

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

CHANGES

B. Changes in Apparatus

B.1	<u>Superseded</u>	<u>Superseded By</u>
	M - 18BH Resistor - Fig. 1, Option P	M - 533A Diode - Fig. 1, Option N

D. Description of Changes

D.1 The FS1 has been revised to show the addition of N option. Option P was not formerly designated and is rated Mfr Disc.

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

D.3 Circuit Note 104 revised.

F. Changes in CD SECTION III

F.1 In 4.01, add:

(g) 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

CROSSBAR SYSTEMS
NO. 3
OUTGOING PLUG-ENDED TRUNK
CIRCUIT
MF PULSING
AUTOMATIC NUMBER IDENTIFICATION
OPERATOR ASSISTANCE OR SPECIAL TOLL
E AND M LEAD SUPERVISION
COIN AND NONCOIN
IN-BAND OR MULTIPLE WINK COIN
CONTROL

CHANGES

D. Description of Changes

D.1 The FS1, contact 10 break of the S2 relay is removed from the operate path of the PB relay and the circuit is arranged so that with nonrecord option R both the CN and PB relays must operate for ground to be returned on lead CN. Nonrecord option Q is added so that ground will still be returned to the CN lead when option R is not used.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25820-JRF-GWC-PN

13

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

TABLE OF CONTENTS	PAGE	TABLE OF CONTENTS (Cont)	PAGE
<u>SECTION I - GENERAL DESCRIPTION</u>	1	<u>2. ABANDONED CALL - SC3</u>	8
<u>1. PURPOSE OF CIRCUIT</u>	1	<u>3. RINGBACK - SC7 (APP FIG. 2)</u>	8
<u>2. GENERAL DESCRIPTION OF OPERATION</u> .	2	<u>4. RINGBACK - SC3 (APP FIG. 3)</u>	9
WITH SENDER.	2	<u>5. RINGBACK (NONCOIN)</u>	9
A. <u>ANI Special Toll Calls</u> (Customer Dials "0" Followed by the Called Number).	2	<u>6. OPERATOR ATTACHED STATE</u>	9
B. <u>ANI Assistance Calls</u> (Customer Dials "0" Only).	2	<u>7. OPERATOR RELEASED STATE</u>	9
C. <u>Non-ANI Special Toll Calls</u>	2	<u>8. DISCONNECT - SC7</u>	9
WITHOUT SENDER	2	<u>9. TESTING</u>	10
COIN CONTROL AND RINGBACK.	2	<u>10. NONCOIN CALLS</u>	10
<u>SECTION II - DETAILED DESCRIPTION</u>	3	<u>SECTION III - REFERENCE DATA</u>	10
<u>1. ESTABLISHING CONNECTION - SC1 -</u> <u>COIN CALL</u>	3	<u>1. WORKING LIMITS</u>	10
SEIZURE.	3	<u>2. FUNCTIONAL DESIGNATIONS</u>	10
SPECIAL TOLL CALL - SC1.	4	<u>3. FUNCTIONS</u>	11
A. <u>With ANI</u>	4	<u>4. CONNECTING CIRCUITS</u>	13
B. <u>Without ANI</u>	5	<u>5. MANUFACTURING TESTING REQUIRE-</u> <u>MENTS</u>	13
OPERATOR ASSISTANCE CALL	5	<u>6. TAKING EQUIPMENT OUT OF SERVICE</u> . .13	
A. <u>With ANI - SC1</u>	5	<u>SECTION I - GENERAL DESCRIPTION</u>	
B. <u>Without ANI - SC2</u>	5	<u>1. PURPOSE OF CIRCUIT</u>	
COIN CONTROL - SC5 (APP FIG. 2). . . .	6	1.01 This circuit is used to handle special toll calls or operator assistance calls from coin or noncoin customers in a crossbar No. 3 office which are to be com- pleted through a crossbar tandem office, TSP or TSPS [TSP(S)], on an automatic number identification (ANI) basis. Special toll calls are prefixed with the zero digit. The called number is MF outputted to the distant office.	
A. <u>General</u>	6		
B. <u>Coin Return - SC5</u>	6		
C. <u>Coin Collect - SC5</u>	7		
COIN CONTROL - SC6 (APP FIG. 3). . . .	7		
A. <u>General</u>	7		
B. <u>Coin Return - SC6</u>	7		
C. <u>Coin Collect - SC6</u>	8		
SENDER RELEASE ON TIME-OUT - SC4 . . .	8		

1.02 This circuit also handles operator assistant calls on a temporary non-ANI basis in which case no sender operation is required. For this purpose, use in-band signaling only for coin control.

1.03 When App Fig. 2 is used this circuit is arranged for coin control and ringback using two frequencies over tip and ring.

1.04 When App Fig. 3 is used this circuit is arranged for coin control and ringback using the multiwink counter.

1.05 The circuit can be arranged to automatically return the initial coin when the operator answers. Also, the circuit can be arranged for coin service improvements (dial-tone-first).

2. GENERAL DESCRIPTION OF OPERATION

WITH SENDER

2.01 The MF sender operation is required on all ANI calls and on special toll non-ANI calls. The marker selects an idle trunk associated with the desired TSP(S) office and when it has completed certain tests the customer is cut through to this trunk. 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 the 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.

A. ANI Special Toll Calls (Customer Dials "O" Followed by the Called Number)

2.02 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 outputpulses 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 outputpulses the calling number. It then releases from the connection, cutting the transmission path through.

B. ANI Assistance Calls (Customer Dials "O" Only)

2.03 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, outputpulses this information after it receives the TSP(S) off-hook. When pulsing is completed the local sender releases, cutting the transmission path through.

C. Non-ANI Special Toll Calls

2.04 The local sender outputpulses the called number as earlier described after which it released. The calling customer is identified by the 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 "O" 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.

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.

COIN CONTROL AND RINGBACK

2.07 When App Fig. 2 is used coin control and ringback signals are received from the TSP(S) office using inband frequencies over tip and ring. A wink signal precedes the application of the frequencies. An electronic receiver circuit associated with this trunk detects the frequencies and causes the proper relays in this circuit to function. The application of the signals is timed by the TSP(S) office. A timer in this circuit functions in conjunction with the coin return relays when the call is abandoned during marker and/or sender functions. When a wink signal from TSP(S) is not followed by frequencies (false wink), the timer times out to release the receiver circuit and restore the talking path.

*The word sender is defined here as a cross-bar tandem sender for TSP or a digit receiver for TSP(S).

2.08 When App Fig. 3 is used coin control and ringback pulses are received from the E relay. These pulses are received by the multiwink counter. The counter supplies ground to the necessary relay and a timer determines the duration of the ringback signal.

2.09 Where the circuit is arranged to automatically return the coin or coins when the operator answers, the circuit completes a coin return cycle upon receiving an off-hook signal from the distant end after the sender completes pulsing. In the case where a sender is not used, the coin return cycle occurs upon receiving an off-hook signal from the distant end.

2.10 Where the circuit is arranged for coin service improvements (dial-tone-first) a +48 volt supply is used on coin calls for talking battery and supervision to the coin station. When App Fig. 3 is provided the +48 volt potential is under control of the TSP(S) and is applied only when an operator is attached.

SECTION II - DETAILED DESCRIPTION

1. ESTABLISHING CONNECTION - SC1 - COIN CALL

SEIZURE

1.01 The marker selects an idle trunk in the usual manner by first selecting a particular trunk switch frame which has access to an idle sender, and which has at least one idle trunk associated with the desired route. It then selects a particular trunk by placing low-resistance battery through a marker relay coil on the individual TF lead, operating the F relay. When the marker selected the trunk switch frame it locked out the other marker from that frame until completion of its functions in connection with this call.

1.02 The F relay operated:

- (a) Locks to lead TF.
- (b) Connects positive 130 volts through 1500 ohms to lead JC.
- (c) Operates S1 relay.
- (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 and R 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 out-sender link circuit.

(h) Operates relay CN over lead CN if the call is a coin call.

(i) Connects +130 volts through resistor E to lead JC to the trunk switch circuit operating an associated trunk connector relay.

1.03 Relay CN in operating:

(a) Prepares the operate paths of relays CC and CR.

(b) If the circuit is arranged for coin service improvements, operates relay PB.

1.04 Positive 130 volts connected to the JC lead causes the trunk switch circuit to function in conjunction with the marker to set up the call. The battery start arrangement is preferred over the ground start arrangements found in other types of outgoing trunks, because of the coin control functions of this circuit. (Should the +130 volt supply fail, the trunk switch circuit does not function and the marker causes a trouble record to be made.)

1.05 Assuming that the trunk switch circuit functions normally, the marker proceeds to test this circuit. The sleeve is tested for trouble ground and the tip and ring are tested for continuity to the customer line.

1.06 The F relay operated also extends leads SL and SSB into the marker.

1.07 This circuit is arranged for coin and noncoin operation and for a coin call, the marker will ground the CN lead operating the CN relay. The operation of relay CN operates relay PB if the circuit is arranged for coin service improvements (dial-tone-first).

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

which causes the hold magnet associated with the preferred sender to operate. The sender is now connected to this circuit and relay D is operated over the D lead.

1.09 Relay 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 in the control of the sleeve lead with the trunk while the sender is attached.
- (c) Transfers the outgoing tip and ring into the sender.

1.10 Relay S1 operated:

- (a) Opens the MB lead to make this circuit busy.
- (b) Enables operate path of L relay.
- (c) Operates S2.
- (d) Self-locks to ground through L or TK operated.

1.11 Relay S2 operated:

- (a) Opens the TF lead at an additional place.
- (b) Disconnects ground from the FT lead to make this frame busy, insofar as this circuit is concerned.
- (c) Enables a ground to lead S to the trunk switch circuit for holding the switch connections.
- (d) Provides an additional locking path for CN relay.
- (e) Breaks an additional point between marker trunk test leads TT and TG.
- (f) Prepares the operation of TK1.
- (g) Connects ground to the sleeve to hold the connection through the switch and to give an indication to the traffic usage recorder circuit.
- (h) Provides a holding path for relay CN.

1.12 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. If

this is a coin call and the circuit is arranged for coin service improvements (dial-tone-first), +48 volt talking battery is used to provide the feature by disabling the nickel trap relay in the coin telephone. This allows the operator to collect a single nickel, such as might be required for calls where the charge is 15 cents, 25 cents, 30 cents, 35 cents, etc. If coin service improvements (dial-tone-first) is not provided in the office, the -48 volt talking battery disables the nickel trap relay in the coin telephone, and thus allows the operator to collect a single nickel, if necessary.

1.13 Relay L operated, also provides a locking path for S1.

1.14 Relay L1 operated:

Note: Resistor L1 in parallel with the coil of relay L1 guards against relay L releasing L1, should L release momentarily due to contact stagger of relay R contacts when R operates and releases.

(a) Holds the idle circuit termination disconnected when the sender releases D.

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

1.15 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

1.16 When the TSP(S) sender is attached an off-hook is transmitted to this circuit which operates relay E. The local sender does not output at this time. When the TSP(S) sender is ready to receive pulses it reverses to on-hook which is recognized by the local sender as a dial signal (after which it output pulses the called number). When outputting is complete the local sender obtains the calling line identification information from the marker. After the TSP(S) 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. The E reoperates when this second off-hook is received, once again reversing the tip and ring to the sender. The sender now output pulses the calling number after which it releases from the trunk, thereby releasing D and SA.

1.17 The D relay released, cuts the transmission path through.

1.18 When SA is released, the M lead is placed under control of L1 (calling customer).

1.19 Relay D released, also operates relay TK which:

- (a) Operates relay TK1 if the call is a noncoin call or the call is a coin call with the automatic return of the initial coin feature not provided.
- (b) Provides additional locking path for S1 relay.
- (c) Operates relay CR if the call is a coin call with the automatic return of the initial coin feature provided.

1.20 In the case where relay TK operates relay TK1, the operation of relay TK1 transfers control of the relay S1 locking path from L (calling customer) to TK (TSP(S) offices). The trunk circuit is now in the talking condition. In the TSP(S) office an operator will be connected to perform the functions as described in SECTION I.

1.21 When option S is furnished the TK relay operates and the circuit completes a coin return sequence. Relay CR is operated which in turn operates relay CB. The operation of relay CB:

- (a) Applies the coin return potential to the customer line.
- (b) Starts timer CT. A minimum of 500 milliseconds later relay CT operates.

The operation of the CT relay:

- (c) Removes the coin return potential from the customer line.
- (d) Operates relay TK1.
- (e) Releases slow-release relay CR.

Relay TK1 operated:

- (f) Releases relay CR.
- (g) Transfers control of the relay S1 locking path from relay L (calling customer) to relay TK (TSP(S) office).

Relay CR in releasing releases slow-release relay CB. The line discharge network (resistors B and C, and capacitor B) remains connected to the line for approximately 400 milliseconds (release intervals of CR and CB in tandem). Relay CB in releasing releases relay CT and closes the transmission path. The trunk circuit is now in the talking condition.

B. Without ANI

1.22 Without ANI, no calling number is outpulsed. The local sender releases from the trunk after 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. When relay D releases, relay TK is operated and from this point the circuit functions as described in A above. Identification of the calling customer is done by the operator.

OPERATOR ASSISTANCE CALL

A. With ANI - SC1

1.23 Dedicated (TSP) - 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 SEIZURE. 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 and the local sender releases. The circuit now functions as described in 1.17 through 1.21.

1.24 Nondedicated TSP(S) - Upon seizure the TSP(S) returns an off-hook followed by an on-hook causing the sender to pulse a KP signal immediately by a start signal. Upon receipt of these signals the TSP(S) returns an off-hook as an ANI request.

B. Without ANI - SC2

1.25 Non-ANI assistance calls do not require sender operations. The marker selects an idle trunk in the same manner as described in SEIZURE.

1.26 Relay S1 operated through operated F relay contacts.

1.27 The S1 operated, operates S2. After the marker completes its functions it releases from the trunk, releasing F which

connects the customer line to this circuit. Relay L operates over the station loop, in turn operating Ll. This causes an off-hook signal to be sent forward to seize the TSP(S) incoming trunk. The Ll operated, also removes the idle circuit termination.

1.28 When the TSP(S) office returns an off-hook, relay E operates.

1.29 Relay E operated, operates relay TK and from this point the circuit functions as described in 1.19 through 1.21.

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

COIN CONTROL - SC5 (APP FIG. 2)

A. General

1.31 This circuit is arranged to use ac signaling for the coin disposal and ringback features. A 700-Hz frequency activates the ringback feature. An 1100-Hz frequency activates the coin return feature, and a combination of 700-Hz and 1100-Hz tones activates the coin collect feature. The dual channel receiver circuit associated with this circuit detects the tones and causes the proper relays in this circuit to function. Before transmitting the frequencies, the TSP(S) office will send this circuit a wink signal of 75 through 125 milliseconds followed by an off-hook condition of maximum 300 milliseconds. This is necessary to cut in the receiver circuit and to condition the CX signaling units. When the off-hook condition following the wink signal exceeds 500 milliseconds, this circuit times out restoring the transmission path and releasing the receiver circuit.

B. Coin Return - SC5

1.32 On abandoned calls or sender or marker time-outs the auxiliary coin line circuit returns the coin after the channel has been released and the calling party goes on-hook.

(a) When the wink signal is received relay E releases, causing El to operate.

1.33 Relay El operated:

(a) Locks under control of ER normal.

(b) Prepares the operation of ER.

(c) Allows the called line to discharge.

1.34 Function (c) above takes place at this time, ie, before the tones are applied to prevent surges that would cause false operation of relays F1 and F2.

1.35 At the end of the wink signal relay E reoperates, causing ER to operate.

1.36 Relay ER operated:

(a) Locks under control of CT.

(b) Releases El.

(c) Connects relays F1 and F2 to the outputs of the receiver circuit.

(d) Transfers the trunk tip and ring into the receiver.

(e) Provides a holding path for the L relay.

(f) Provides an additional path for battery to the M lead, to maintain a steady off-hook condition forward, even when Ll releases.

(g) Removes the shunt from the CT capacitor to start the timing.

1.37 Maximum 300 milliseconds after the end of the wink signal, 1100-Hz tone will be received causing the receiver circuit to ground its lead 9. This action causes F2 to operate.

1.38 The F2 operated, operates F3. Relay F3 is somewhat slow operating (15 through 40 milliseconds). This is done to allow transient conditions in the operate paths of CC and CR to disappear in order to operate the proper relay when ground is cut through from F3 operated.

1.39 Relay F3 operated:

(a) Operates CR.

(b) Reconnects a shunt across capacitor CT to stop the timing.

(c) Provides holding circuits for S2 and ER.

1.40 Relay CR operated:

(a) Operates CB.

- (b) Extends coin return potential to a front contact of CB.

1.41 Relay CB operated connects the coin return potential to the line.

1.42 To ensure the operation of the station coin magnet the TSP(S) office applies the signal for a minimum duration of 500 milliseconds.

1.43 When the 1100-Hz tone is removed from the trunk, the receiver circuit removes ground from its lead 9 which releases F2 in this circuit.

1.44 Relay F2 released:

- (a) Releases F3 which removes the coin potential from the line.

- (b) Releases CR.

1.45 Relay F3 released, releases ER which returns the receiver circuit to normal, and partly restores the transmission path.

1.46 Relay CR released, releases CB.

1.47 Relays CR and CB are slow-release relays and their release intervals in tandem (minimum 400 milliseconds) provide sufficient time for a RC- network (resistors B and C, and capacitor B) to drain off charges from the line before talking battery is restored to the line.

1.48 Relay CB released restores the transmission path.

1.49 False wink: When the wink signal is not followed by 1100-Hz tone this circuit will time out, releasing the receiver circuit and restoring the talking path. The circuit action is as follows. The ER relay starts the CT timer which operates the CT relay after approximately 500 milliseconds.

1.50 Relay CT operated:

- (a) Locks locally under control of ER, at the same time disconnecting the CT timer.

- (b) Releases ER.

1.51 Relay ER released:

- (a) Releases the receiver circuit.

- (b) Restores the trunk tip and ring to the talking path.

- (c) Releases relay CT.

C. Coin Collect - SC5

1.52 The circuit action is similar as for coin return. The combination of 700-Hz and 1100-Hz tones now causes both relays F1 and F2 to operate and when F3 operates, relay CC is operated.

COIN CONTROL - SC6 (APP FIG. 3)

A. General

1.53 When App Fig. 3 is provided this circuit is arranged to use a multiwink counter. Five pulses activate the ringback feature. Four pulses activate the coin return feature and three pulses activate the coin collect feature. The multiwink counter supplies ground to the correct relay in the circuit. When the off-hook condition following the wink signal exceeds 300 milliseconds, the CT1 timer times out allowing the wink-counter to furnish ground.

B. Coin Return - SC6

1.54 Relay E releases causing relay ST to operate.

1.55 Relay ST operated:

- (a) Prepares holding path for counter.
- (b) Sets up relay SP operating path.
- (c) Blocks ground from being supplied from counter prematurely.
- (d) Locks itself through CT1 contact.
- (e) Prepares CT1 timer.

1.56 Relay E reoperates, operating ORC.

1.57 Relay ORC operated:

- (a) Completes locking path through OAC contact.
- (b) Relay SP operates.
- (c) Prepares ground path from counter.

1.58 Relay E releases, operating OAC relay.

1.59 Relay OAC operated:

- (a) Completes locking path through CCC.
- (b) Releases ORC.
- (c) Prepares ground path from counter.

1.60 The procedure (1.54 through 1.59) continues until relay CRC is operated.

1.61 Relay CRC operated:

- (a) Releases CCC.
- (b) Prepares ground path from counter.

1.62 When E relay does not release in 205 to 240 milliseconds, CT1 operates.

1.63 Relay CT1 operated, releases ST relay.

1.64 Relay ST released:

- (a) Completes ground path to CR relay through CRC contact.
- (b) Releases relay SP.

1.65 Relay CR operated:

- (a) Operates CB.
- (b) Extends coin return potential to a front contact of CB.

1.66 Relay CB operated:

- (a) Connects the coin return potential to the line.
- (b) Released counter thus releasing CRC.
- (c) Starts CT timer.

1.67 Maximum 605 milliseconds later, CR relay is released and the CB is released. The line now is restored to normal.

C. Coin Collect - SC6

1.68 The wink counter receives only three pulses and the counter stops at CCC relay operated. The counting procedure is the same as 1.54 through 1.59. The CC relay is operated.

1.69 Relay CC operated:

- (a) Operates CB.
- (b) Extends coin collect potential to a front contact of CB.

1.70 Relay CB operated:

- (a) Connects the coin collect potential to the line.
- (b) Releases the counter thus releasing CCC.
- (c) Starts CT timer.

1.71 Maximum 605 milliseconds later CC relay is released and the CB is released; the line now is restored to normal.

SENDER RELEASE ON TIME-OUT - SC4

1.72 When the sender is unable to complete its functions it times out and operates its RO relay. This removes ground from the sleeve (S) lead of this trunk circuit, which releases the channel and the sender and sets the line to lock-out. This circuit restores to normal.

1.73 The line lock-out circuit connects overflow tone to the customer line. When the party hangs up, the auxiliary coin line circuit returns the coin.

2. ABANDONED CALL - SC3

2.01 When the marker detects an abandoned call it will release the F relay after which this circuit starts to release. 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 auxiliary coin line circuit will return the coin when the calling customer hangs up.

3. RINGBACK - SC7 (APP FIG. 2)

3.01 As already mentioned in 1.31 a 700-Hz frequency activates the ringback feature. When the ringback key in the TSP(S) office is operated a wink signal of 75 through 125 milliseconds is transmitted to this circuit, releasing E which operates E1. When E reoperates at the end of the wink, ER operates which cuts in the receiver circuit and releases E1. The now following off-hook condition of maximum 300 milliseconds is to condition the receiver circuit and the CX- signaling units. When the 700-Hz tone is received the receiver circuit functions, causing F1 in this circuit to operate. Relay F1 operated, operates F3 which operates RB and stops the timing. Timing was started when ER operated and is necessary to release the receiver circuit

and restore the talking paths when 700-Hz tone is not received maximum 300 milliseconds after the wink.

3.02 The RB operated, operates R and ringing tone is applied to the calling customer.

3.03 When the ringback key is released, the 700-Hz tone is removed from the trunk. The receiver circuit in turn releases F1 in this circuit.

3.04 The F1 released:

(a) Releases F3 which releases ER.

(b) Releases RB in turn releasing R which removes ringing from the calling line.

3.05 The ER released, restores the talking path.

3.06 The RB is somewhat slow-release (37 through 95 milliseconds) to prevent ER from being held operated through CB and RB normal, should RB release before F3 releases.

3.07 The above operations take place every time the ringback key is operated and released.

4. RINGBACK - SC8 (APP FIG. 3)

4.01 As already mentioned in 1.52 five pulses activate the ringback feature. The wink counter counts to the fifth position by the same method discussed in 1.54 through 1.59. Relay RBC is now operated. The counter now checks for more pulses by the same method as 1.62 through 1.63.

4.02 Relay RBC operated:

(a) Releases CRC.

(b) Prepares ground path from counter.

4.03 Relay ST released:

(a) Completes ground path to the RB relay through RBC contact operating RB relay.

(b) Releases relay SP.

4.04 Relay RB operated:

(a) Operates R and ringing tone is applied to the line.

(b) Releases wink counter.

(c) Starts CT timer.

4.05 The CT relay operates 2000 milliseconds to 2400 milliseconds later.

4.06 Relay CT operated:

(a) Relay RB releases.

(b) Counter is reset.

4.07 Relay RB released:

(a) Relay CT releases.

(b) Relay R releases.

4.08 Ringing removed.

5. RINGBACK (NONCOIN)

5.01 On noncoin calls the ringback signal is the same as for coin calls either for the inband signaling or multiple wink option. However, when option V is not provided ringback is only permitted against an off-hook. This allows the TSP(S) operator to alert a PBX attendant at the end of a call. If there are only single-party lines in the office, option V can be provided so that ringback is permitted at all times.

6. OPERATOR ATTACHED STATE

6.01 The wink-counter receives two pulses and the OAC relay is operated. This is achieved by the same method discussed in 1.54 through 1.59. The PB relay is now operated through an OAC contact. The operation of PB causes the operation of the TRN relay which resets the wink-counter. The resetting of the counter causes the release of OAC and in turn TRN.

7. OPERATOR RELEASED STATE

7.01 The sequence of events to achieve the operator released state is the same as discussed in 6.01 with the exception that the ORC relay is operated instead of the OAC relay and OR instead of the PB relay. The operation of OR causes the release of PB. The release procedure is the same as discussed in 8.01 with the exceptions discussed above.

8. DISCONNECT - SC7

8.01 After this circuit is in the talking condition, control of the connection

is with the TSP(S) office. The operator is therefore able to ring back after the customer has hung up. On the other hand, when the TSP(S) office disconnects this circuit will release the connection regardless of customer supervision. The customer is therefore unable to hold the connection indefinitely. The circuit action is as follows.

8.02 With App Fig. 2 - A wink signal will be received from TSP(S) to make this circuit dispose of the coins. When the tone signals are removed relay E releases. The receiver circuit will be released at this time and F3 and ER return to normal. In the time that the discharge network is connected to the line, relay TK will release, in turn releasing S1. When CB is released at the end of the line discharge interval, relay S2 releases, releasing the connection. When the customer has not yet hung up, relays L and Ll will release at this time because S1 released removes the L relay connection from the ring lead.

8.03 With App Fig. 3 - Three or four winks will be received by the wink counter depending on the type of coin disposal. Relay CB releases releasing the counter. Relay E releases when an on-hook is received from crossbar tandem. Relay TK releases in turn releasing the S1 relay. When CB released at the end of the line discharge interval, relay S2 releases, in turn releasing TK1 and the connection. When the customer has not yet hung up, relay L and Ll will release at this time.

8.04 Relay S2 released, releases TK1, removes the busy indication and this circuit is restored to normal.

9. TESTING

9.01 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).

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

10. NONCOIN CALLS

10.01 The CN relay will not be operated upon trunk seizure on a noncoin call. The CN not operated prevents the CC, CR, and AB relays from operating. Trunk operation will proceed in the normal manner without the coin collect and coin return sequence. No operator attached on return signals will be received from TSP(S) and circuit will remain in operator released condition.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 See keysheet for customer line working limits.

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

<u>Desig</u>	<u>Meaning</u>	<u>Main Function</u>
CB	Coin Battery	Connects positive or negative 130 volts to the line to operate the coin magnet in the station equipment.
CC	Coin Collect	Prepares connection of positive 130 volts to the line when 700- and 1100-Hz tones are received from TSP(S).
CCC	Coin Collect Counter	Supplies ground from counter to CC relay.
CN	Coin Call	Operated by the marker circuit on coin calls. Enables functions applicable only to coin calls and disables coin call functions on non-coin calls.
CR	Coin Return	Prepares connection of negative 130 volts to the line when 1100-Hz tone is received from TSP(S).
CRC	Coin Return Counter	Supplies ground from counter to CR relay.

<u>Desig</u>	<u>Meaning</u>	<u>Main Function</u>	<u>Desig</u>	<u>Meaning</u>	<u>Main Function</u>
CT	Coin Timer	Operates under control of the CT timer.	PB	Positive Battery	Operated on coin calls where the office is arranged for coin service improvements (dial-tone-first). Applies +48 volt talking battery to the coin station for supervision to operate the nickel trap relay in the coin station.
CTL	Counter Timer	Operates under control of the CTL timer.			
D	Traditional	Transfers TSP(S) tip and ring into the sender when the latter is attached.			
E	Traditional	Repeats on- and off-hook signals received over the E lead from TSP(S).	R	Ringling	Connects ringing tone to the calling line.
E1	Auxiliary to E		RB	Ring Back	Operates when a ring-back signal is received from TSP(S).
ER	Electronic Receiver	Operates when a wink signal is received from TSP(S) to transfer outgoing tip and ring to the receiver circuit.	RBC	Ring Back Counter	Supplies ground to RB relay.
F	Traditional	Operates when this circuit is seized by a marker.	S1	Sleeve	Operates under control of the marker. Initially held under control of calling customer and after this circuit is in the talking condition under control of TSP(S).
F1	Frequency 1	Operates when the receiver circuit detects 700-Hz tone.	S2	Auxiliary to S1	
F2	Frequency 2	Operates when the receiver circuit detects 1100-Hz tone.	SA	Sender Attached	Operates when the sender applies loop closure to send a seizure signal forward (battery on M lead).
F3	Auxiliary to F1 and F2	Somewhat slow-operating (15 through 40 milliseconds) to ensure operation of proper coin control relay.	SP	STOP	Breaks starting ground path.
L	Calling Customer Supervision	Operates over the station loop.	ST	Start	Closes starting ground path.
L1	Auxiliary to L		TK	Talking	Operates when TSP(S) returns off-hook following sender out-pulsing.
OAC	Operator Attached Counter	Supplies ground to PB relay.	TK1	Auxiliary to TK	
OR	Operator Released	Operates when operator released signal is received by wink counter.	TRN	Transfers	Operates when operator attached, operator released functions change state.
ORC	Operator Released Counter	Supplies ground to OR relay.			

3. FUNCTIONS

3.01 To serve the following types of coin originated 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.
Operator assistance calls non-ANI
can also be served temporarily, on an optional basis.

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

- 3.02 To appear idle to a marker by presence of ground on the FT lead.
- 3.03 To allow the trunk switch circuit to function in conjunction with the marker by connecting positive 130 volts through 1500 ohms to the JC lead. Should the +130 volt supply develop trouble the call will not be routed through this circuit and a trouble record is made.
- 3.04 To appear busy to subsequent originating traffic by absence of ground on the FT lead:
 - (a) When handling a regular call.
 - (b) When handling a test call.
 - (c) When made busy locally at the test frame.
 - (d) When made busy by the TSP(S) office through the trunk make-busy 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 return to normal when the attached sender times out. The line lock-out circuit then returns overflow tone to the calling customer.

3.09 To recognize an abandoned call during marker and/or sender functions in which case this circuit returns to normal. If it is a coin call the auxiliary coin line circuit returns the coin.

3.10 To connect an electronic receiver circuit, associated with this circuit, to the outgoing tip and ring for the purpose of detecting tone signals after a wink signal of 75 through 125 milliseconds is received from TSP(S).

3.11 To perform the following functions when signals as indicated are received from TSP(S), (App Fig. 2):

- (a) Coin return - 1100 Hz.
- (b) Coin collect - 700 and 1100 Hz.
- (c) Ringback - 700 Hz.

3.12 To perform the following functions when winks as indicated are received by the wink counter:

- (a) Operator released - 1 wink.
- (b) Operator attached - 2 winks.
- (c) Coin collect - 3 winks.
- (d) Coin release - 4 winks.
- (e) Ring Back - 5 winks.

3.13 To dispose of the coins in the station equipment, after TSP(S) is connected, by connecting positive or negative 130 volts to the line.

3.14 To hold a discharge network connected to the line for at least 400 milliseconds following a coin control function, before restoring talking battery to the line.

3.15 To time 500 milliseconds minimum:

- (a) To ensure coin magnet operation when coins are to be returned following an early abandoned call.
- (b) To release the associated receiver circuit and restore the talking path when a wink signal from TSP(S) is not followed by tone signals within this period.

- 3.16 To provide an idle circuit terminating network for the carrier equipment.
- 3.17 To provide access for the office test circuit.
- 3.18 To recognize a coin or noncoin call and to disable the coin collect and coin return features when a noncoin call is indicated.
- 3.19 To automatically return the initial coin on operator answer if the circuit is so arranged.
- 3.20 To provide positive 48-volt supervision to the coin station if the circuit is so arranged.

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) Dual Channel Receiver Circuit - SD-26348-05 - HS-1.
- (c) PRTD Circuit - SD-26414-01.
- (d) Traffic Usage Recorder Circuit - SD-96494-01.
- (e) Outgoing Sender Link Circuit - SD-26395-01.

(f) Tandem Office With TSP(S) Incoming Trunk Circuit - SD-1B005-01.

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.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245

WE DEPT 355 HFB-KLF-BA

