CROSSBAR SYSTEMS
NO. 3
OUTGOING PLUG-ENDED TRUNK
CIRCUIT
MF PULSING
AUTOMATIC NUMBER IDENTIFICATION
OPERATOR ASSISTANCE OR SPECIAL TOLL
E AND M LEAD SUPERVISION
NON-COIN

CHANGES

B. Changes in Apparatus

B.1	Superseded	Superseded By
	M - 18BH Resistor - Fig. 1, Option W	M - 533A Diode - Fig. 1, Option V

D. Description of Changes

D.1 The FS1 and CAD 2 reference to "Transmission and Signaling Facilities with Type I Interface" is added.

D.2 The FS1 has been revised to show the addition of V option. Option W was not formerly designated and is rated Mfr Disc.

D.3 Circuit Note 104 is revised.

F. Changes in CD SECTION III

F.1 In 4.01, add:

(j) Tandem Office with TSP(S) Incoming Trunk Circuit - SD-1B005-01.

(k) Remote Trunk Arrangement No. 1, 2-Wire Incoming Trunk Circuit E&M Lead Supervision - SD-1B116-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25820-JRF-GWC-BT

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is used to handle special toll calls or operator assistance calls from noncoin customers in a No. 3 crossbar office which are to be completed through a TSP(S) office on an automatic number identification (ANI) basis. Special toll calls are prefixed with the zero digit. The called number is MF outpulsed to the distant office.

1.02 This circuit can be used for handling operator assistance calls on a temporary non-ANI basis in which case no sender operations are required. It is arranged for ring back under control of the operator.

1.03 In this CD TSP(S) refers to TSP and TSPS.

2. GENERAL DESCRIPTION OF OPERATION

WITH SENDER

2.01 Sender operation is required on all ANI calls and on special toll non-ANI calls. The marker selects an idle trunk of this type associated with the desired TSP(S) office and when it has completed certain tests the customer is cut through to this circuit. In the meantime an idle sender is selected and connected to this circuit through a sender link. When the sender applies loop closure an off-hook signal is sent forward to seize a TSP(S) incoming trunk. In the TSP(S) office a sender will be attached and when the latter is ready to receive pulses a start signal is sent to the local sender.

2.02 ANI Special Toll Calls (Customer dials "0" followed by the called number.) When the TSP(S) sender is ready to receive the called number the initially returned off-hook is changed to on-hook. The local sender then outpulses the called number, after which it proceeds to obtain calling number information from the marker. When the TSP(S) sender is ready to receive the calling number it changes the on-hook back to off-hook and the local sender now outpulses the calling number. It then releases from the connection, cutting the transmission path through.

2.03 ANI Assistance Calls (Customer dials "0" only.) When the distant office is seized, a TSP(S) sender will be attached and when the latter is ready to receive the calling number it sends an off-hook to the local office. The local sender which has obtained the calling number from the marker outpulses this information after it receives the TSP(S) off-hook. When pulsing is completed the local sender releases, cutting the transmission path through.

2.04 Non-ANI Special Toll Calls - The local sender outpulses called number information as earlier described after which it releases. The calling customer is identified by an operator in the TSP(S) office.

WITHOUT SENDER

2.05 Operator assistance calls can temporarily be handled on a non-ANI basis in which case no sender is required. The customer dials "0" and when the marker has completed its tests the customer is connected to this trunk. The supervisory relay is operated over the station loop, sending a seizure signal to the TSP(S) office.

TSP(S) OPERATOR

2.06 In the TSP(S) office all calls are directed to an operator. When the call results in a chargeable conversation the operator presses a START-TIMING key to indicate to the AMA equipment that a record can be made. On person-to-person calls the operator remains connected long enough to make sure that the desired person is reached. On a collect call, the operator stays on long enough to assure that an authorized person, who agrees to accept the charges, is reached. The operator must also record the credit card number or the number of a third telephone when such calls are handled. This ticket is eventually associated with the AMA record to complete the billing data for the call.

RING BACK

2.07 When the operator wishes to ring back to the calling customer the ring back key is operated and released. This action sends a wink signal to this circuit of 75 to 125 milliseconds. The wink signal causes ringing tone to be connected to the calling line for approximately 1.5 seconds. The timing of this interval is done by this circuit.

SECTION II - DETAILED DESCRIPTION

1. ESTABLISHING CONNECTION (WITH SENDER) - SC1

SEIZURE

1.01 When the marker determines that a trunk of this type is required to complete the call, it finds and selects an idle trunk in the following manner. The marker first locates an idle trunk switch frame that has at least one idle trunk of the desired route before establishing a connection to the frame through its connector. Ground on the FT lead from the trunk indicates to the marker that at least one trunk in the group on the associated frame is idle. Then the marker connects to the idle frame and selects and seizes one of the idle trunks of the desired route. The marker connects resistance battery through a marker relay coil to the TF lead to operate the trunk F relay which self-locks to the TF lead.

1.02 The operation of F:

(a) Grounds leads JC and SW to the trunk switch circuit operating associated trunk connector relays JC and SW, respectively.

(b) Locks directly to lead TF.

(c) Operates relay S1.

(d) Connects sleeve lead S to lead SL to allow the marker to operate the hold magnet in the trunk switch circuit.

(e) Transfers the T, R, and S leads from this trunk to the marker for continuity, ground, etc, tests.

(f) Opens MB lead to test circuit.

(g) Connects SS lead to SSB lead to operate select magnet in outgoing sender link and grounds the VG lead enabling the hold magnet to be operated in the outsender link circuit.

1.03 At the same time that the above is taking place, the marker selects an idle sender. It operates the select magnet of the link switch for the level on which this trunk appears. The select off-normal contacts cause a vertical group (VG) relay to operate through operated F relay contacts, which cause the hold magnet associated with the preferred sender to operate.

1.04 The outsender is now connected to this circuit and operation of the ON relay in the outsender circuit provides a ground to operate relay D in the trunk circuit.

1.05 The D operated:

(a) Removes the idle circuit termination.

(b) Prepares for connecting sleeve lead S to lead SL to the outsender when relay F releases so the outsender will share control of the sleeve lead with the trunk while the outsender is connected.

(c) Opens relay TK operate path.

(d) Transfers the outgoing tip and ring into the sender.

1.06 The S1 operated:

(a) Opens the FT lead to indicate that this circuit is busy.

(b) Prepares a ground to the S lead to the trunk switch circuit for holding the switch connections after the F relay releases.

(c) Opens the operate path for F.

(d) Provides a locking path for itself through TK operated or through L operated and TK1 released.

(e) Prepares a holding path for TK1.

(f) Breaks connection between marker trunk test leads TT and TG.

(g) Opens the MB lead in another place.

1.07 When the marker has completed its functions it releases from the trunk, releasing F and connecting the customer line to this circuit. Relay L operates over the station loop, in turn operating L1.

1.08 The L operated, also provides a locking circuit for S1.

1.09 The L1 operated.

(a) Disconnects the idle circuit termination at an additional place.

(b) Prepares the cut-through of the talking path.

1.10 When D operated, it also placed the M lead under control of SA. When the sender closes the loop to this circuit, SA operates and a seizure signal is sent forward over the M lead.

SPECIAL TOLL CALL - SC1

A. With ANI

1.11 When the TSP(S) incoming trunk is seized it calls for a TSP(S) sender and when the latter is attached an off-hook is transmitted to this circuit which operates relay E. The local sender does not outpulse at this time. When the TSP(S) sender is ready to receive pulses it reverses to on-hook supervision. This action releases E which is recognized by the local sender as a start dial signal and it outpulses the called number. When outpulsing is complete the local sender obtains the calling line information from the marker. After the CAMA sender has registered the called number it sends an off-hook to this circuit as a signal that it is ready to receive the calling number. Relay E reoperates when this second off-hook is received and the local sender now outpulses the calling number after which it releases from the trunk, thereby releasing D and SA.

1.12 The D relay released, cuts the transmission path through. When SA is released, the M lead is placed under control of L1, calling customer.

1.13 The D released, also operates TK which in turn operates TK1.

1.14 The TK1 operated, transfers control of the S1 locking circuit from L, calling customer, to TK, TSP(S) office. The trunk is now in the talking condition.

1.15 In the TSP(S) office an operator will be connected to perform the functions as described in SECTION I.

B. Without ANI

1.16 The difference with the above is that no calling number is outpulsed. The local sender releases from the trunk when the called number is outpulsed. When the TSP(S) sender has registered the called number an off-hook is returned to this circuit, reoperating E.

1.17 The E operated, operates TK, in turn operating TK1. The trunk is now in the talking condition. Identification of the calling customer is done by the TSP(S) or switchboard operator.

OPERATOR ASSISTANCE CALL

A. With ANI - SC1

1.18 A marker directed to set up an ANI assistance call selects an idle trunk and an idle sender in the same manner as described in 1.01 through 1.10. Since there is no called number to be outpulsed the sender proceeds to obtain calling number information from the marker. When the TSP(S) office has returned an off-hook, the calling number is outpulsed to the TSP(S) sender after which the local sender releases. The circuit now functions as earlier described.

B. Without ANI - SC2

1.19 Non-ANI assistance calls do not require sender operations. The marker selects an idle trunk in the same manner as described in 1.01 through 1.10.

1.20 When the marker operates F relay in this circuit S1 operates through F operated. After the marker completes its functions, it releases from the trunk, releasing F and connecting the customers line to this circuit. Relay L operates over the station loop, in turn operating L1. This causes an off-hook to be sent forward to seize the TSP(S) incoming trunk. The L1 operated, also removes the idle circuit termination.

1.21 When the TSP(S) office returns an off-hook, relay E operates. The E operated, operates TK in turn operating TK1. The trunk is now in the talking condition. Control of the S1 locking circuit is transferred from L to TK.

1.22 In the TSP(S) office an operator will be connected to assist the customer.

SENDER RELEASE ON TIME-OUT - SC4

1.23 When the sender is unable to complete its functions it times out. The sender then releases, releasing SA which sends an on-hook forward.

1.24 When the customer disconnects, L releases in turn releasing L1 and S1.

1.25 The S1 released:

(a) Releases the connection.

2. ABANDONED CALL - SC3

2.01 When the marker detects an abandoned call it will release from this circuit, releasing F which returns this circuit to normal. When the call is abandoned during sender functions, the release of the L relay will cause the sender to release after which this circuit returns to normal.

2.02 The circuit action is as follows

(a) Either F or L released, releases S1. When a sender is already engaged, S1 released removes ground from the AB lead and the sender releases. The S1 released, releases the connection. When the sender is released SA and D release and this circuit is returned to normal.

3. RING BACK - SC5

3.01 When the operator wishes to ring back to the calling customer the ringback key must be operated and released. This causes a wink signal of 75 to 125 milliseconds to be transmitted to this circuit. The E relay releases at the beginning of this interval. The E released, operates E1. When E reoperates at the end of the wink, R operates which connects ringing tone to the calling line;

(a) Under all circumstances when unrestricted ring back is provided, option X.

(b) When the customer is off-hook when restricted ring back is provided.

3.02 When E reoperated, it also removed the shunt across the D capacitor allowing it to discharge. After 1.5 to 2.0 seconds the TM timer operates operating relay TM.

3.03 Relay TM operated, releases R thereby removing ringing tone from the line. It also releases E1 which in turn releases relay TM.

3.04 The above operation takes place every time the ringback key is operated and released.

3.05 Resistor L1 in parallel with relay L1 coil guards against L releasing L1 relay should L release momentarily during contact stagger of relay R contacts when R operates and releases.

4. DISCONNECT - SC6

4.01 As mentioned earlier, when this circuit is in the talking condition the TSP(S) office has control over the connection. When the TSP(S) office disconnects,

this circuit will therefore release the connection and return to normal regardless of customer supervision.

4.02 The circuit action is as follows:

(a) When TSP(S) disconnects it sends an on-hook to this circuit causing E to release. The E released, releases TK, in turn releasing S1. The S1 released, releases TK1. The S1 released also releases the hold magnets. Relays L and L1 will release at this time when the customer has not already disconnected.

5. TESTING

5.01 Routine tests are made on this trunk by setting up a test connection to this trunk from the test frame to distant office incoming trunk test line. The test frame circuit is used to control a marker which selects this trunk in the same general manner as for a regular call with the exception that if the trunk has already been made busy, the marker can be directed to temporarily remove ground from lead MB of the trunk circuit, via the trunk switch circuit, thus permitting this trunk to be selected by the marker. Routine operations are performed from the test line to the distant TSP(S) in the same manner that a call is completed from a customer to the TSP(S).

5.02 If tests are to be performed on tip and ring cable connectors to TSP(S) office, access can be obtained at the CDM.

5.03 When the test connection is released, relay S1 will release. The S1 released, releases TK1 and hold magnets after which this circuit is returned to normal.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 See keysheet for customer line working limits.

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

Desig	Meaning	Main Function
D	Traditional	Transfers TSP(S) tip and ring into sender when the latter is attached.
E	Traditional	Repeats on- and off-hook signals from TSP(S).
E1	Auxiliary to E	
F	Frame	Operates when this circuit is seized by the marker.
L	Calling Customer Supervision	Operates over the station loop.
L1	Auxiliary to L	
R	Ring back	Operates after a wink signal of 75 to 125 milliseconds is received from TSP(S) to connect ringing tone to the calling tone.
S1	Sleeve	Operated by the marker. Initially held under control of calling customer and after this circuit is in the talking condition under control of TSP(S).
SA	Sender Attached	Operates when the sender applies loop closure to send a seizure signal forward.
TK	Talking	Operates when TSP(S) returns off-hook following sender outpulsing.
TK1	Auxiliary to TK	
TM	Timer Relay	Operates under control of the E relay and TM timer circuit.

2.02 Timer

Desig	Meaning	Main Function
TM	Timer	Times 1.5 to 2.0 seconds after a wink signal of 75 to 125 milliseconds is received from TSP(S), to limit the application of ringing on the calling line to this interval.

3. FUNCTIONS

3.01 To serve the following types of non-coin traffic to a TSP(S) office on an assignment basis:

(a) Special Toll Calls with ANI.

(b) Special Toll Calls non-ANI.

(c) Operator assistance calls with ANI.

Non-ANI operator assistance calls can also be served temporarily.

3.02 The first three types require engagement of an outgoing sender to outpulse called and/or calling number information.

3.03 To appear idle to completing markers by presence of ground on the FT lead.

3.04 To appear busy to subsequent originating traffic by absence of ground on the FT lead:

(a) When serving a regular call.

(b) When handling a test call.

(c) When made busy locally at the test circuit.

(d) When made busy from a remote location via the make-busy and restore translator circuit.

3.05 To hold the connection by connecting ground to the sleeve:

(a) Initially under control of the calling customer.

(b) After this circuit is in the talking condition under control of the TSP(S) office.

3.06 To give an indication to the traffic usage recorder circuit when this circuit is serving a call.

3.07 To send a seizure signal (off-hook) forward when an outgoing sender is attached and to provide a pulsing path for the sender.

3.08 To recognize an abandoned call during marker and/or sender functions after which this circuit returns to normal.

3.09 To recognize a wink signal from TSP(S) of 75 to 125 milliseconds to activate its ringback feature.

3.10 To connect ringing tone to the calling line for an interval of 1.5 to 2.0 seconds every time a wink signal is received from TSP(S).

3.11 To provide an idle circuit terminating network to the carrier equipment.

3.12 To provide access for the office test equipment.

4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a key-sheet the information thereon should be followed. This circuit will function with the following crossbar system circuits:

(a) Trunk Switch and Connector Circuit - SD-26383-01.

(b) Test Circuit - SD-26411-01.

(c) PRTD Circuit - SD-26414-01.

(d) Traffic Usage Recorder Circuit - SD-96494-01.

(e) Outsender Link Circuit - SD-26395-01.

(f) CX Set and Rep Coil Circuit - SD-95004-01.

(g) 4-wire Terminal Set 900-Ohm Impedance - SD-95489-01.

(h) N1-Carrier Application Schematic - SD-95121-01.

(i) Patching Jack Circuit - SD-56498-01.

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 A jack per trunk is provided at the test circuit for making the trunk busy. When a shorting plug is inserted, ground is applied to the MB lead of the trunk. If the trunk is not in use relay D will operate to open leads TF and FT to the marker. If trunk is in use with a call, D relay will not operate until that call ends and relays F, S1, and TK1 return to normal. Insertion of the plug does not interfere with a call that may be in progress.

6.02 When testing this trunk, the test circuit will operate relay TST in the test circuit to remove ground from MB leads

of any trunks that are made busy and associated with that trunk switch. The trunk is then seized normally by the marker as directed by test circuit.

6.03 When remote make-busy facilities are provided, the MB lead to the trunk can be grounded by the operation of an associated latching relay located in the remote make-busy and restore translator circuit via the jack of the test circuit.

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