

17

CROSSBAR SYSTEMS  
NO. 3  
2-WAY PLUG-ENDED TRUNK  
CIRCUIT  
FOR EXCHANGE USE, MF PULSING  
E AND M LEAD SUPERVISION

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SECTION I - GENERAL DESCRIPTION1. PURPOSE OF CIRCUIT

1.01 This trunk circuit is used to provide 2-way traffic between offices. It utilizes either dial pulsing or multifrequency pulsing in either direction and E and M lead supervision.

2. GENERAL DESCRIPTION OF OPERATIONINCOMING CALL - SEIZURE

2.01 The off-hook seizure supervision from the trunk in the distant office causes the E relay to operate which causes a start signal to be sent to the incoming register link. If a register is available, the link switch operates to attach a register to the trunk. With the link closed various control and pulsing leads are cut through to the register.

2.02 At the same time the trunk made the link start, it also sent off-hook stop-dial supervision to the originating office. The signal is sent via the E and M signaling circuit and forms the first part of the wink signal which tells the outgoing sender to start outpulsing. The attached incoming register causes the trunk to change the off-hook supervision to on-hook supervision which completes the wink signal and causes the outgoing sender to MF outpulse the digits registered in it. The MF pulses are sent to the trunk over the tip and ring circuit and are cut-through to the register.

MARKER OPERATION - INCOMING CALLS

2.03 When pulsing is completed, the incoming register operates relay CT in the trunk and summons a marker. The marker operates relay LF over lead F via the register link. Relay LF causes the trunk link frame to function and provides marker access to the trunk via the trunk link frame. Leads R2, R3, RC, and TPR are connected to the marker and are used in setting up the ringing connection. After performing tests on the called line and on ringing the connection, the marker releases relay LF and ringing is begun on the called line.

ANSWER AND DISCONNECT - INCOMING CALLS

2.04 When the called customer answers, ringing is tripped and a talking path established. A signal that the call has been answered is returned to the originating end. When both parties disconnect at the end of conversation the trunk returns to normal. However, should the called customer fail to disconnect after the calling customer has done so, a time-out feature will function to release the connection and restore the circuit to normal in a minimum of 13 seconds. Reselection of the trunk during the timing interval is possible. When this happens the timing is stopped and the previous called customers line is released.

2.05 The timing circuit also functions when the called customer disconnects before the calling customer. At the end of the timing interval, the resulting time-out will cause the release of the called customers line and the trunk will await the calling customers disconnect or timed release before returning to normal.

OUTGOING CALLS - SEIZURE

2.06 When the marker determines that an outgoing trunk is required, it selects an idle trunk link frame, an idle trunk on that frame associated with the desired route, and a sender. The marker completes certain tests then connects the trunk to the calling customer.

2.07 After the marker disconnects, the sender MF outpulses the dialed digits and if required for ANI purposes it will outpulse the calling number. The attached sender causes the trunk to split the tip and ring from the calling customers line but the MF pulses are connected through the trunk to the tip and ring to the distant office. The sender disconnects when outpulsing is complete.

ANSWER AND DISCONNECT - OUTGOING CALLS

2.08 When the called customer answers, off-hook supervision is returned to the trunk which remains in a state prepared for disconnect. The calling customer disconnecting first causes the trunk to release

the channel through the No. 3 office, to send off-hook supervision to the distant office, and then to return to normal after a timed interval. The called customer disconnecting followed by the local customer will result in the trunk returning to idle in the same fashion. If the local customer does not disconnect, the trunk time-out feature will function to release the local customers line and restore the trunk to normal.

ABANDONED CALL

2.09 The trunk is arranged to release if the local customer abandons the call at any time after the marker disconnects. If the sender is attached the trunk delays the start of the coverup timing prior to release until the sender releases.

OVERFLOW

2.10 If during an outgoing call the sender is not able to complete its functions, it sets the trunk in the overflow state and releases. The trunk causes overflow tone to be returned to the calling customer and awaits the customers disconnect before returning to normal.

SIMULTANEOUS SEIZURE

2.11 A simultaneous seizure occurs when the distant office sends an off-hook seizure to this trunk at the same time it has been seized by the marker for an outgoing call. The trunk causes the local outgoing sender to time-out and send overflow tone to the local calling customer causing the customer to hang up. The trunk, which has sustained stop pulsing off-hook supervision to the distant office sender, now sends a start signal to the incoming register link and when a register is attached, the wink start pulsing signal is sent allowing the distant sender to output its stored digits.

MAKE-BUSY AND TEST CALLS

2.12 A jack for each trunk is provided at the test frame for making the trunk busy. If the trunk is in use when the make-busy plug is inserted, the call is not affected; however, at the end of the call the trunk will be made busy immediately. Two jacks per trunk permit simple tests to be made. One is bridged across the tip and ring circuit; the other is cut into the E and M signaling leads. For more detailed testing the circuit is able to accept test calls initiated through the marker.

SECTION II - DETAILED DESCRIPTION

1. INTEROFFICE SIGNALING

1.01 This circuit uses E and M signaling to send and receive the supervisory signals necessary between offices. Relay E is operated over lead E by off-hook supervision from the distant office and released by on-hook supervision. Low-resistance battery is connected to lead M to signal off-hook supervision to the distant office and ground is connected to the M lead to send on-hook.

2. INCOMING CALLS

INCOMING LOCALLY COMPLETED CALLS - SC1

A. Trunk Seizure

2.01 Relay E is operated by off-hook seizure supervision from the originating office. Relay E operated:

- (a) Partially closes resistance battery to the ST lead to the incoming register link.
- (b) Changes the polarity on the tip and ring leads which will later be cut-through to the incoming register to off-hook supervision.
- (c) Partially closes a path from ground to the coil of the SA relay.
- (d) Removes ground from the FT lead to the trunk switch circuit so that the trunk appears busy.
- (e) Opens the TF lead and the TT and TG loop leads from the trunk switch circuit to prevent the marker from seizing the trunk for an outgoing call.
- (f) Disables the TMB timer.
- (g) Operates the E1 and IN relays.

2.02 The operation of relay E1.

- (a) Transfers an operating path of the RL thermal relay.
- (b) Opens a TMA timer control path.
- (c) Partially closes the B lead.

2.03 The operation of relay IN:

- (a) Partially closes resistance battery on the ST lead.
- (b) Operates the SA relay.
- (c) Partially closes the RC relay lock path.
- (d) Transfers a TMA timer control path.
- (e) Operates the BSY relay.
- (f) Changes the TMB timing from 750 to 920 milliseconds to 460 to 545 milliseconds.
- (g) Opens an S lead holding path.
- (h) Partially closes the C2 and C3 leads.

2.04 The operation of relay SA:

- (a) Transfers resistance battery to the M lead as the off-hook stop dial wink signal to the distant sender.
- (b) Transfers an operating path of the GL relay.
- (c) Transfers an operating path of the RL thermal relay.
- (d) Provides a control ground for the TMB timer.
- (e) Transfers a TMA timer control ground and partially closes a locking path of the MRP relay.

2.05 The operation of relay BSY:

- (a) Opens the FT and TF leads.
- (b) Opens the TT and TG lead loop.
- (c) Connects the G relay to the TMB timer.
- (d) Provides its own locking ground.
- (e) Completes the path from resistance battery to the ST lead to the incoming register link as a request that a register be attached to the trunk.

B. Incoming Register Attached

2.06 The attached incoming register operates the CO relay in the trunk. The operated CO relay splits the tip and ring circuit through the trunk and transfers the end which comes from the distant office into the incoming register. When the register is ready to receive digits, it applies off-hook supervision to the tip and ring which causes the RSS relay to operate. The RSS operated opens the path to the SA relay which releases changing the supervision on the E and M signaling circuit from off-hook to on-hook. This change in supervision completes the wink start-dial signal to the distant sender causing it to MF outpulse the digits registered in it. The MF pulses are received by the incoming register over the tip and ring circuit.

C. Abandoned Call During Pulsing

2.07 Should the calling customer abandon the call while the distant sender is outpulsing, the resulting on-hook supervision received by the trunk causes the E relay to release. The E relay released releases relay E1 and also causes the incoming register to release by changing the supervision on the tip and ring to that circuit to on-hook. Also the TMB time delay control circuit is enabled and after the cover up interval it times out and operates the G relay. The G operated releases the IN relay. The register releases releasing the CO relay. With G operated and CO released, BSY releases and the trunk returns to normal when G releases.

D. Pulsing Completed

2.08 When pulsing is completed, the register grounds the CT lead operating relay CT. The operation of relay CT:

- (a) Locks relay CO operated.
- (b) Transfers the SA relay operating path.

- (c) Removes a control ground from the TMA timer.
- (d) Removes shunts from the T and R capacitors.
- (e) Transfers the T and R leads from the incoming register back to this circuit.
- (f) Closes a locking path for the DS relay.

The CT relay locks operated to its 6 make-contact under control of the 5 make-contact of the IN relay. The register checks for the appearance of the CT relay locking ground on lead CT. Absence of the ground indicates an abandon call to the register.

E. Marker Operation

2.09 At the time that the incoming register operated the CT relay in the trunk, it bid for a marker. The marker operates the LF relay in the trunk via the register link circuit. Battery appearing on lead F operates the LF relay. The operation of relay LF:

- (a) Transfers the S lead from this circuit to the SL lead.
- (b) Opens the PU relay operate path.
- (c) Grounds the JC lead and the SW lead.
- (d) Transfers the T and R leads from this circuit to the T1 and R1 leads, respectively.
- (e) Connects the R2 relay to the R2 relay.
- (f) Connects the R3 relay to the R3 lead.
- (g) Connects the TPR relay to the TPR lead.
- (h) Connects the RC relay to the RC lead.

- (i) Opens the RC relay lock path and partially grounds the RA lead.
  - (j) Operates the DS relay.
- 2.10 The operation of relay DS:
- (a) Locks under control of the CT relay.
  - (b) Grounds the TT1 lead.
  - (c) Partially closes a ground path on the S lead.
- 2.11 The marker sets up the connection from this trunk to the called line and operates the RC relay and also operates the R2, R3, and TPR relays if they are required.
- 2.12 The operation of relay R2 and/or R3:
- (a) Close their own lock path.
  - (b) Set up the required ringing code.
  - (c) Delay the operation of the PU relay until the PU lead is grounded if required.
- 2.13 The operation of relay TPR:
- (a) Reverses the ringing and ground applied to the R and T leads.
  - (b) Closes its own lock path.
- 2.14 The operation of relay RC:
- (a) Transfers a CH relay ground from the RL thermal relay to itself.
  - (b) Transfers the T and R leads to the ringing circuit.
  - (c) Provides a locking ground for the R2, R3, and TPR relays.
  - (d) Grounds the RA lead.
  - (e) Closes a ground for later use by the S lead.
  - (f) Partially closes an operating ground path and a locking path for the PU relay.
- F. Ringing the Called Customer
- 2.15 When the marker is completed it releases the LF relay.
- 2.16 The release of relay LF operates the PU relay directly or after the PU lead is grounded as required.
- 2.17 The operation of relay PU:
- (a) Applies ringing to the line.
  - (b) Closes the C1 ringing lead.
  - (c) Transfers to its locking circuit in place of its operating circuit.
- G. Answer
- 2.18 When the call is answered, the RT relay will operate over the line loop.
- 2.19 The operation of relay RT releases the RC relay.
- 2.20 The release of relay RC releases the RT and PU relays and also R2, R3, and TPR relays if they are operated. It also connects the calling customer to the called customer.
- 2.21 When the tip and ring leads are cut through, the S relay coils are bridged across them thus supplying transmitter battery and ground to the called line and causing relay S to operate.

2.22 The operation of relay S:

- (a) Operates the SA relay.
- (b) Partially closes a lock path for the S1 relay.

2.23 The operation of relay SA:

- (a) See 2.03.
- (b) Activates the TMA timer which operates the CH relay.

2.24 The operation of relay CH:

- (a) Transfers a ground from the MRP relay locking path to the RL thermal relay locking path.
- (b) Opens the TF lead.
- (c) Opens the S lead grounding path.
- (d) Replaces direct ground with message register potential on the S lead when the MRP relay is also operated.
- (e) Grounds the A lead.

2.25 The trunk is now in the talking state.

### 3. LINE-BUSY OR FAILURE TO MATCH - SC2

3.01 If the called line is busy, the marker sets up the channel from this trunk to 50-IPM line-busy tone or 120-IPM overflow tone if a channel is not available to complete the call.

3.02 When the marker is completed, it releases the LF relay which connects the tone to the calling line.

3.03 When the calling customer hangs up, the E and E1 relays release.

3.04 The release of E relay activates the TMB timer which operates the G relay.

3.05 The operation of relay G:

- (a) Opens the ST lead.
- (b) Opens a BSY relay operating and lock path.
- (c) Releases the IN relay.

3.06 The release of relay IN releases the CT relay.

3.07 The release of relay CT releases the C0 relay and the tone channel and also the DS relay.

3.08 The release of relay C0 releases the BSY relay.

3.09 The release of relay BSY releases the G relay restoring the trunk to its idle state.

### 4. INCOMING CALL - CALLING CUSTOMER DISCONNECTS FIRST - SC3

4.01 When the calling customer disconnects first, relay E releases.

4.02 The release of relay E:

- (a) Releases the E1 relay.
- (b) Activates the TMB timer which operates the G relay.

4.03 The operation of relay G:

- (a) Opens the ST lead.
- (b) Opens a BSY relay operating and lock path.
- (c) Releases the IN relay.

- 4.04 The release of relay IN releases the CT relay.
- 4.05 The release of relay CT:
- (a) Releases the CO relay.
  - (b) Releases the DS relay.
  - (c) Releases the S relay.
- 4.06 The release of relay DS releases the channel and drops the called line to line lockout.
- 4.07 The release of relay S releases the SA relay.
- 4.08 The release of relay SA:
- (a) Grounds the M lead as an on-hook supervision signal to the originating office.
  - (b) Releases the CH relay.
- 4.09 The release of relay CO releases the BSY relay.
- 4.10 The release of relay BSY releases the G relay restoring the trunk to its idle state.
- 4.11 The called line will return to its idle state when the called customer hangs up.
5. INCOMING CALLS - CALLED CUSTOMER DISCONNECTS FIRST - SC4
- 5.01 When the called customer disconnects, relays S and SA release.
- 5.02 The release of the SA relay:
- (a) Grounds the M lead as an on-hook supervision signal to the originating office.
  - (b) Starts the RL thermal relay timing.
- 5.03 If the calling customer hangs up before the RL thermal relay operates, the E relay releases.
- 5.04 The release of relay E:
- (a) Activates the TMB timer which operates the G relay.
  - (b) Releases relay E1 which deactivates the RL thermal relay timing.
- 5.05 The operation of relay G:
- (a) Opens the ST lead.
  - (b) Opens the BSY relay operating and lock path.
  - (c) Releases the IN relay.
- 5.06 The release of the IN relay releases the CT relay.
- 5.07 The release of relay CT:
- (a) Releases the CO relay.
  - (b) Releases the CH relay.
  - (c) Releases the DS relay.
- 5.08 The release of relay DS, releases the channel connecting the trunk to the line.
- 5.09 The release of relay CO releases the BSY relay.
- 5.10 The release of relay BSY releases the G relay restoring the trunk to its idle state.
- 5.11 If the RL thermal relay operates before the calling customer hangs up, it will operate the RC relay.
- 5.12 The operation of relay RC:
- (a) See 2.14.
  - (b) Releases the RL thermal relay.
  - (c) Releases the channel connecting the trunk to the called line.

5.13 When the calling customer hangs up or is timed released, the E relay releases.

5.14 The release of relay E:

- (a) Releases the E1 relay.
- (b) Activates the TMB timer which operates the G relay.

5.15 The operation of relay G:

- (a) Opens the ST lead.
- (b) Opens the BSY relay operating and lock path.
- (c) Releases the IN relay.

5.16 The release of relay IN:

- (a) Releases relay RC.
- (b) Releases relay CT.

5.17 The release of relay CT:

- (a) Releases the CO relay.
- (b) Releases the CH relay.
- (c) Releases the DS relay.

5.18 The release of relay CO releases the BSY relay.

5.19 The release of relay BSY releases the G relay restoring the trunk to its idle state.

6. OUTGOING CALL - SC5

6.01 When the marker selects this trunk for an outgoing call, it operates the F relay.

6.02 The operation of relay F:

- (a) Connects resistance battery to the M lead of the signaling circuit as off-hook seizure supervision to the distant office.

(b) Opens the CH relay operating path.

(c) Operates the SG relay.

(d) Grounds the VG lead.

(e) Operates the S1 relay.

(f) Opens the F lead and operates the LF relay.

(g) Locks itself to the TF lead.

(h) Operates the MRP relay.

(i) Connects the SS lead to the SSB lead.

(j) Partially grounds the TMB time control lead.

(k) Operates the TPC relay if the calling customer is the tip party on a 2-party line.

(l) Opens the DS relay operating path.

6.03 The operation of relay LF:

(a) Transfers the S lead from this circuit to the SL lead.

(b) Opens the PU relay operate path.

(c) Grounds the JC lead and the SW lead.

(d) Transfers the T and R leads from this circuit to the T1 and R1 leads, respectively.

(e) Connects the R2 relay to the R2 lead.

(f) Connects the R3 relay to the R3 lead.

(g) Connects the TPR relay to the TPR lead.

(h) Connects the RC relay to the RC lead.

(i) Opens the RC relay lock path and partially grounds the RA lead.

6.04 The operation of relay S1:

- (a) Provides a ground for later use on the S lead.
- (b) Bypasses the CT relay contacts on the R lead.
- (c) Closes its own lock path.
- (d) Transfers a TMA timer control path.
- (e) Partially connects ground to the B lead.

6.05 The operation of relay MRP:

- (a) Partially closes the MRS-RP lead.
- (b) Replaces direct ground with message register potential on the S lead when the CH relay is also operated.
- (c) Opens the F relay operating path.
- (d) Partially closes its own locking path.

6.06 The operation of relay TPC:

- (a) Replaces MRS-RP with MRS-TP message register potential.
- (b) Partially closes its own locking path.

6.07 The operation of relay SG:

- (a) Provides locking ground for the TPC relay.
- (b) Transfers a TMB timer control path.
- (c) Opens the IN relay operate path.
- (d) Operates the BSY relay which provides a locking path for the BSY relay and the SG relay.

6.08 The operation of relay BSY:

- (a) See 2.05.

6.09 The marker associates an outgoing sender with this trunk via the outgoing sender link circuit.

6.10 The outgoing sender applies ground over lead D to operate the D relay.

6.11 The operation of relay D:

- (a) Transfers the T and R leads from this circuit to the outgoing sender.
- (b) Grounds the AB lead.
- (c) Transfers the S lead from the AB lead to the SL lead when LF relay is not operated.
- (d) Connects resistance battery to the M lead of the signaling circuit as off-hook seizure supervision to the distant office.
- (e) Grounds the TMB timer control lead.
- (f) Opens the E1 relay operating path.
- (g) Partially closes the GL relay operating path.

6.12 Before the marker releases, it causes the sender to close a loop between the T and R leads from the trunk. The closure operates relay RSS. When the D relay first operated, the E relay was released as a result of on-hook supervision received from the distant office. As soon as a register is attached to the trunk at the distant office, the supervision is changed to off-hook operating the E relay. The E relay operated transfers the supervision to the sender, to off-hook as the first part of the wink start-dial signal. The distant register changes the supervision to on-hook to complete the wink start-dial signal and the E relay releasing repeats that signal to the sender.

6.13 After relay RSS operates and the marker has set up the channel between this trunk and the calling line, it releases relay F and then releases itself.

- 6.14 The release of relay F releases the LF relay.
- 6.15 The release of relay LF operates the S relay over the line loop.
- 6.16 The operation of relay S:
- (a) Closes a locking path for the S1 relay which is a slow-release.
  - (b) Operates the SA relay.
- 6.17 The operation of relay SA:
- (a) See 2.04.
- 6.18 If the outgoing sender is unable to pulse the digits, it will perform its reorder function which removes ground from the S lead, releasing the channel between this trunk and the calling line. When the sender releases it releases the RSS relay.
- 6.19 The release of the channel:
- (a) Drops the calling line to line lockout.
  - (b) Releases the S relay.
- 6.20 The release of relay S releases the SA and S1 relays.
- 6.21 The release of relay SA releases relay MRP.
- 6.22 The release of relay S1 removes ground from the AB lead, which causes the outgoing sender to release the D relay.
- 6.23 The release of relay D:
- (a) Sends an on-hook signal to the distant office over the M lead.
  - (b) Activates the TMB timer operating the G relay.
- 6.24 The operation of relay G:
- (a) Opens the ST leads.
  - (b) Releases the SG and BSY relays.
- 6.25 The release of relay SG:
- (a) Transfers a TMB timer control lead.
  - (b) Releases the TPC relay if it had operated.
- 6.26 The release of relay BSY releases the G relay, restoring the trunk to its idle state.
- 6.27 The calling line will return to its idle state when the calling customer hangs up.
- 6.28 If the outgoing sender is able to pulse the digits, it will do so using either dial pulsing or multifrequency pulsing as required.
- 6.29 Upon completion of outpulsing the outgoing sender will release the D relay and then release itself.
- 6.30 The release of relay D will connect the trunk to the line.
- 6.31 When the outgoing sender releases it opens the loop between the T and R leads which releases the RSS relay.
- 6.32 The terminating office will connect this trunk to line-busy tone if the called line is busy, to overflow tone if a channel is not available, or to the called line if it is idle and a channel is available. In the latter case, the terminating office will ring the called line.
- 6.33 If the calling customer hangs up due to line-busy, overflow or no answer, the S relay will release.
- 6.34 The release of relay S releases the SA and the S1 relay.
- 6.35 The release of relay S1:
- (a) Removes ground from the AB lead to the sender indicating to it that the call is abandoned and causing it to start releasing.

- (b) Removes ground from the S lead which releases the channel between this trunk and the calling line.
- 6.36 The release of relay SA:
  - (a) Releases the MRP relay.
  - (b) Grounds the M lead as an on-hook supervision signal to the distant office.
  - (c) Activates the TMB timer operating the G relay.
- 6.37 The operation of relay G:
  - (a) Opens the ST lead.
  - (b) Releases the SG and BSY relays.
- 6.38 The release of relay SG releases the TPC relay if it is operated.
- 6.39 The release of relay BSY releases the G relay, restoring the trunk to its idle state.
- 6.40 When the called customer answers, the E relay operates from the answer supervision returned by the distant office.
- 6.41 The operation of E relay operates relay E1.
- 6.42 The operation of relay E1:
  - (a) Transfers an operating path of the RL thermal relay.
  - (b) Activates the TMA timer operating the CH relay.
  - (c) Partially closes the B lead.
- 6.43 The operation of relay CH:
  - (a) See 2.24.
- 6.44 The trunk is now in the talking state.

7. OUTGOING CALL - CALLING CUSTOMER DIS-CONNECTS FIRST - SC6

- 7.01 If the calling customer hangs up due to line-busy, overflow, or no answer the S relay will release.
- 7.02 The release of relay S releases the SA and the S1 relays.
- 7.03 The release of relay S1:
  - (a) Deactivates the TMA timer and releases relay CH.
  - (b) Releases the channel to the called customer.
- 7.04 The release of relay SA:
  - (a) Grounds the M lead as an on-hook supervision signal to the distant office which returns on-hook supervision on the E lead and releases relay E and relay E1.
  - (b) Activates the TMB timer operating the G relay.
- 7.05 The operation of relay G:
  - (a) Opens the ST lead.
  - (b) Releases the SG and BSY relays.
- 7.06 The release of relay SG releases the TPC relay if it is operated.
- 7.07 The release of relay BSY releases the G relay, restoring the trunk to its idle state.

8. OUTGOING CALL - CALLED CUSTOMER DIS-CONNECTS FIRST - SC7

- 8.01 When the called customer disconnects, relay E releases.
- 8.02 Release of relay E releases relay E1.

- 8.03 The release of the EI relay starts the RL thermal relay timing.
- 8.04 If the RL thermal relay operates before the calling customer hangs up, it will operate the RC relay.
- 8.05 The operation of relay RC:
- (a) Releases the RL thermal relay.
  - (b) Releases the channel connecting the trunk to the calling line.
- 8.06 The release of the channel:
- (a) Drops the calling line to line lockout.
  - (b) Releases the S relay.
- 8.07 The releases of relay S releases the SA and S1 relays.
- 8.08 The release of realy SA:
- (a) Releases relay RC.
  - (b) Grounds the M lead as an on-hook supervision signal to the distant office.
  - (c) Activates the TMB timer which operates the G relay.
- 8.09 The release of relay S1 deactivates the TMA timer and releases the CH relay.
- 8.10 The operation of relay G:
- (a) Open the ST.
  - (b) Releases the SG and BSY relays.
- 8.11 The release of relay SG releases the TPC relay if ti is operated.
- 8.12 The release of relay BSY releases the G relay, restoring the trunk to its idle state.
- 8.13 If the calling customer disconnects before the RL thermal relay operates, the S relay will release.
- 8.14 The release of relay S releases the SA and S1 relays.
- 8.15 The release of relay SA:
- (a) Deactivates the RL thermal relay timing.
  - (b) Grounds the M lead as an on-hook supervision signal to the distant office.
  - (c) Activates the TMB timer and operates the G relay.
- 8.16 The release of relay S1 deactivates the TMA timer and releases the CH relay.
- 8.17 The operation of relay G:
- (a) See 8.10.
- 8.18 The release of relay SG releases the TPC relay if it is operated.
- 8.19 The release of relay BSY releases the G relay, restoring the trunk to its idle state.
- 8.20 The calling line will return to its idle state when the calling customer hangs up.

#### 9. SIMULTANEOUS SEIZURE - SC8

- 9.01 A simultaneous seizure occurs if during the period the marker and sender have control of the trunk, the distant office attempts to seize the trunk by sending continuous off-hook supervision. The signal operates the E relay.
- 9.02 The operation of relay E:
- (a) Partially closes resistance battery to the ST lead to the incoming register circuit.

(b) Changes polarity on the T and R leads to the sender circuit for off-hook supervision.

9.03 The sender circuit interprets the continuous off-hook signal as a stop-dial signal and does not outpulse. When the local sender times-out, but before the sender releases, it releases the channel and drops the local customer to line lock-out.

9.04 When the channel releases and the local customer disconnects, the S relay releases.

9.05 The release of relay S:

- (a) Releases the SA relay.
- (b) Releases the S1 relay.

9.06 The release of relay SA:

- (a) Releases the MRP relay.
- (b) Operates the GL relay.

9.07 The operation of relay GL:

- (a) Changes the TMB time delay circuit so that it will operate immediately upon release of the D relay.
- (b) Locks under control of the CO relay.
- (c) Maintains off-hook supervision to the distant office over the M lead.

9.08 The release of the sender:

- (a) Releases the RSS relay.
- (b) Releases the D relay.

9.09 The release of the D relay:

- (a) Operates the E1 relay.
- (b) Activates the TMB timer operating the G relay immediately.

9.10 The operation of relay G:

- (a) Releases the BSY relay.
- (b) Releases the SG relay.

9.11 The release of relay SG:

- (a) Operates the IN relay.
- (b) Releases the TPC relay if it is operated.

9.12 The release of the BSY relay releases the G relay.

9.13 The release of the G relay closes the operate path of the BSY relay.

9.14 The operation of relay IN:

- (a) See 2.03.

9.15 Resistance battery is now applied to the ST lead requesting an incoming register be attached.

9.16 When the incoming register is attached the CO relay operates, CO relay operated releases the GL relay and the incoming call proceed in the normal manner as covered in 2., starting with operation 2.06.

## 10. TESTING

10.01 Testing of the outgoing features 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.

10.02 Testing of the incoming features of this trunk is performed by accessing the T and R leads through jack T1. This enables the test employee to control the supervisory circuits of this trunk and to dial pulse, multifrequency pulse, and talk into it.

#### 11. MISCELLANEOUS

11.01 The T and R capacitors are provided to isolate the input and output circuits.

11.02 The M diode to ground is used to suppress voltage transients during contact break.

11.03 The MB and A diodes are used as unidirectional current control devices.

11.04 The L resistor is used to limit the current on the ST lead.

11.05 The M resistance lamp is used to provide resistance battery for off-hook supervision.

11.06 The S network is provided to protect the diodes in the line circuits.

11.07 The C and D capacitors and the S, T, and T1 resistors are the timing elements of the TMA and TMB timer circuits.

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>
BSY	Busy
CH	Charge Call
CO	Cut Off
CT	Cut Through
D	Sender Connected
DS	Delayed Start
E	Traditional - E and M Signaling
E1	Traditional
F	Frame - Trunk Seized by Marker
G	Trunk Release
GL	Glare - Simultaneous Seizure
IN	Incoming Call
LF	Auxiliary Frame
MRP	Message Rate
PU	Pickup
R2	Auxiliary Ringing
R3	Auxiliary Ringing
RC	Ringing Control

Designation      Meaning      (Cont)

RL	Release
RSS	Register Sender Supervision
RT	Ringing Trip
S	Supervisory
SL	Sleeve
SA	Auxiliary Supervisory
SG	Outgoing Call
TPC	Tip Party Charge
TPR	Tip Party Relay

3. FUNCTIONS

3.01 See SECTIONS I and II for Functions of this circuit.

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) Incoming Register Link Circuit - SD-26394-01.
- (c) Outgoing Sender Link Circuit - SD-26395-01.
- (d) Test Circuit - SD-26411-01.
- (e) PRTD Circuit - SD-26414-01.
- (f) Time Delay Control Circuit - SD-94820-01.
- (g) Traffic Usage Recorder Circuit - SD-96494-01.

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 BSY 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 normal service.

6.04 Test jacks T1 and T2 provide access to this circuit for test purposes. Insertion of a plug in the jacks disconnects the trunk circuit from the cable pair.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

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