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CROSSBAR SYSTEMS  
NO. 3  
PERMANENT SIGNAL TO OPERATOR  
PLUG-ENDED TRUNK  
CIRCUIT  
HIGH-LOW SUPERVISION

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is used to connect a line, which is in a permanent signal state, to an operator initially. This permits the operator to converse with a possible incapacitated customer who may be in need of

emergency assistance. The line is dropped to the lockout state when the operator disconnects.

1.02 This circuit is arranged for high-low supervision.

2. GENERAL DESCRIPTION OF OPERATION

SEIZURE

2.01 When the marker determines that a trunk of this type is required, it makes tests to find an idle trunk on an idle trunk switch and connector circuit. The marker then operates the F relay of the selected trunk.

2.02 The F relay operates the S1 relay, which in turn operates the BY relay to set the busy condition. After the marker determines that the connections to the trunk are in order, the marker releases the F relay and then releases, leaving the customers line connected to the tip and ring of this circuit.

2.03 Relay L operates over the line loop, provides a holding path for relay S1, and operates relay L. Relay L1 connects battery and ground through the TK relay to the distant switchboard as a seizure signal to the distant switchboard. The call is now established to the distant switchboard.

OPERATOR ANSWERS

2.04 When the operator answers at the distant switchboard, the loop closure operates the TK relay, which operates the TK1 relay. The TK1 relay operates the TK2 relay and also transfers the T and R outgoing leads from the TK relay to the H relay. This releases the TK relay and operates the H relay. The H relay is in its low-resistance or off-hook state at this time.

2.05 The operator can now talk to a possible incapacitated customer on the line. If this is the case, the operator can summon and direct emergency assistance to the premises of the customer.

OPERATOR DISCONNECTS

2.06 Having performed the emergency functions, or more likely having found the line to be in a permanent signal state, the operator disconnects which releases the H relay. This causes the release of relays TK1, L, Ll, S1, TK2, and BY returning the trunk to the idle state.

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

SECTION II - DETAILED DESCRIPTION

1. SEIZURE

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

(a) Ground supplied by the trunk over the FT lead indicates to the marker that at least one trunk in the required group on the associated trunk switch and connector circuit is idle.

(b) Ground supplied by the marker is looped through the trunk on leads TG and TT and is directed by the marker connector, trunk block, and trunk group relays to operate one of twelve TT- relays.

(c) Battery supplied by the marker and directed by the marker connector, trunk block, and TT- relay through lead TF operates the F relay in the trunk.

(d) The operation of F:

- (1) Locks the F relay directly to lead TF.
- (2) Grounds the SW and JC leads to operate the associated SW and JC relays in the trunk switch and connector circuit.
- (3) Transfers the incoming T, R, and S leads from the trunk to the marker (Tl, Rl, and SL leads, respectively) for test purposes.

(4) Operates the S1 relay.

(e) The operation of S1:

- (1) Supplies ground to the S lead, after the F relay releases, to hold the switch connections and to activate the TUR circuit.
- (2) Supplies a holding ground for later use by the TK2 relay.

(3) Opens the MB lead to the test circuit.

(4) Operates the BY relay.

(f) The operation of BY:

- (1) Opens the FT lead.
- (2) Opens the loop through the TG and TT leads.
- (3) Opens the operate path of the F relay.

(g) When the marker has connected the line through the network to the trunk it:

- (1) Tests the tip and ring leads for continuity.
- (2) Tests the sleeve lead for a false ground.
- (3) If the above tests are successful, it releases the F relay which transfers the incoming T, R, and S leads back to this trunk.
- (4) Releases.

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

(a) Relay L operates over the T and R leads to the customers line and:

- (1) Closes the holding path for the S1 relay.
- (2) Operates the Ll relay.

(b) The operation of Ll:

- (1) Connects battery and ground through the TK relay winding to the T and R leads to the distant switchboard as a seizure signal.
- (2) Shorts out the high-resistance winding and external resistance of the H relay for later use as an off-hook signal.

2. OPERATOR ANSWERS

2.01 When the distant operator answers, the following operations occur:

(a) Relay TK operates over the closed loop and operates the TK1 relay.

(b) The operation of TK1:

- (1) Provides a holding path for the L relay.
- (2) Provides a holding path for the S1 relay.

(3) Operates the TK2 relay.

(4) Transfers the outgoing T and R leads from the TK relay to the H relay. This releases the TK relay and operates the H relay over its low-resistance winding, sending an off-hook signal to the distant switchboard.

(c) The operation of H provides a holding path for the TK1 relay.

(d) The operation of TK2:

(1) Closes its own holding path through a contact on the S1 relay.

(2) Opens the already open FT lead.

(3) Opens the already open loop through the TG and TT leads.

(4) Opens the operating path for the L relay.

(5) Opens the original holding path of the S1 relay.

(e) The operator can now talk to a possible incapacitated customer on the line.

If this is the case, the operator can summon and direct emergency assistance to the premises of the customer.

### 3. OPERATOR DISCONNECTS

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

(a) Relay H releases which releases slow-release relay TK1.

(b) Release of TK1:

(1) Releases relay L.

(2) Releases slow-release relay S1.

(3) Transfers the outgoing T and R leads from the H relay back to the TK relay.

(c) Release of L:

(1) Releases relay L1:

(d) Release of L1:

(1) Removes the short around the high-resistance winding of the H relay.

(2) Disconnects this trunk from the T and R leads to the distant switchboard.

(e) Release of S1:

(1) Removes ground from the S lead to release the line to the trunk channel in the network and to deactivate the TUR circuit.

(2) Releases relay TK2.

(3) Releases relay BY.

(f) The trunk is now in its normal idle state.

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

### 4. TESTING

4.01 Testing of this trunk is performed by setting up a test connection to this trunk from a test line. Routine operations are performed from the test line to the distant operator in the same manner as for a regular service call.

### 5. MISCELLANEOUS

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

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

5.03 The A inductor is provided to retard the flow of talking current through the H and TK relays.

5.04 The H resistance in conjunction with the secondary winding of the H relay is used to send a high-resistance or on-hook signal to the distant operator when the L1 relay is normal and the TK1 relay is operated.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

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

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

<u>Designation</u>	<u>Meaning</u>
BY	Busy
F	Frame (Marker Function)
H	Hold (Called Supervisory)
L	Line (Calling Supervisory)
L1	Line Auxiliary
S1	Sleeve
TK	Talk
TK1	Talk Auxiliary 1
TK2	Talk Auxiliary 2

3. FUNCTIONS

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

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

3.03 An F relay associated with lead TF is provided and is operated by the marker when this trunk is seized. The F relay grounds leads SW and JC to operate the associated SW and JC relays in the trunk switch and connector circuit. It also transfers the incoming T, R, and S leads from the trunk to the marker (T1, R1, and S1 leads) so that the marker can perform line tip and ring continuity and sleeve lead false ground tests. The F relay also operates the S1 relay, which in turn operates the BY relay.

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

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

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

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

3.08 An L1 line auxiliary relay is provided to connect this circuit through to the distant switchboard as a seizure signal and to control the off-hook and on-hook signals to the distant switchboard.

3.09 A TK relay is provided to supply battery and ground to the distant switchboard as a seizure signal and to detect the answer by the operator.

3.10 The TK1 and TK2 auxiliary relays are provided to place supervisory control of this circuit with the distant operator.

3.11 The H relay and H resistor are provided to send on-hook (high) and off-hook (low) signals to the distant operator and to detect the disconnection by the operator.

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

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

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

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

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

3.16 The A inductor is provided to limit the transmission loss through the supervisory relays.

4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a key-sheet, the connecting information thereon shall be followed.

- (a) Trunk Switch and Connector Circuit - SD-26383-01.
- (b) Traffic Usage Recorder Circuit - SD-96494-01.
- (c) Test Circuit - SD-26411-01.
- (d) Incoming Intercept Trunk Circuit - SD-95789-01, (Typical).

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall be capable of performing all the functions listed in

this Circuit Description and meeting the requirements listed in the Circuit Requirements Tables.

6. TAKING EQUIPMENT OUT OF SERVICE

- 6.01 If it is desired to remove this trunk from service for trouble or other reasons, the test circuit is arranged to ground the MB lead which operates the BY relay. This sets the trunk in the busy state.
- 6.02 The test circuit can ground the MB lead by either of the following methods:
  - (a) Insertion of a make-busy plug in the associated TRK MB-jack.
  - (b) Operation of the remote make-busy facilities if they are provided.
- 6.03 Removal of ground from the MB lead will restore this circuit to service.

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