across its starter gap. The main gap breaks down and sufficient current flows during the negative half-cycles to operate relay LK. The D diode is used to help the flux build up in the LK relay should it fail to operate on the first negative half-cycle. The operation of the LK relay:

- (a) Closes audible ringing on the ring lead towards the calling customer.
- (b) Connects the starter gap of tube RT across the tip and ring leads.

(c) Provides its own lock path under control of the SL relay.

(d) Connects the ST lead to the ST1 lead as a start signal to the announcement machine.

(e) Partially closes the operating path of the CT1 relay.

The ringing voltage supplied by the preceding trunk is high enough during negative half-cycle peaks to break down the starter gap of tube RT and keep it conducting to operate the trip relay in the preceding trunk. When ringing is tripped, the preceding trunk provides talking battery and ground to the tip and ring leads. This voltage is below the sustaining voltage of tube RT. Tube RT extinguishes but remains across the tip and ring leads in the event of subsequent ringing.

1.03 When the announcement machine starts up, it places a ground pulse on the CT lead approximately one-second before the beginning of the announcement. This pulse is repeated on every announcement cycle as long as the machine is running. The CT relay follows this ground pulse and causes the following sequence of relay operations:

(a) (Option G - 1 Announcement)

CT	P	CT1	W	Z	TR
+	+	+			
-	-		+		
+	+				+
-	-		-		

(b) (Option F - 2 Announcements)

CT	P	CT1	W	Z	TR
+	+	+			
-	-		+		
+	+			+	
-	-		-		
+	+				+
-	-			-	

1.04 The operation of the CT1 relay:

- (a) Provides the operating ground for the W, Z, and TR relays.
- (b) Provides its own locking ground.
- (c) Removes audible ringing from the ring lead and cuts the tip and ring leads through to the announcement machine.
- (d) Provides a transfer contact in the AL lead so that a ground on this lead can operate the P and TR relays as described in 3.01.

1.05 If the calling customer does not hang up before the second (G option) or third (F option) operation of the P relay, the TR relay will operate and cause the following:

- (a) Transfers the incoming tip and ring leads from the announcement machine to the manual class-of-service line switch appearance.
- (b) Opens the start loop to stop the announcement machine.
- (c) Locks to ground through a contact on the CT1 relay.
- (d) Releases the P and W or Z relays.
- (e) Starts the TD timer.
- (f) Partially closes the operating lead for the STO relay.
- (g) Partially closes the operating lead for the TN relay.

1.06 If the calling customer does not hang up before the end of the 4-second TD timing interval, relay TD will operate. The operation of relay TD:

- (a) Opens the operating path of the TN relay.
- (b) Opens one of two paths connecting the OA inductor across the tip and ring leads.
- (c) Operates the STO relay.

1.07 The operation of the STO relay:

- (a) Stops the TD timer and releases the TD relay.
- (b) Locks to ground through a contact on the TR relay.
- (c) Changes the timing of the TD timer from 4 seconds to 2 seconds.
- (d) Connects the OA inductor across the tip and ring leads as an off-hook signal on the manual class-of-service line circuit.

1.08 The off-hook signal causes the manual line circuit to be connected through the switching network to an outgoing trunk terminating at an assistance operators position. The outgoing trunk places a resistance ground (19 ohms) on the S lead. This resistance ground places a reverse bias on the input of the Q1 transistor preventing its operation and keeping the SLA relay in its idle state. The resistance ground does, however, operate the SL relay. The operation of the SL relay:

- (a) Closes a second path to keep the OA inductor across the tip and ring leads after the TD relay operates at a later time.

- (b) Connects the negative biasing resistor to the base of the Q1 transistor to prepare it for later operation.

1.09 When the operator answers, the outgoing trunk changes the resistance ground on the S lead to a direct ground. This direct ground places a forward bias on the input of the Q1 transistor, turning it on and operating the SLA relay. Resistor E is a current limiting resistor, and resistors F and G are used as a voltage dividing biasing network. The B capacitor and D1 diode provide surge protection for the Q1 transistor. The operation of the SLA relay:

- (a) Starts the TD timer.

- (b) Operates the TN relay.

1.10 The operation of the TN relay connects audible ringing tone to the line to identify the nature of this call to the assistance operator.

1.11 The TD timer operates after a 2-second interval operating the TD relay. This releases the TN relay removing the audible ringing tone from the line. The assistance operator may now talk to the calling customer.

## 2. DISCONNECT

2.01 When the calling customer hangs up, the associated intraoffice or incoming trunk removes ground from the S lead causing the following sequence of operations:

- (a) Relay SL releases.
- (b) Relay LK releases.
- (c) Start signal to announcement machine is turned off if still on.
- (d) Relay CT1 releases.

2.02 If the call had progressed to connect to the assistance operator, the following sequence of operations will also occur:

- (a) Relay TR releases.
- (b) Relay TD releases if operated.

- (c) Relay STO releases.
- (d) The OA inductor is disconnected from its bridging connection across the tip and ring leads causing the channel to the assistance operator to be released.
- (e) Relays S1 and S1A release.
- (f) The circuit is now in its idle state.

### 3. ANNOUNCEMENT MACHINE BYPASS

3.01 The voice alarm and control circuit (or option H) will ground the AL lead in the event of an announcement machine failure or to intentionally bypass the announcement machine either temporarily or permanently. This will cause the following sequence of operations when this circuit is seized:

- (a) Relay SL operates.
- (b) Relay P operates.
- (c) Tube RT fires.
- (d) Relay LK operates.
- (e) Tube RT extinguishes.
- (f) Relay Ctl operates.
- (g) Relay TR operates.
- (h) Relay P releases.

3.02 If the calling customer does not hang up before the second (G option) or third (F option) of the P relay, the TR relay will operate and cause the following:

- (a) Transfers the incoming tip and ring leads from the announcement machine to the manual class-of-service line switch appearance.
- (b) Opens the start loop to stop the announcement machine.
- (c) Locks to ground through a contact on the Ctl relay.
- (d) Releases the P and W or Z relays.
- (e) Starts the TD timer.
- (f) Partially closes the operating lead for the STO relay.
- (g) Partially closes the operating lead for the TN relay.

3.03 If the calling customer does not hang up before the end of the 4-second TD timing interval, relay TD will operate. The operation of relay TD:

- (a) Opens the operating path of the TN relay.
- (b) Opens one of two paths connecting the OA inductor across the tip and ring leads.

(c) Operates the STO relay.

3.04 The operation of STO relay:

- (a) Stops the TD timer and releases the TD relay.
- (b) Locks to ground through a contact on the TR relay.
- (c) Changes the timing of the TD timer from 4 seconds to 2 seconds.
- (d) Connects the OA inductor across the tip and ring leads as an off-hook signal on the manual class-of-service line circuit.

3.05 The off-hook signal causes the manual line circuit to be connected through the switching network to an outgoing trunk terminating at an assistance operator position. The outgoing trunk places a resistance ground (19 ohms) on the S lead. This resistance ground places a reverse bias on the input of the Q1 transistor preventing its operation and keeping the S1A relay in its idle state. The resistance ground does, however, operate the S1 relay. The operation of the S1 relay:

- (a) Closes a second path to keep the OA inductor across the tip and ring leads after the TD relay operates at a later time.
- (b) Connects the negative biasing resistor to the base of the Q1 transistor to prepare it for later operation.

3.06 When the operator answers, the outgoing trunk changes a resistance ground on the S lead to a direct ground. This direct ground places a forward bias on the input of the Q1 transistor, turning it on and operating the S1A relay. Resistor E is a current limiting resistor, and resistor F and G are used as a voltage dividing biasing network. The B capacitor and D1 diode provide surge protection for the Q1 transistor. The operation of the S1A relay:

(a) Starts the TD timer.

(b) Operates the TN timer.

3.07 The operation of the TN relay connects audible ringing tone to the line to identify the nature of this call to the assistance operator.

3.08 The TD timer operates after a 2-second interval operating the TD relay. This releases the TN relay removing the audible ringing tone from the line. The assistance operator may now talk to the calling customer.

#### 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 in the same manner as for a regular service call.

#### 5. MISCELLANEOUS

5.01 A 185A network is connected across the CT relay winding to protect its operating contact.

5.02 Capacitors T and R are provided to isolate the input circuit from the output circuit.

5.03 Capacitors T1, R1, and A are provided to isolate the AC tones and DC signals.

5.04 Resistors T and R are provided to match the trunk impedance with the announcement machine impedance.

5.05 The LK resistor provides a resistance battery holding circuit for the LK relay.

5.06 The TD capacitor and C and D resistors are the timing elements of the TD time delay circuit.

#### SECTION III - REFERENCE DATA

##### 1. WORKING LIMITS

1.01 No problem; this circuit connects to local circuits only.

##### 2. FUNCTIONAL DESIGNATIONS

###### 2.01 Relays

<u>Designation</u>	<u>Meaning</u>
CT	Cut Through
CTL	Auxiliary Cut Through

##### Designation

##### Meaning

LK	Link
MB	Make Busy
P	Pulsing
SL	Sleeve (Line)
SLA	Auxiliary Sleeve (Line)
SL	Sleeve (Trunk)
STO	Start Operator
TD	Time Delay
TN	Tone
TR	Transfer
W	Walking
Z	

##### 3. FUNCTIONS

3.01 Provides a means for indicating to the marker that this circuit is idle or busy.

3.02 Connects a customer's line to an announcement machine to receive one or two recorder announcements, with cut-through coordinated with the start of an announcement cycle.

3.03 Provides a means to transfer the customer to an assistance operator if the customer does not hang up after one or two announcement cycles.

3.04 Provides a 4-second delay prior to transferring to the assistance operator to encourage the customer to hang up.

3.05 Provides for automatic transfer to the assistance operator if the announcement machine is not functioning.

3.06 Provides a means for making this circuit busy by local or remote control.

##### 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) Line, Line Switch, and Connector Circuit - SD-26382-01.

(c) Announcement Circuit - SD-26435-01.

- (d) Voice Alarm and Control Circuit - SD-26390-01.
- (e) Traffic Usage Recorder Circuit - SD-96494-01.
- (f) Test Circuit - SD-26411-01.
- (g) PRTD Circuit - SD-26414-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall be capable of performing all of the functions listed in this Circuit Description and meeting the requirements listed in the Circuit Requirement 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 MB 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.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-LCB

WE DEPT 355-AJE-KLF-MH