

CROSSBAR SYSTEMS
NO. 3
2-WAY PLUG-ENDED TRUNK
CIRCUIT
DIAL PULSING USING BYLINK
REVERSE BATTERY SUPERVISION

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This trunk circuit is used to provide 2-way traffic between a local No. 3 crossbar office and a step-by-step office. It is arranged for dial pulsing with incoming bylink operation and reverse battery supervision.

2. GENERAL DESCRIPTION OF OPERATION

2.01 Incoming call:

- (a) This trunk circuit is seized by an off-hook signal from the originating office.
- (b) If pulsing is started before closure of the bylink path, this circuit will send overflow tone to the calling customer. The calling customer will disconnect and all circuits will restore to normal.
- (c) If pulsing is started after closure of the bylink path, an incoming register will be connected to this trunk via the incoming register link.
- (d) The originating office pulses the required digits to this office using dial pulsing.
- (e) The received digits are stored in the incoming register.
- (f) If the calling customer abandons the call and disconnects, all circuits will restore to normal.
- (g) If the call is not abandoned, the incoming register transfers the received digits to the marker, associates the marker with this trunk, and then releases the incoming register link connection between itself and this trunk.
- (h) If the called line is busy, the marker will connect this trunk to line-busy tone on level nine of the trunk switch. The calling customer will then hang up, restoring all circuits to normal.
- (i) If the marker is unable to set up a channel to the called line, it will connect this trunk to overflow tone on level nine of the trunk switch. The calling customer will then hang up, restoring all circuits to normal.

(j) If the called line is idle and a channel is available, the marker will connect this trunk to the called line and set this trunk up for the required ringing.

(k) This trunk will ring the called line.

(l) If the call is not answered, the calling customer will hang up restoring all circuits to normal.

(m) If the call is answered, ringing will be tripped and an off-hook answer signal will be sent to the originating office.

(n) The customers can now talk.

(o) If the calling customer disconnects first, an on-hook signal is sent from the originating office which restores all circuits to normal and drops the called line to line lockout. The called line will return to its idle state when the called customer hangs up.

(p) If the called customer disconnects first, an on-hook signal is sent to the originating office. All circuits will restore to normal when the calling customer hangs up, or if failing to hang up within a maximum of 32 seconds, a timed release circuit will release the channel. The trunk will then return to its idle state when the calling customer hangs up or is time released.

2.02 Outgoing call:

- (a) When this trunk circuit is seized by the marker for an outgoing call, this trunk sends an off-hook signal to the terminating office.
- (b) The marker transfers the required dialed digits to an outgoing sender, connects the outgoing sender to this trunk via the outgoing sender link, connects this trunk to the calling line, and then releases itself.
- (c) If the outgoing sender is unable to pulse the digits, it will send a re-order signal to this trunk. This will cause all circuits to restore to normal and drop the calling line to line lockout. The calling line will return to its idle state when the calling party hangs up.

(d) If the outgoing sender is able to pulse the digits, it will do so using dial pulsing.

(e) The terminating office will connect this trunk to line-busy tone if the called line is busy, to overflow tone if a path is not available, or to the called line if it is idle and a path is available. In the latter case, the terminating office will ring the called line.

(f) If the calling party hangs up due to line-busy, overflow, or no answer, all circuits will be restored to normal.

(g) If the call is answered, ringing will be tripped and an off-hook answer signal will be sent back to the originating office.

(h) The customers can now talk.

(i) If the calling customer disconnects first, an on-hook signal is sent to the terminating office and all circuits restore to normal.

(j) If the called customer disconnects first, an on-hook signal is sent from the terminating office. All circuits will restore to normal when the calling customer hangs up, or if failing to hang up within a maximum of 32 seconds, a timed release circuit will restore all circuits to normal and drop the calling line to line lockout. The calling line will return to its idle state when the calling customer hangs up.

2.03 Simultaneous seizure:

(a) If this trunk is seized simultaneously for an incoming call as well as for an outgoing call, the incoming call will proceed in the normal manner, while the outgoing call will be released, dropping the local calling customer to line lockout. The local calling line will return to its idle state when the local calling customer hangs up.

SECTION II - DETAILED DESCRIPTION

1. INCOMING SEIZURE AND CALL COMPLETION -
SCI

1.01 This circuit is seized for an incoming call by a loop closure on the T and R leads which operates the A relay.

1.02 The operation of relay A:

- (a) Grounds the R and BL leads to the IRL circuit.
- (b) Places battery on the ST lead to the IRL circuit.
- (c) Operates the A1 relay.

1.03 The operation of relay A1:

- (a) Operates the BSY relay.
- (b) Operates the B relay.
- (c) Transfers an operating path from the BY relay to the SS relay.
- (d) Opens the FT lead.

1.04 The operation of relay BSY:

- (a) Connects the G relay to the TMB time delay circuit.
- (b) Opens the loop between the TG and TT leads.
- (c) Removes a control ground from the TMB time delay circuit.
- (d) Opens the TF lead.
- (e) Provides a locking ground for the SS relay.
- (f) Opens the FT lead.
- (g) Provides its own locking ground.

1.05 The operation of relay B:

- (a) Provides an operating ground for relays BY and SS.
- (b) Connects resistance B between its own winding and ground to slow its own release (option S).
- (c) Opens the loop between the TG and TT leads.

(d) Transfers an operating path of the RL thermal relay.

(e) Opens the TF lead.

(f) Partially closes the B lead.

(g) Opens a control lead of the TMA time delay circuit.

(h) Grounds the control lead of the TMB time delay circuit.

(i) Shorts its own secondary winding to slow its release.

1.06 If pulsing is started before closure of the bylink path, the first pulse will release the A and A1 relays in tandem.

1.07 The release of relay A1 will operate the BY relay.

1.08 The operation of relay BY:

- (a) Starts the reorder tone interrupter and places reorder or overflow tone on the R lead and ground on the T lead.
- (b) Opens the ST lead to the IRL circuit.
- (c) Opens the R and BL leads to the IRL circuit.
- (d) Opens the LK lead to the IRL circuit.

1.09 The A and A1 relays in tandem will continue to follow the pulses and will remain operated upon completion of pulsing.

1.10 Upon hearing reorder or overflow tone, the calling customer will hang up, which will release the A and A1 relays in tandem.

1.11 The release of relay A1 will release the slow-release B relay.

1.12 The release of relay B:

- (a) Releases the BY relay.
- (b) Activates the TMB time delay circuit which operates the G relay.

1.13 The operation of relay G:

- (a) Opens the CT relay locking circuit.
- (b) Opens the SS relay locking circuit.

- (c) Releases the BSY relay.
- (d) Opens the SG relay locking circuit.
- 1.14 The release of relay BSY, releases the G relay returning the trunk to its idle state.
- 1.15 If the bylink path is closed before pulsing is started, the R relay will operate over leads RL and LK.
- 1.16 The operation of relay R:
 - (a) Locks its secondary winding to the T lead.
 - (b) Transfers a control path of the TMA time delay circuit.
 - (c) Opens the BY relay operating path.
 - (d) Transfers the ST lead from battery to the LK lead.
 - (e) Connects the T1 jack sleeve to the CT lead.
 - (f) Provides a holding ground for the BSY relay.
- 1.17 The A and A1 relays in tandem will follow the pulses, which are repeated by the A relay and are stored in the incoming register. The A and A1 relays remain operated upon completion of pulsing.
- 1.18 If the calling customer abandons the call and hangs up at this point, the A and A1 relays will release in tandem.
- 1.19 The release of relay A1:
 - (a) Releases the slow-release B relay.
 - (b) Causes the incoming register to release which releases the R relay.
- 1.20 The release of relay B activates the TMB time delay circuit which operates the G relay.
- 1.21 The release of relay R and operation of relay G cause the release of relay BSY.
- 1.22 The release of relay BSY, releases the G relay returning the trunk to its idle state.
- 1.23 If the calling customer does not abandon the call upon completion of pulsing, the incoming register will transfer the received digits to the marker, associate the marker with this trunk, and ground the CT lead, which operates the CT relay.
- 1.24 The operation of relay CT:
 - (a) Partially removes shunts from the T1 and R1 capacitors.
 - (b) Closes the C2 lead.
 - (c) Connects resistance battery to the T lead.
 - (d) Provides a locking ground for the RC relay.
 - (e) Transfers a control lead of the TMA time delay circuit.
 - (f) Connects the input T and R leads to the output T and R leads.
 - (g) Provides its own lock path.
- 1.25 The marker seizes this trunk by grounding the F lead operating the LF relay.
- 1.26 The operation of relay LF:
 - (a) Opens the PU relay operating path.
 - (b) Opens the RC relay operate path and partially closes the ground path to lead RA.
 - (c) Opens the CH relay operating path.
 - (d) Grounds the SW lead.
 - (e) Grounds the JC lead.
 - (f) Operates the LF1 relay.
 - (g) Closes the TPC relay operating path.
 - (h) Transfers the T, R, and S leads from this circuit to the T1, R1, and SL leads in the marker.
 - (i) Closes a control path for the TMB time delay circuit.
 - (j) Operates the DS relay under control of the CT relay.
- 1.27 The operation of relay LF1:
 - (a) Closes the RC relay operating path.
 - (b) Closes the R2 relay operating path.
 - (c) Closes the R3 relay operating path.

- (d) Closes the TPR relay operating path.
- (e) Grounds the TT1 lead.
- 1.28 The marker sets up the connection from this trunk to the called line, operates the RC relay and also operates the R2, R3, and TPR relays if they are required.
- 1.29 The operation of relay R2 and/or R3:
 - (a) Close their own lock paths.
 - (b) Set up the required ringing code.
 - (c) Delay the operation of the PU relay until the PU lead is grounded if required.
- 1.30 The operation of relay TPR:
 - (a) Reverses the ringing and ground applied to the R and T leads.
 - (b) Closes its own lock path.
- 1.31 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) Partially closes the C3 lead.
 - (d) Provides a locking ground for the R2, R3, and TPR relays.
 - (e) Grounds the RA lead.
 - (f) Closes a ground for later use by the S lead.
 - (g) Partially closes the PS lead.
 - (h) Provides an operating ground (if required) and locking ground for the PU relay.
- 1.32 When the marker is completed it releases the LF and LF1 relays in tandem.
- 1.33 The release of relay LF operates the PU relay directly or after the PU lead is grounded as required.
- 1.34 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.
- 1.35 If the call is not answered, the calling customer will hang up releasing the A, A1, and B relays in tandem.
- 1.36 The release of the B relay activates the TMB timer which operates the G relay.
- 1.37 The operation of relay G:
 - (a) See 1.13.
 - (b) Releases the CT relay.
- 1.38 The release of relay CT:
 - (a) Releases the DS relay and drops the channel.
 - (b) Releases the RC relay.
 - (c) Releases the R relay.
- 1.39 The release of relay RC:
 - (a) Releases the PU relay.
 - (b) Releases the R2, R3, and TPR relays if they are operated.
- 1.40 The release of relay R releases the BSY relay.
- 1.41 The release of relay BSY releases the G relay restoring the trunk to its idle state.
- 1.42 If the call is answered, the RT relay will operate over the line loop.
- 1.43 The operation of relay RT releases the RC relay.
- 1.44 The release of relay RC:
 - (a) Releases the RT and PU relays.
 - (b) Releases the R2, R3, and TPR relays if they are operated.
 - (c) Connects the calling customer to the called customer.
- 1.45 The S relay operates over the line loop which:
 - (a) Partially closes a lock path for the S1 relay.
 - (b) Operates the SA relay.

- (c) Activates the TMA timer which operates the CH relay.

1.46 The operation of relay SA:

- (a) Sends an off-hook signal to the originating office.
- (b) Transfers an operating path of the RL thermal relay.
- (c) Partially closes the MRP relay lock path.
- (d) Provides a control ground for the TMB time delay circuit.

1.47 The operation of relay CH:

- (a) Opens the MRP relay lock path.
- (b) Grounds the A lead.
- (c) Opens the TF lead.
- (d) Opens an S lead control path.
- (e) Replaces direct ground with message register potential on the S lead when the MRP relay is also operated.
- (f) Provides an operating ground for the RL thermal relay.

1.48 The trunk is now in the talking state.

2. LINE-BUSY OR FAILURE TO MATCH - SC2

2.01 This circuit is seized for an incoming call by a loop closure on the T and R leads which operates the A relay.

2.02 The operation of relay A:

- (a) Grounds the R and BL leads to the IRL circuits.
- (b) Places battery on the ST lead to the IRL circuit.
- (c) Operates the A1 relay.

2.03 The operation of relay A1:

- (a) Operates the BSY relay.
- (b) Operates the B relay.
- (c) Transfers an operating path from the BY relay to the SS relay.
- (d) Opens the FT lead.

2.04 The operation of relay BSY:

- (a) Connects the G relay to the TMB time delay circuit.
- (b) Opens the loop between the TG and TT leads.
- (c) Removes a control ground from the TMB time delay circuit.
- (d) Opens the TF lead.
- (e) Provides a locking ground for the SS relay.
- (f) Opens the FT lead.
- (g) Provides its own locking ground.

2.05 The operation of relay B:

- (a) Provides an operating ground for relays BY and SS.
- (b) Connects resistance B between its own winding and ground to slow its own release (option S).
- (c) Opens the loop between the TG and TT leads.
- (d) Transfers an operating path of the RL thermal relay.
- (e) Opens the TF lead.
- (f) Partially closes the B lead.
- (g) Opens a control lead of the TMA time delay circuit.
- (h) Grounds the control lead of the TMB time delay circuit.
- (i) Shorts its own secondary winding to slow its release.

2.06 If pulsing is started before closure of the bylink path, the first pulse will release the A and A1 relays in tandem.

2.07 The release of relay A1 will operate the BY relay.

2.08 The operation of relay BY:

- (a) Starts the reorder tone interrupter and places reorder or overflow tone on the R lead and ground on the T lead.
- (b) Opens the ST lead to the IRL circuit.

- (c) Opens the R and BL leads to the IRL circuit.
- (d) Opens the LK lead to the IRL circuit.
- 2.09 The A and A1 relays in tandem will continue to follow the pulses and will remain operated upon completion of pulsing.
- 2.10 Upon hearing reorder or overflow tone, the calling customer will hang up, which will release the A and A1 relays in tandem.
- 2.11 The release of relay A1 will release the slow-release B relay.
- 2.12 The release of relay B:
 - (a) Releases the BY relay.
 - (b) Activates the TMB time delay circuit which operates the G relay.
- 2.13 The operation of relay G:
 - (a) Opens the CT relay locking circuit.
 - (b) Opens the SS relay locking circuit.
 - (c) Releases the BSY relay.
 - (d) Opens the SG relay locking circuit.
- 2.14 The release of relay BSY, releases the G relay returning the trunk to its idle state.
- 2.15 If the bylink path is closed before pulsing is started, the R relay will operate over leads RL and LK.
- 2.16 The operation of relay R:
 - (a) Locks its secondary winding to the T lead.
 - (b) Transfers a control path of the TMA time delay circuit.
 - (c) Opens the BY relay operating path.
 - (d) Transfers the ST lead from battery to the LK lead.
 - (e) Connects the T1 jack sleeve to the CT lead.
 - (f) Provides a holding ground for the BSY relay.
- 2.17 The A and A1 relays in tandem will follow the pulses, which are repeated by the A relay and are stored in the incoming register. The A and A1 relays remain operated upon completion of pulsing.
- 2.18 If the calling customer abandons the call and hangs up at this point, the A and A1 relays will release in tandem.
- 2.19 The release of relay A1:
 - (a) Releases the slow-release B relay.
 - (b) Causes the incoming register to release which releases the R relay.
- 2.20 The release of relay B activates the TMB time delay circuit which operates the G relay.
- 2.21 The release of relay R and operation of relay G cause the release of relay BSY.
- 2.22 The release of relay BSY, releases the G relay returning the trunk to its idle state.
- 2.23 If the calling customer does not abandon the call upon completion of pulsing, the incoming register will transfer the received digits to the marker, associate the marker with this trunk, and ground the CT lead, which operates the CT relay.
- 2.24 The operation of relay CT:
 - (a) Partially removes shunts from the T1 and R1 capacitors.
 - (b) Closes the C2 lead.
 - (c) Connects resistance battery to the T lead.
 - (d) Provides a locking ground for the RC relay.
 - (e) Transfers a control lead of the TMA time delay circuit.
 - (f) Connects the input T and R leads to the output T and R leads.
 - (g) Provides its own lock path.
- 2.25 The marker seizes this trunk by grounding the F lead operating the LF relay.
- 2.26 The operation of relay LF:
 - (a) Opens the PU relay operating path.
 - (b) Opens the RC relay operate path and partially closes the ground path to lead RA.
 - (c) Opens the CH relay operating path.
 - (d) Grounds the SW lead.

- (e) Grounds the JC lead.
- (f) Operates the LF1 relay.
- (g) Closes the TPC relay operating path.
- (h) Transfers the T, R, and S leads from this circuit to the TL, RL, and SL leads in the marker.
- (i) Closes a control path for the TMB time delay circuit.
- (j) Operates the DS relay under control of CT relay.

2.27 The operation of relay LF1:

- (a) Closes the RC relay operating path.
- (b) Closes the R2 relay operating path.
- (c) Closes the R3 relay operating path.
- (d) Closes the TPR relay operating path.
- (e) Grounds the TT1 lead.

2.28 The marker sets up the channel from this trunk to line-busy tone if the called line is busy, or to overflow tone if a channel is not available to complete the call.

2.29 When the marker is completed, it releases the LF and LF1 relays in tandem.

2.30 The release of the LF relay connects the tone to the line.

2.31 When the calling customer hangs up, the A, A1, and B relays release in tandem.

2.32 The release of the B relay activates the TMB timer which operates the G relay.

2.33 The operation of relay G:

- (a) See 1.13.
- (b) Releases the CT relay.

2.34 The release of relay CT releases the R and DS relays.

2.35 The release of relay R releases the BSY relay.

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

3. INCOMING CALL - CALLING CUSTOMER DIS-CONNECTS FIRST - SC3

3.01 This circuit is seized for an incoming call by a loop closure on the T and R leads which operates the A relay.

3.02 The operation of relay A:

- (a) Grounds the R and BL leads to the IRL circuits.
- (b) Places battery on the ST lead to the IRL circuit.
- (c) Operates the A1 relay.

3.03 The operation of relay A1:

- (a) Operates the BSY relay.
- (b) Operates the B relay.
- (c) Transfers an operating path from the BY relay to the SS relay.
- (d) Opens the FT lead.

3.04 The operation of relay BSY:

- (a) Connects the G relay to the TMB time delay circuit.
- (b) Opens the loop between the TG and TT leads.
- (c) Removes a control ground from the TMB time delay circuit.
- (d) Opens the TF lead.
- (e) Provides a locking ground for the SS relay.
- (f) Opens the FT lead.
- (g) Provides its own locking ground.

3.05 The operation of relay B:

- (a) Provides an operating ground for relays BY and SS.
- (b) Connects resistance B between its own winding and ground to slow its own release (option S).
- (c) Opens the loop between the TG and TT leads.
- (d) Transfers an operating path of the RL thermal relay.

- (e) Opens the TF lead.
 - (f) Partially closes the B lead.
 - (g) Opens a control lead of the TMA time delay circuit.
 - (h) Grounds the control lead of the TMB time delay circuit.
 - (i) Shorts its own secondary winding to slow its release.
- 3.06 If pulsing is started before closure of the bylink path, the first pulse will release the A and A1 relays in tandem.
- 3.07 The release of relay A1 will operate the BY relay.
- 3.08 The operation of relay BY:
- (a) Starts the reorder tone interrupter and places reorder or overflow tone on the R lead and ground on the T lead.
 - (b) Opens the ST lead to the IRL circuit.
 - (c) Opens the R and BL leads to the IRL circuit.
 - (d) Opens the LK lead to the IRL circuit.
- 3.09 The A and A1 relays in tandem will continue to follow the pulses and will remain operated upon completion of pulsing.
- 3.10 Upon hearing reorder or overflow tone, the calling customer will hang up, which will release the A and A1 relays in tandem.
- 3.11 The release of relay A1 will release the slow-release B relay.
- 3.12 The release of relay B:
- (a) Releases the BY relay.
 - (b) Activates the TMB time delay circuit which operates the G relay.
- 3.13 The operation of relay G:
- (a) Opens the CT relay locking circuit.
 - (b) Opens the SS relay locking circuit.
 - (c) Releases the BSY relay.
 - (d) Opens the SG relay locking circuit.
- 3.14 The release of relay BSY, releases the G relay returning the trunk to its idle state.
- 3.15 If the bylink path is closed before pulsing is started, the R relay will operate over leads RL and LK.
- 3.16 The operation of relay R:
- (a) Locks its secondary winding to the T lead.
 - (b) Transfers a control path of the TMA time delay circuit.
 - (c) Opens the BY relay operating path.
 - (d) Transfers the ST lead from battery to the LK lead.
 - (e) Connects the T1 jack sleeve to the CT lead.
 - (f) Provides a holding ground for the BSY relay.
- 3.17 The A and A1 relays in tandem will follow the pulses, which are repeated by the A relay and are stored in the incoming register. The A and A1 relays remain operated upon completion of pulsing.
- 3.18 If the calling customer abandons the call and hangs up at this point, the A and A1 relays will release in tandem.
- 3.19 The release of relay A1:
- (a) Releases the slow-release B relay.
 - (b) Causes the incoming register to release which releases the R relay.
- 3.20 The release of relay B activates the TMB time delay circuit which operates the G relay.
- 3.21 The release of relay R and operation of relay G cause the release of relay BSY.
- 3.22 The release of relay BSY, releases the G relay returning the trunk to its idle state.
- 3.23 If the calling customer does not abandon the call upon completion of pulsing, the incoming register will transfer the received digits to the marker, associate the marker with this trunk, and ground the CT lead, which operates the CT relay.

3.24 The operation of relay CT:

- (a) Partially removes shunts from the T1 and R1 capacitors.
- (b) Closes the C2 lead.
- (c) Connects resistance battery to the T lead.
- (d) Provides a locking ground for the RC relay.
- (e) Transfers a control lead of the TMA time delay circuit.
- (f) Connects the input T and R leads to the output T and R leads.
- (g) Provides its own lock path.

3.25 The marker seizes this trunk by grounding the F lead operating the LF relay.

3.26 The operation of relay LF:

- (a) Opens the PU relay operating path.
- (b) Opens the RC relay operate path and partially closes the ground path to lead RA.
- (c) Opens the CH relay operating path.
- (d) Grounds the SW lead.
- (e) Grounds the JC lead.
- (f) Operates the LF1 relay.
- (g) Closes the TPC relay operating path.
- (h) Transfers the T, R, and S leads from this circuit to the T1, R1, and SL leads in the marker.
- (i) Closes a control path for the TMB time delay circuit.
- (j) Operates the DS relay under control of the CT relay.

3.27 The operation of relay LF1:

- (a) Closes the RC relay operating path.
- (b) Closes the R2 relay operating path.
- (c) Closes the R3 relay operating path.
- (d) Closes the TPR relay operating path.
- (e) Grounds the TT1 lead.

3.28 The marker sets up the connection from the trunk to the called line, operates the RC relay and also operates the R2, R3, and TPR relays if they are required.

3.29 The operation of relay R2 and/or R3:

- (a) Close their own lock paths.
- (b) Set up the required ringing code.
- (c) Delay the operation of the PU relay until the PU lead is grounded if required.

3.30 The operation of relay TPR:

- (a) Reverses the ringing and ground applied to the R and T leads.
- (b) Closes its own lock path.

3.31 The operation of relay RC:

- (a) Transfer a CH relay ground from the RL thermal relay to itself.
- (b) Transfers the T and R leads to the ringing circuit.
- (c) Partially closes the C3 lead.
- (d) Provides a locking ground for the R2, R3, and TPR relays.
- (e) Grounds the RA lead.
- (f) Closes a ground for later use by the S lead.
- (g) Partially closes the PS lead.
- (h) Provides an operating ground (if required) and locking ground for the PU relay.

3.32 When the marker is completed it releases the LF and LF1 relays in tandem.

3.33 The release of relay LF operates the PU relay directly or after the PU lead is grounded as required.

3.34 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.

- 3.35 If the call is not answered, the calling customer will hang up releasing the A, A1, and B relays in tandem.
- 3.36 The release of the B relay activates the TMB timer which operates the G relay.
- 3.37 The operation of relay G:
 - (a) See 1.13.
 - (b) Releases the CT relay.
- 3.38 The release of relay CT:
 - (a) Releases the DS relay and drops the channel.
 - (b) Releases the RC relay.
 - (c) Releases the R relay.
- 3.39 The release of relay RC:
 - (a) Releases the PU relay.
 - (b) Releases the R2, R3, and TPR relays if they are operated.
- 3.40 The release of relay R releases the BSY relay.
- 3.41 The release of relay BSY releases the G relay restoring the trunk to its idle state.
- 3.42 If the call is answered, the RT relay will operate over the line loop.
- 3.43 The operation of relay RT releases the RC relay.
- 3.44 The release of relay RC:
 - (a) Releases the RT and PU relays.
 - (b) Releases the R2, R3, and TPR relays if they are operated.
 - (c) Connects the calling customer to the called customer.
- 3.45 The S relay operates over the line loop which:
 - (a) Partially closes a lock path for the S1 relay.
 - (b) Operates the SA relay.
 - (c) Activates the TMA timer which operates the CH relay.
- 3.46 The operation of relay SA:
 - (a) Sends an off-hook signal to the originating office.
 - (b) Transfers an operating path of the RL thermal relay.
 - (c) Partially closes the MRP relay lock path.
 - (d) Provides a control ground for the TMB time delay circuit.
- 3.47 The operation of relay CH:
 - (a) Opens the MRP relay lock path.
 - (b) Grounds the A lead.
 - (c) Opens the TF lead.
 - (d) Opens an S lead control path.
 - (e) Replaces direct ground with message register potential on the S lead when the MRP relay is also operated.
 - (f) Provides an operating ground for the RL thermal relay.
- 3.48 The trunk is now in the talking state.
- 3.49 When the calling customer disconnects, relays A, A1, and B release in tandem.
- 3.50 The release of relay B activates the TMB timer which operates the G relay.
- 3.51 The operation of relay G:
 - (a) See 1.13.
 - (b) Releases the CT relay.
- 3.52 The release of relay CT:
 - (a) Releases the DS relay and the channel dropping the called line to line lock-out.
 - (b) Releases the R relay.
- 3.53 Release of the channel releases the S relay.
- 3.54 The release of relay S:
 - (a) Releases the CH relay.
 - (b) Releases the SA relay.
- 3.55 The release of relay SA sends an on-hook signal to the originating office.
- 3.56 The release of relay R releases the BSY relay.
- 3.57 The release of relay BSY releases the G relay restoring the trunk to its idle state.

3.58 The called line will return to its idle state when the called customer hangs up.

4. INCOMING CALL - CALLED CUSTOMER DIS-CONNECTS FIRST - SC4

4.01 This circuit is seized for an incoming call by a loop closure on the T and R leads which operates the A relay.

4.02 The operation of relay A:

- (a) Grounds the R and BL leads to the IRL circuits.
- (b) Places battery on the ST lead to the IRL circuit.
- (c) Operates the A1 relay.

4.03 The operation of relay A1:

- (a) Operates the BSY relay.
- (b) Operates the B relay.
- (c) Transfers an operating path from the BY relay to the SS relay.
- (d) Opens the FT lead.

4.04 The operation of relay BSY:

- (a) Connects the G relay to the TMB time delay circuit.
- (b) Opens the loop between the TG and TT leads.
- (c) Removes a control ground from the TMB time delay circuit.
- (d) Opens the TF lead.
- (e) Provides a locking ground for the SS relay.
- (f) Opens the FT lead.
- (g) Provides its own locking ground.

4.05 The operation of relay B:

- (a) Provides an operating ground for relays BY and SS.
- (b) Connects resistance B between its own winding and ground to slow its own release (option S).

(c) Opens the loop between the TG and TT leads.

(d) Transfers an operating path of the RL thermal relay.

(e) Opens the TF lead.

(f) Partially closes the B lead.

(g) Opens a control lead of the TMA time delay circuit.

(h) Grounds the control lead of the TMB time delay circuit.

(i) Shorts its own secondary winding to slow its release.

4.06 If pulsing is started before closure of the bylink path, the first pulse will release the A and A1 relays in tandem.

4.07 The release of relay A1 will operate the BY relay.

4.08 The operation of relay BY:

- (a) Starts the reorder tone interrupter and places reorder or overflow tone on the R lead and ground on the T lead.
- (b) Opens the ST lead to the IRL circuit.
- (c) Opens the R and BL leads to the IRL circuit.
- (d) Opens the LK lead to the IRL circuit.

4.09 The A and A1 relays in tandem will continue to follow the pulses and will remain operated upon completion of pulsing.

4.10 Upon hearing reorder or overflow tone, the calling customer will hang up, which will release the A and A1 relays in tandem.

4.11 The release of relay A1 will release the slow-release B relay.

4.12 The release of relay B:

- (a) Releases the BY relay.
- (b) Activates the TMB time delay circuit which operates the G relay.

4.13 The operation of relay G:

- (a) Opens the CT relay locking circuit.
- (b) Opens the SS relay locking circuit.
- (c) Releases the BSY relay.
- (d) Opens the SG relay locking circuit.

4.14 The release of relay BSY, releases the G relay returning the trunk to its idle state.

4.15 If the bylink path is closed before pulsing is started, the R relay will operate over leads RL and LK.

4.16 The operation of relay R:

- (a) Locks its secondary winding to the T lead.
- (b) Transfers a control path of the TMA time delay circuit.
- (c) Opens the BY relay operating path.
- (d) Transfers the ST lead from battery to the LK lead.
- (e) Connects the T1 jack sleeve to the CT lead.
- (f) Provides a holding ground for the BSY relay.

4.17 The A and A1 relays in tandem will follow the pulses, which are repeated by the A relay and are stored in the incoming register. The A and A1 relays remain operated upon completion of pulsing.

4.18 If the calling customer abandons the call and hangs up at this point, the A and A1 relays will release in tandem.

4.19 The release of relay A1:

- (a) Releases the slow-release B relay.
- (b) Causes the incoming register to release which releases the R relay.

4.20 The release of relay B activates the TMB time delay circuit which operates the G relay.

4.21 The release of relay R and operation of relay G cause the release of relay BSY.

4.22 The release of relay BSY, releases the G relay returning the trunk to its idle state.

4.23 If the calling customer does not abandon the call upon completion of pulsing, the incoming register will transfer the received digits to the marker, associate the marker with this trunk, and ground the CT lead, which operates the CT relay.

4.24 The operation of relay CT:

- (a) Partially removes shunts from the T1 and R1 capacitors.
- (b) Closes the C2 lead.
- (c) Connects resistance battery to the T lead.
- (d) Provides a locking ground for the RC relay.
- (e) Transfers a control lead of the TMA time delay circuit.
- (f) Connects the input T and R leads to the output T' and R leads.
- (g) Provides its own lock path.

4.25 The marker seizes this trunk by grounding the F lead operating the LF relay.

4.26 The operation of relay LF:

- (a) Opens the PU relay operating path.
- (b) Opens the RC relay operate path and partially closes the ground path to lead RA.
- (c) Opens the CH relay operating path.
- (d) Grounds the SW lead.
- (e) Grounds the JC lead.
- (f) Operates the LF1 relay.
- (g) Closes the TPC relay operating path.
- (h) Transfers the T, R, and S leads from this circuit to the T1, R1, and S1 leads in the marker.
- (i) Closes a control path for the TMB time delay circuit.
- (j) Operates the DS relay under control of the CT relay.

4.27 The operation of relay LF1:

- (a) Closes the RC relay operating path.
- (b) Closes the R2 relay operating path.
- (c) Closes the R3 relay operating path.
- (d) Closes the TPR relay operating path.
- (e) Grounds the TT1 lead.

4.28 The marker sets up the connection from this trunk to the called line, operates the RC relay and also operates the R2, R3, and TPR relays if they are required.

4.29 The operation of relay R2 and/or R3:

- (a) Close their own lock paths.
- (b) Set up the required ringing code.
- (c) Delay the operation of the PU relay until the PU lead is grounded if required.

4.30 The operation of relay IFR:

- (a) Reverses the ringing and ground applied to the R and T leads.
- (b) Closes its own lock path.

4.31 The operation of relay RC:

- (a) Transfers a OH relay ground from the RL thermal relay to itself.
- (b) Transfers the T and R leads to the ringing circuit.
- (c) Partially closes the C3 lead.
- (d) Provides a locking ground for the R2, R3, and TPR relays.
- (e) Grounds the RA lead.
- (f) Closes a ground for later use by the S lead.
- (g) Partially closes the PS lead.
- (h) Provides an operating ground (if required) and locking ground for the PU relay.

4.32 When the marker is completed it releases the LF and LF1 relays in tandem.

4.33 The release of relay LF operates the PU relay directly or after the PU lead is grounded as required.

4.34 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.

4.35 If the call is not answered, the calling customer will hang up releasing the A, A1, and B relays in tandem.

4.36 The release of the B relay activates the TMB timer which operates the G relay.

4.37 The operation of relay G:

- (a) See 1.13.
- (b) Releases the CT relay.

4.38 The release of relay CT:

- (a) Releases the DS relay and drops the channel.
- (b) Releases the RC relay.
- (c) Releases the R relay.

4.39 The release of relay RC:

- (a) Releases the PU relay.
- (b) Releases the R2, R3, and TPR relays if they are operated.

4.40 The release of relay R releases the BSY relay.

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

4.42 If the call is answered, the RT relay will operate over the line loop.

4.43 The operation of relay RT releases the RC relay.

4.44 The release of relay RC:

- (a) Releases the RT and PU relays.
- (b) Releases the R2, R3, and TPR relays if they are operated.
- (c) Connects the calling customer to the called customer.

4.45 The S relay operates over the line loop which:

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

- (b) Operates the SA relay.
- (c) Activates the TMA timer which operates the CH relay.
- 4.46 The operation of relay SA:
 - (a) Sends an off-hook signal to the originating office.
 - (b) Transfers an operating path of the RL thermal relay.
 - (c) Partially closes the MRP relay lock path.
 - (d) Provides a control ground for the TMB time delay circuit.
- 4.47 The operation of relay CH:
 - (a) Opens the MRP relay lock path.
 - (b) Grounds the A lead.
 - (c) Opens the TF lead.
 - (d) Opens an S lead control path.
 - (e) Replaces direct ground with message register potential on the S lead when the MRP relay is also operated.
 - (f) Provides an operating ground for the RL thermal relay.
- 4.48 The trunk is now in the talking state.
- 4.49 When the called customer disconnects, relays S and SA release in tandem.
- 4.50 The release of relay SA:
 - (a) Sends an on-hook disconnect signal to the originating office.
 - (b) Starts the RL thermal relay timing.
- 4.51 If the calling customer hangs up before the RL thermal relay operates, the A, Al, and B relays will release in tandem.
- 4.52 The release of relay B:
 - (a) Stops the RL thermal relay timing.
 - (b) Activates the TMB timer which operates the G relay.
- 4.53 The operation of relay G:
 - (a) See 1.13.
- (b) Releases the CT relay.
- 4.54 The release of relay CT:
 - (a) Releases the DS relay and drops the channel.
 - (b) Releases the CH relay.
 - (c) Releases the R relay.
- 4.55 The release of relay R releases the BSY relay.
- 4.56 The release of relay BSY releases the G relay restoring the trunk to its idle state.
- 4.57 If the RL thermal relay operates before the calling customer hangs up, it will operate the RC relay.
- 4.58 The operation of relay RC:
 - (a) See 1.31.
 - (b) Releases the RL thermal relay.
 - (c) Grounds the PS lead to the alarm circuit.
 - (d) Releases the channel.
- 4.59 When the calling customer hangs up or is time released, the A, Al, and B relays will release in tandem.
- 4.60 The release of the B relay activates the TMB timer which operates the G relay.
- 4.61 The operation of relay G:
 - (a) See 1.13.
 - (b) Releases the CT relay.
- 4.62 The release of relay CT:
 - (a) Releases the CH relay.
 - (b) Releases the RC relay.
 - (c) Releases the R relay.
 - (d) Releases the DS relay.
- 4.63 The release of relay R releases the BSY relay.
- 4.64 The release of relay BSY releases the G relay restoring the trunk to its idle state.

5. OUTGOING CALL - SC5

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

5.02 The operation of relay F:

- (a) Partially closes the ST lead.
- (b) Operates the LF relay.
- (c) Operates the SG relay.
- (d) Opens the LF1 relay operating path.
- (e) Operates the S1 relay.
- (f) Provides its own lock path.
- (g) Operates the MRP relay.
- (h) Partially closes an operating path of the SS relay.
- (i) Grounds the VG lead.
- (j) Transfers the T and R leads from the A relay to the CS relay as an off-hook signal.
- (k) Closes the SS to SSB lead loop.

5.03 The operation of relay LF:

- (a) See 1.26

5.04 The operation of relay S1:

- (a) Provides a ground for later use on the S lead.
- (b) Bypasses the SA relay contacts on the T and R leads.
- (c) Cuts through the T and R leads.
- (d) Transfers a control path of the TMA timer.
- (e) Provides its own locking ground.
- (f) Partially closes the B lead.
- (g) Transfers the T and R leads from the A relay to the CS relay.
- (h) Operates the RLS relay which locks under control of the SS and G relays. Relay RLS operated partially opens the T and R leads.

5.05 The operation of relay SG:

- (a) Provides a locking ground for the TPC relay.
- (b) Transfers a control path of the TMB timer.
- (c) Opens an operating path of the BY relay.
- (d) Provides its own locking circuit and operates the BSY relay.

5.06 The operation of relay MRP:

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

5.07 The operation of relay TPC (by the marker if required):

- (a) Replaces MRS-RP with MRS-TP message register potential.
- (b) Provides its own lock path.

5.08 The operation of relay BSY:

- (a) See 1.04

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

5.10 The outgoing sender operates the D relay.

5.11 The operation of relay D:

- (a) Grounds the AB lead.
- (b) Provides a TMB timer control ground.
- (c) Transfers the S lead from the AB lead to the SL lead
- (d) Opens the T and R leads.

- 5.12 When the marker has set up the channel between this trunk and the calling line, it releases the F and LF relays in tandem and then releases itself.
- 5.13 The release of relay LF operates the S relay over the line loop.
- 5.14 The operation of relay S:
 - (a) See 1.45.
 - (b) Operates the SA relay.
- 5.15 The operation of relay SA:
 - (a) See 1.46.
- 5.16 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.
- 5.17 The release of the channel:
 - (a) Drops the calling line to line lockout.
 - (b) Releases the S relay.
- 5.18 The release of relay S releases the SA and S1 relays.
- 5.19 The release of relay SA releases the MRP relay.
- 5.20 The release of relay S1 removes ground from the AB lead, which causes the outgoing sender to release the D relay.
- 5.21 The release of relay D:
 - (a) Sends an on-hook signal to the distant office.
 - (b) Activates the TMB timer operating the G relay.
- 5.22 The operation of relay G:
 - (a) See 1.13.
 - (b) Releases the SG relay.
 - (c) Releases the BSY relay.
 - (d) Releases the RLS relay and closes the T and R leads.
- 5.23 The release of relay SG, releases the TPC relay if it is operated.
- 5.24 The release of relay BSY releases the G relay, restoring the trunk to its idle state.
- 5.25 The calling line will return to its idle state when the calling customer hangs up.
- 5.26 If the outgoing sender is able to pulse the digits, it will do so using dial pulsing.
- 5.27 Upon completion of outpulsing the outgoing sender will release the D relay and then release itself.
- 5.28 The release of relay D will connect the trunk to the line.
- 5.29 The terminating office will connect this trunk to line-busy tone if the called line is busy, to overflow tone if a path is not available, or to the called line if it is idle and a path is available. In the latter case the terminating office will ring the called line.
- 5.30 If the calling customer hangs up due to line-busy, or overflow, or no answer, the S relay will release.
- 5.31 The release of relay S:
 - (a) Releases the SA relay.
 - (b) Releases the S1 relay.
- 5.32 The release of relay S1:
 - (a) Releases the channel between this trunk and the calling line.
 - (b) Sends an on-hook signal to the distant office.
- 5.33 The release of relay SA:
 - (a) Releases the MRP relay.
 - (b) Activates the TMB timer operating the G relay.
- 5.34 The operation of relay G:
 - (a) See 1.13.
 - (b) Releases the SG and BSY relays.
 - (c) Releases the RLS relay and closes the T and R leads.
- 5.35 The release of relay SG releases the TPC relay if it is operated.
- 5.36 The release of relay BSY, releases the G relay restoring the trunk to its idle state.

- 5.37 If the call is answered, ringing will be tripped and an off-hook answer signal will operate the CS relay.
- 5.38 The operation of relay CS operates the B relay.
- 5.39 The operation of relay B:
- (a) See 1.05.
 - (b) Activates the TMA timer operating the CH relay.
- 5.40 The operation of relay CH:
- (a) See 1.47.
 - (b) Places message register potential on the S lead.
 - (c) Releases the MRP relay.
- 5.41 The trunk is now in the talking state.

6. OUTGOING CALL - CALLING CUSTOMER DIS-CONNECTS FIRST - 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) Partially closes the ST lead.
 - (b) Operates the LF relay.
 - (c) Operates the SG relay.
 - (d) Opens the LF1 relay operating path.
 - (e) Operates the S1 relay.
 - (f) Provides its own lock path.
 - (g) Operates the MRP relay.
 - (h) Partially closes an operating path of the SS relay.
 - (i) Grounds the VG lead.
 - (j) Transfers the T and R leads from the A relay to the CS relay as an off-hook signal.
 - (k) Closes the SS to SSB lead loop.
- 6.03 The operation of relay LF:
- (a) See 1.26.

- 6.04 The operation of relay S1:
- (a) Provides a ground for later use on the S lead.
 - (b) Bypasses the SA relay contacts on the T and R leads.
 - (c) Cuts through the T and R leads.
 - (d) Transfers a control path of the TMA timer.
 - (e) Provides its own locking ground.
 - (f) Partially closes the B lead.
 - (g) Transfers the T and R leads from the A relay to the CS relay.
 - (h) Operates the RLS relay which locks under control of the SS and G relays. Relay RLS operated partially opens the T and R leads.
- 6.05 The operation of relay SG:
- (a) Provides a locking ground for the TPC relay.
 - (b) Transfers a control path of the TMB timer.
 - (c) Opens an operating path of the BY relay.
 - (d) Provides its own locking circuit and operates the BYS relay.
- 6.06 The operation of relay MRP:
- (a) Provides its own locking circuit.
 - (b) Opens the F relay operating path.
 - (c) Replaces direct ground with message register potential on the S lead when the CH relay is also operated.
- 6.07 The operation of relay TPC (by the marker if required):
- (a) Replaces MRS-RP with MRS-TP message register potential.
 - (b) Provides its own lock path.
- 6.08 The operation of relay BSY:
- (a) See 1.04.
- 6.09 The marker associates an outgoing sender with this trunk via the outgoing sender link.

- 6.10 The outgoing sender operates the D relay.
- 6.11 The operation of relay D:
 - (a) Grounds the AB lead:
 - (b) Provides a TMB timer control ground.
 - (c) Transfers the S lead from the AB lead to the SL lead.
 - (d) Opens the T and R leads.
- 6.12 When the marker has set up the channel between this trunk and the calling line, it releases the F and LF relays in tandem and then releases itself.
- 6.13 The release of relay LF operates the S relay over the line loop.
- 6.14 The operation of relay S:
 - (a) See 1.45.
 - (b) Operates the SA relay.
- 6.15 The operation of relay SA:
 - (a) See 1.46.
- 6.16 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.
- 6.17 The release of the channel:
 - (a) Drops the calling line to line lock-out.
 - (b) Releases the S relay.
- 6.18 The release of relay S releases the SA and Sl relays.
- 6.19 The release of relay SA releases the MRP relay.
- 6.20 The release of relay Sl removes ground from the AB lead, which causes the outgoing sender to release the D relay.
- 6.21 The release of relay D:
 - (a) Sends an on-hook signal to the distant office.
 - (b) Activates the TMB timer operating the G relay.
- 6.22 The operation of relay G:
 - (a) See 1.13.
 - (b) Releases the SG relay.
 - (c) Releases the BSY relay.
 - (d) Releases the RLS relay and closes the T and R leads.
- 6.23 The release of relay SG, releases the TPC relay if it is operated.
- 6.24 The release of relay BSY releases the G relay, restoring the trunk to its idle state.
- 6.25 The calling line will return to its idle state when the calling customer hangs up.
- 6.26 If the outgoing sender is able to pulse the digits, it will do so using dial pulsing.
- 6.27 Upon completion of outpulsing the outgoing sender will release the D relay and then releases itself.
- 6.28 The release of relay D will connect the trunk to the line.
- 6.29 The terminating office will connect this trunk to line-busy tone if the called line is busy, to overflow tone if a path is not available, or to the called line if it is idle and a path is available. In the latter case the terminating office will ring the called line.
- 6.30 If the calling customer hangs up due to line-busy, overflow, or no answer, the S relay will release.
- 6.31 The release of relay S:
 - (a) Releases the SA relay.
 - (b) Releases the Sl relay.
- 6.32 The release of relay Sl:
 - (a) Releases the channel between this trunk and the calling line.
 - (b) Sends an on-hook signal to the distant office.
- 6.33 The release of relay SA:
 - (a) Releases the MRP relay.
 - (b) Activates the TMB timer operating the G relay.

- 6.34 The operation of relay G:
- (a) See 1.13.
 - (b) Releases the SG and BSY relays.
 - (c) Releases the RLS relay and closes the T and R leads.
- 6.35 The release of relay SG releases the TPC relay if it is operated.
- 6.36 The release of relay BSY, releases the G relay restoring the trunk to its idle state.
- 6.37 If the call is answered, ringing will be tripped and an off-hook answer signal will operate the CS relay.
- 6.38 The operation of relay CS operates the B relay.
- 6.39 The operation of relay B:
- (a) See 1.05.
 - (b) Activates the TMA timer operating the CH relay.
- 6.40 The operation of relay CH:
- (a) See 1.47.
 - (b) Places message register potential on the S lead.
 - (c) Releases the MRP relay.
- 6.41 The trunk is now in the talking state.
- 6.42 When the calling customer disconnects, relay S releases.
- 6.43 The release of relay S, releases the S1 and SA relays.
- 6.44 The release of relay S1:
- (a) Releases the CS and CH relays.
 - (b) Releases the channel between this trunk and the calling line.
 - (c) Sends an on-hook signal to the distant office.
- 6.45 The release of relay CS releases the B relay.
- 6.46 The release of relay SA activates the TMB timer and operates the G relay.
- 6.47 The operation of relay G:
- (a) See 1.13.
 - (b) Releases the SG and BSY relays.
 - (c) Releases the RLS relay and closes the T and R leads.
- 6.48 The release of relay SG releases the TPC relay if it is operated.
- 6.49 The release of relay BSY releases the G relay, restoring the trunk to its idle state.
7. OUTGOING CALL - CALLED CUSTOMER DIS-CONNECTS FIRST - SC7
- 7.01 When the marker selects this trunk for an outgoing call, it operates the F relay.
- 7.02 The operation of relay F:
- (a) Partially closes the ST lead.
 - (b) Operates the LF relay.
 - (c) Operates the SG relay.
 - (d) Opens the LF1 relay operating path.
 - (e) Operates the S1 relay.
 - (f) Provides its own lock path.
 - (g) Operates the MRP relay.
 - (h) Partially closes an operating path of the SS relay.
 - (i) Grounds the VG lead.
 - (j) Transfers the T and R leads from the A relay to the CS relay as an off-hook signal.
 - (k) Closes the SS to SSB lead loop.
- 7.03 The operation of relay LF:
- (a) See 1.26.
- 7.04 The operation of relay S1:
- (a) Provides a ground for later use on the S lead.
 - (b) Bypasses the SA relay contacts on the T and R leads.
 - (c) Cuts through the T and R leads.
 - (d) Transfers a control path of the TMA timer.
 - (e) Provides its own locking ground.
 - (f) Partially closes the B lead.
 - (g) Transfers the T and R leads from the A relay to the CS relay.
 - (h) Operates the RLS relay which locks under control of the SS and G relays. Relay RLS operated partially opens the T and R leads.

- 7.05 The operation of relay SG:
- (a) Provides a locking ground for the TPC relay.
 - (b) Transfers a control path of the TMB timer.
 - (c) Opens an operating path of the BY relay.
 - (d) Provides its own locking circuit and operates the BSY relay.
- 7.06 The operation of relay MRP:
- (a) Provides its own locking circuit.
 - (b) Opens the F relay operating path.
 - (c) Replaces direct ground with message register potential on the S lead when the CH relay is also operated.
- 7.07 The operation of relay TPC (by the marker if required):
- (a) Replaces MRS-RP with MRS-TP message register potential.
 - (b) Provides its own lock path.
- 7.08 The operation of relay BSY:
- (a) See 1.04.
- 7.09 The marker associates an outgoing sender with this trunk via the outgoing sender link.
- 7.10 The outgoing sender operates the D relay.
- 7.11 The operation of relay D:
- (a) Grounds the AB lead.
 - (b) Provides a TMB timer control ground.
 - (c) Transfers the S lead from the AB lead to the SL lead.
 - (d) Opens the T and R leads.
- 7.12 When the marker has set up the channel between this trunk and the calling line, it releases the F and LF relays in tandem and then releases itself.
- 7.13 The release of relay LF operates the S relay over the line loop.
- 7.14 The operation of relay S:
- (a) See 1.45.
 - (b) Operates the SA relay.
- 7.15 The operation of relay SA:
- (a) See 1.46.
- 7.16 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.
- 7.17 The release of the channel:
- (a) Drops the calling line to line lock-out.
 - (b) Releases the S relay.
- 7.18 The release of relay S releases the SA and S1 relays.
- 7.19 The release of relay SA releases the MRP relay.
- 7.20 The release of relay S1 removes ground from the AF lead, which causes the outgoing sender to release the D relay.
- 7.21 The release of relay D:
- (a) Sends an on-hook signal to the distant office.
 - (b) Activates the TMB timer operating the G relay.
- 7.22 The operation of relay G:
- (a) See 1.13.
 - (b) Releases the SG relay.
 - (c) Releases the BSY relay.
 - (d) Releases the RLS relay and closes the T and R leads.
- 7.23 The release of relay SG, releases the TPC relay if it is operated.
- 7.24 The release of relay BSY releases the G relay, restoring the trunk to its idle state.
- 7.25 The calling line will return to its idle state when the calling customer hangs up.

- 7.26 If the outgoing sender is able to pulse the digits, it will do so using dial pulsing.
- 7.27 Upon completion of outpulsing the outgoing sender will release the D relay and then release itself.
- 7.28 The release of relay D will connect the trunk to the line.
- 7.29 The terminating office will connect this trunk to line-busy tone if the called line is busy, to overflow tone if a path is not available, or to the called line if it is idle and a path is available. In the latter case the terminating office will ring the called line.
- 7.30 If the calling customer hangs up due to line-busy, overflow, or no answer, the S relay will release.
- 7.31 The release of relay S:
- (a) Releases the SA relay.
 - (b) Releases the SI relay.
- 7.32 The release of relay SI:
- (a) Releases the channel between this trunk and the calling line.
 - (b) Sends an on-hook signal to the distant office.
- 7.33 The release of relay SA:
- (a) Releases the MRP relay.
 - (b) Activates the TMB timer operating the G relay.
- 7.34 The operation of relay G:
- (a) See 1.13.
 - (b) Releases the SG and BSY relays.
 - (c) Releases the RLS relay and closes the T and R leads.
- 7.35 The release of relay SG releases the TPC relay if it is operated.
- 7.36 The release of relay BSY, releases the G relay restoring the trunk to its idle state.
- 7.37 If the call is answered, ringing will be tripped and off-hook answer signal will operate the CS relay.
- 7.38 The operation of relay CS operates the B relay.
- 7.39 The operation of relay B.
- (a) See 1.05.
 - (b) Activates the TMA timer operating the CH relay.
- 7.40 The operation of relay CH:
- (a) See 1.47.
 - (b) Places message register potential on the S lead.
 - (c) Releases the MRP relay.
- 7.41 The trunk is now in the talking state.
- 7.42 When the called customer disconnects, relays CS and B release in tandem.
- 7.43 The release of relay B starts the RL thermal relay timing.
- 7.44 If the calling customer hangs up before the RL thermal relay operates, the S relay will release.
- 7.45 The release of relay S releases the SI and SA relays.
- 7.46 The release of relay SI:
- (a) Releases the channel between this trunk and the calling line.
 - (b) Releases the CH relay.
 - (c) Sends an on-hook signal to the distant office.
- 7.47 The release of relay SA:
- (a) Deactivates the RL thermal relay timing.
 - (b) Activates the TMB timer operating the G relay.
- 7.48 The operation of relay G:
- (a) See 1.13.
 - (b) Releases the SG and BSY relays.
 - (c) Releases the RLS relay and closes the T and R leads.
- 7.49 The release of relay SG releases the TPC relay if it is operated.

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

7.51 If the RL thermal relay operates before the calling customer hangs up, it will operate the RC relay.

7.52 The operation of relay RC:

- (a) See 1.31.
- (b) Releases the RL thermal relay.
- (c) Releases the channel connecting the trunk to the calling line.

7.53 The release of the channel.

- (a) Drops the calling line to line lock-out.
- (b) Releases the S relay.

7.54 The release of relay S releases the SI and SA relays.

7.55 The release of relay SI:

- (a) Sends an on-hook signal to the distant office.
- (b) Releases the CH relay.

7.56 The release of relay SA:

- (a) Releases the RC relay.
- (b) Activates the TMB timer operating the G relay.

7.57 The operation of relay G:

- (a) See 1.13.
- (b) Releases the SG and BSY relays.
- (c) Releases the RLS relay and closes the T and R leads.

7.58 The release of relay SG releases the TPC relay if it is operated.

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

7.60 The calling line will return to its idle state when the calling customer hangs up.

8. SIMULTANEOUS SEIZURE - SC8

8.01 This circuit is seized for an incoming call by a loop closure on the T and R leads which operates the A relay.

8.02 The operation of relay A:

- (a) Grounds the R and BL leads to the IRL circuit.
- (b) Places battery on the ST lead to the IRL circuit.
- (c) Operates the A1 relay.

8.03 The operation of relay A1:

- (a) Operates the BSY relay.
- (b) Operates the B relay.
- (c) Transfers an operating path from the BY relay to the SS relay.
- (d) Opens the FT lead.

8.04 The operation of relay BSY:

- (a) Connects the G relay to the TMB time delay circuit.
- (b) Opens the loop between the TG and TT leads.
- (c) Removes a control ground from the TMB time delay circuit.
- (d) Opens the TF lead.
- (e) Provides a locking ground for the SS relay.
- (f) Opens the FT lead.
- (g) Provides its own locking ground.

8.05 The operation of relay B:

- (a) Provides an operating ground for relays BY and SS.
- (b) Connects resistance B between its own winding and ground to slow its own release (option 3).
- (c) Opens the loop between the TG and TT leads.
- (d) Transfers an operating path of the RL thermal relay.
- (e) Opens the TF lead.
- (f) Partially closes the B lead.
- (g) Opens a control lead of the TMA time delay circuit.

- (h) Grounds the control lead of the TMB time delay circuit.
 - (i) Shorts its own secondary winding to slow its release.
- 8.06 If the marker selects this trunk for an outgoing call before the incoming call operates the BSY or B relays, the F relay will operate and lock itself to the TF lead.
- 8.07 The operated B and F relays will operate the SS relay.
- 8.08 The operation of relay SS:
- (a) Applies a steady on-hook signal on the T and R leads.
 - (b) Transfers its winding from its operating path to its holding path.
 - (c) Opens the S1 relay holding path.
 - (d) Partially closes the operating path of the BY relay.
 - (e) Opens the SA relay operating path.
 - (f) Transfers a control ground from the TMB timer to the TMA timer.
 - (g) Opens the charging path of the TMB timer speeding up the later operation of the G relay.
- 8.09 The operation of relay F:
- (a) Partially closes the ST lead.
 - (b) Operates the LF relay.
 - (c) Operates the SG relay.
 - (d) Opens the LF1 relay operating path.
 - (e) Operates the S1 relay.
 - (f) Provides its own lock path.
 - (g) Operates the MRP relay.
 - (h) Partially closes an operating path of the SS relay.
 - (i) Grounds the VG lead.
 - (j) Transfers the T and R leads from the A relay to the CS relay as an off-hook signal.
 - (k) Closes the SS to SSB lead loop.
- 8.10 The operation of relay LF:
- (a) See 1.26.
- 8.11 The operation of relay S1:
- (a) Provides a ground for later use on the S lead.
 - (b) Bypasses the SA relay contacts on the T and R leads.
 - (c) Cuts through the T and R leads.
 - (d) Transfers a control path of the TMA timer.
 - (e) Provides its own locking ground.
 - (f) Partially closes the B lead.
 - (g) Transfers the T and R leads from the A relay to the CS relay.
- 8.12 The operation of relay SG:
- (a) Provides a locking ground for the TPC relay.
 - (b) Transfers a control path of the TMB timer.
 - (c) Opens an operating path of the BY relay.
 - (d) Provides its own locking circuit and operates the BSY relay.
- 8.13 The operation of relay MRP:
- (a) Provides its own locking circuit.
 - (b) Opens the F relay operating path.
 - (c) Replaces direct ground with message register potential on the S lead when the CH relay is also operated.
- 8.14 The operation of relay TPC (by the marker if required):
- (a) Replaces MRS-RP with MRS-TP message register potential.
 - (b) Provides its own lock path.
- 8.15 The marker associates an outgoing sender with this trunk via the outgoing sender link.
- 8.16 The outgoing sender operates the D relay.

- 8.17 The operation of relay D:
- (a) Grounds the AB lead.
 - (b) Provides a TMB timer control ground.
 - (c) Transfers the S lead from the AB lead to the SL lead.
 - (d) Opens the T and R leads.
- 8.18 When the marker has set up the channel between this trunk and the calling line, it releases the F and LF relays in tandem and then releases itself.
- 8.19 The release of relay LF operates the S relay over the line loop.
- 8.20 The release of relay F:
- (a) Releases the MRP relay.
 - (b) Releases the S1 relay.
- 8.21 The operation of relay S:
- (a) See 1.45 except that the operated SS relay prevents the operation of the SA relay.
- 8.22 The release of relay S1 removes ground from the AB lead, which causes the outgoing sender to:
- (a) Release the channel dropping the local calling customer to line lock-out.
 - (b) Release the D relay.
- 8.23 The release of the channel releases the S relay.
- 8.24 The release of relay D operates the G relay.
- 8.25 The operation of relay G:
- (a) See 1.13.
 - (b) Releases the SG relay.
 - (c) Releases the SS relay.
- 8.26 The release of relay SG releases the TPC relay if it is operated.

- 8.27 The release of relay SS releases the G relay.
- 8.28 The local calling line will return to its idle state when the local calling customer hangs up.
- 8.29 Meanwhile, the incoming call is proceeding in the normal manner, as covered in 1., starting with operation 1.06.

9. TESTING

- 9.01 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.
- 9.02 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 and talk into it.

10. MISCELLANEOUS

- 10.01 The T and R capacitors are provided to isolate the input and output circuits.
- 10.02 The T1 and R1 capacitors are provided to transmit some ringing energy to the calling customer.
- 10.03 The C, D, and E capacitors and S and T resistors are the timing elements of the TMA and TMB timer circuits.
- 10.04 The A resistor is used to limit the current on the T lead.
- 10.05 The A, MB, PS, and PS1 diodes are used as unidirectional current control elements.
- 10.06 The S network is provided to protect the diodes in the line circuits.
- 10.07 The T2 and R2 capacitors are provided to isolate the overflow tone circuit.
- 10.08 The B resistor is provided to slow the release of the B relay.

SECTION III - REFERENCE DATA1. WORKING LIMITS

- 1.01 See the No. 3 crossbar keysheet for customer line supervision limits.
- 1.02 See Notes 102, 303, and 304 on SD-26448-01, Sheet D1.
- 1.03 30,000 ohm minimum insulation resistance.

2. FUNCTIONAL DESIGNATIONS2.01 Relays

<u>Designation</u>	<u>Meaning</u>
A	Calling Supervisory
Al	Auxiliary Calling Supervisory
B	Auxiliary Supervisory
BSY	Busy
BY	Bylink
CH	Charge
CS	Called Supervisory
CT	Cut Through
D	Sender Connected
DS	Delay Seizure
F	Frame
G	Trunk Release
LF	Auxiliary Frame
LF1	Auxiliary Frame
MRP	Message Rate
PU	Pickup
R	Ready
R2	Auxiliary Ringing
R3	Auxiliary Ringing
RC	Ringing Control
RL	Release (Timed)
RLS	Release SXS
RT	Ring Trip
S	Supervisory

DesignationMeaning

Sl	Sleeve
SA	Auxiliary Supervisory
SG	Outgoing Call
SS	Simultaneous Seizure
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-26333-01.
- (b) Incoming Register Link Circuit - SD-26394-01.
- (c) Outgoing Sender Link Circuit - SD-26395-01.
- (d) Traffic Usage Recorder Circuit - SD-96494-01.
- (e) PRTD Circuit - SD-26414-01.
- (f) Test Circuit - SD-26411-01.
- (g) Alarm Circuit - SD-26393-01.
- (h) Time Delay Control Circuit - SD-94820-01.
- (i) Interrupter Circuit - SD-26407-01.
- (j) Two-Way Intertoll Trunk Circuit (Typical) - SD-31674-01.

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 service.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25820-JRF-GWC-VK