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CROSSBAR SYSTEMS
NO. 3
TROUBLE RECORD TRUNK CIRCUIT

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SECTION I - GENERAL DESCRIPTION1. PURPOSE OF CIRCUIT

1.01 This circuit completes trouble and alarm record calls from a crossbar No. 3 office arranged for remote trouble recording and also to function with the remote make-busy and restore feature.

2. GENERAL DESCRIPTION OF OPERATION

2.01 When trunk loop is closed, relays A, A1 operate which serves as a signal to start the return of reverse battery supervision to the distant calling end.

2.02 At the completion of supervision, TM timer starts alarm record timing and trunk cut-through is established to either the tape recorder circuit or the remote make-busy and restore control circuit for the pulsing function of the call.

2.03 At the completion of pulsing on a call involving the tape recorder circuit, answer supervision will be returned only if a message parity check in that circuit is successful. At the completion of pulsing on a call involving the remote make-busy and restore control circuit, answer supervision is not returned.

2.04 This trunk circuit will return to normal when relays A, A1 are released after the trunk loop controlled from the distant end is opened.

SECTION II - DETAILED DESCRIPTION1. SEIZURE

1.01 Closure of the loop at the distant crossbar No. 3 office causes relay A to operate. Relay A operated closes a ground path through an A1 resistor and thermistor which delays the operation of relay A1 for a time period of 283 to 319 milliseconds.

1.02 Relay A1 operated:

(a) Bypasses the A1 resistor and thermistor and locks to ground under control of relay A1.

(b) Removes the idle line filter from the tip and ring (resistor and capacitor designated IDL).

(c) Closes an RV3, RV4 path to the tape recorder circuit. This closure prepares an operate path to the tape recorder.

(d) Prepares a lock path for relay CW.

(e) Prepares in part a check path (leads RB8, RB9) to the remote make-busy and restore control circuit.

(f) Completes a ground path through a back contact of relay CW to operate relay RV.

2. SUPERVISION

2.01 Prior to and at the time of trunk seizure the distant office finds battery on the ring lead and ground on the tip lead. The operation of relay RV is a signal to initiate the wink signal which replaces the battery from the ring lead to the tip, and ground from the tip to the ring lead. In addition, a ground path is closed through a thermistor designated CW which operates relay CW after a delay of 47 to 62 milliseconds.

2.02 Relay CW operated and locked under control of relay A1, removes the operate ground of slow-release relay RV. In addition, a tip and ring path is prepared to the tape recorder circuit, a portion of the RB8, RB9 check path to the remote make-busy and restore control circuit is closed, and removes ground from the I3 lead (TM time delay circuit) as a start alarm record timing signal.

2.03 Relay RV releasing (140 to 350 milliseconds) is the end of wink signal whereby battery is returned to the ring lead, ground to the tip lead, and with relay CLP normal provides a clear tip and ring to the tape recorder circuit.

3. TAPE RECORDER FUNCTION

3.01 At the completion of the trunk signal (relay RV released) the test circuit (trouble record sender FS) at the distant end:

(a) Will immediately forward a trouble record message to the tape recorder circuit.

(b) Will delay for a period of 10 to 12 seconds before forwarding an alarm record message to the tape recorder circuit.

3.02 This circuit provides jack access (MON jack) to the trouble analyzer and display circuit which allows record monitor ability as a message is passed through the trunk to the tape recorder circuit.

3.03 At the completion of outpulsing the tape recorder circuit performs a parity check on the number of pulses received. If the parity check is successful, a ground is closed through leads RV1 and RV2 which reoperates relay RV. Relay RV reoperating returns answer supervision to the far end by reversing polarity of the tip and ring and energizes the NTR 15A register.

3.04 The test circuit (trouble record sender FS) recognizing answer supervision within 650 to 815 milliseconds after completion of the start pulse proceeds to open the loop and returns to normal. The opened loop initiates the release sequence of this circuit. If the parity check in the tape recorder circuit is unsuccessful, relay RV is not operated and consequently answer supervision is not returned to the distant end. The test circuit (trouble record sender FS) times out after 650 to 850 milliseconds, outpulses a trouble tone, opens the loop, and initiates a trouble recycle function. The opened loop starts the release of this circuit.

4. ALARM RECORD TIMING

4.01 This circuit in conjunction with circuitry at the far end provides alarm records of alarms in the No. 3 crossbar office in the same manner as trouble records. In addition, this circuit is arranged to identify an alarm record as it is received by tripping an office alarm in the maintenance center.

4.02 Relay CW operated in its supervisory function (2.02) starts first alarm record timing (6.8 to 8.0 seconds).

4.03 If a trouble record call is in progress, a keypulse recognized by the tape recorder circuit prior to time-out, recycles the TM time delay circuit by the placement of ground on the ALM lead.

4.04 If a remote make-busy and restore call is in progress, the operation of relay CLP recycles the TM time delay circuit.

4.05 In either of the two conditions specified above, the TM time delay circuit recycled allows the call to complete normally without an office alarm indication. However, if an alarm record is in progress, the keypulse at the far end is delayed 10 to 12 seconds thereby allowing the TM time delay circuit to time-out, which operates relay ALT. Relay ALT operates relay ALT1 which locks to relay CW. Relay ALT1 recycles the TM time delay circuit which releases relay ALT, and alters the timing components required for the next timing cycle. Relay ALT releasing operates relay ALT2. Relay ALT2 locks to relay CW, starts the TM time delay circuit for calamity timing (13.8 to 16.2 seconds) and prepares an operate path for relay ALM.

4.06 The alarm record keypulse after its enforced delay is recognized by the

tape recorder circuit and applies ground to the ALM lead which operates relay ALM. Relay ALM operated recycles the TM time delay circuit, lights the ALM lamp, and makes available an 800-ohm battery signal to the office alarm circuit. This alarm resistance battery will only be present for the duration of the alarm record (6 to 10 seconds). At the completion of the alarm record this circuit returns to normal as described in 7.

5. CALAMITY ALARM

5.01 At the discretion of the telephone company, a calamity alarm arrangement is available at the No. 3 crossbar location. A cross-connection from GRD to CALM punchings is all that is necessary to accommodate this feature in this circuit.

5.02 A calamity alarm condition at the far end places an enforced continuous loop closure toward this circuit. After recognizing loop closure, this circuit functions normally with returned supervision ready to receive trouble record pulses. After a period of 6.8 to 8 seconds, an alarm record time-out occurs and calamity timing begins as described in 4 of this section.

5.03 After a time period of 13.8 to 16.2 seconds has expired, a second TM time delay circuit time-out occurs to reoperate relay ALT. Relay ALT and previously operated relay ALT2 provides an 800-ohm battery signal (CALM) to the office alarm circuit and also lights the red ALM lamp on this trunk unit. This condition will continue to exist as long as the enforced loop closure is apparent to this circuit.

6. REMOTE MAKE-BUSY AND RESTORE OPERATION

6.01 At the completion of trunk supervision (wink signal) relay ONR is operated by ground furnished on lead RB14 from the remote make-busy and restore control circuit. Relay ONR provides battery supply to the control circuit on leads RB5 and RB7. In addition, the front contacts of relays Al, CW, and a back contact of relay RV, completes a check path (leads RB8, RB9) to the remote make-busy and restore and control circuit which returns ground to operate relay CLP in this circuit. Relay CLP operated releases relay A and holds relay Al through its secondary winding. Relays ONR and CLP operated is a signal to the control circuit to proceed with its pulsing. Relay CLP operated recycles the TM time delay circuit.

6.02 At the completion of pulsing, relay CLP is returned to normal and relay A reoperates and unlike the trouble record call, answer supervision is not returned to the distant end. The trunk circuit now awaits the open loop condition in order to start trunk release. Relay ONR will release under control of the ON key in the control circuit.

7. RELEASE

7.01 To start the release sequence of this circuit, the loop circuit at the distant end must be opened. The loop circuit opened releases relay A which starts the slow-release of relay Al. Relay Al released releases relay RV if operated, returns the idle line filter to the tip and ring, and also releases relay CW. Relay CW releases relays ALT, ALT1, ALT2, ALM if operated, returns the A relay to the tip and ring for the next subsequent call. Relay RV or relay C in the tape recorder circuit releasing scores the NTR 15A register.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Trunk Selection and Supervision

	<u>Resistance</u>	<u>Cable</u>
	<u>45V</u> <u>48V</u>	
Max Ext	6400Ω 6800Ω	60 Miles
Ckt Loop		
Resis-		
tance	30000Ω	

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

<u>Designation</u>	<u>Meaning</u>
A	Supervisory
Al	Supervisory Slave
ALM	Alarm
ALT	Alarm Timer
ALT1	Alarm Timer First State
ALT2	Alarm Timer Second State

<u>Designation</u>	<u>Meaning</u>
CLP	Close Loop
CW	Completed Wink
ONR	Off-Normal Remote
RV	Reversal

2.02 Register

<u>Designation</u>	<u>Meaning</u>
NTR	Number Trouble Records

3. FUNCTIONS

- 3.01 Seizure, A relay operates.
- 3.02 Return supervision to calling end.
- 3.03 Provide cut-through to tape recorder circuit.
- 3.04 Start alarm record timing.
- 3.05 Receive alarm record; send alarm signal to alarm circuit.
- 3.06 Start calamity timing.
- 3.07 Send calamity alarm signal to alarm circuit; light CALM lamp.
- 3.08 Provide cut-through to the remote make-busy and restore control circuit.
- 3.09 Provides battery and ground supply to the remote make-busy and restore control circuit.

3.10 Provides answer supervision on record calls.

3.11 Release when an open loop condition exists.

3.12 Provides jack access to the trouble analyzer and display unit.

4. CONNECTING CIRCUITS

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

(a) Tape Recorder Circuit - SD-26439-01.

(b) Remote Make-Busy and Restore Control Circuit - SD-26372-05.

(c) Trouble Analyzer and Display Circuit - SD-26328-05.

(d) Incoming Auxiliary Trunk - SD-26008-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 The trunk shall be capable of performing all the functions listed in this Circuit Description and meeting the requirements listed in the Circuit Requirements Table.

5.02 All operations and timing shall be made with test voltages within the following limits.

<u>Minimum</u>	<u>Maximum</u>
-48.5 Volts	-50.0 Volts

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