

CIRCUIT DESCRIPTION

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14

CROSSBAR SYSTEMS
NO. 3
OUTGOING PLUG-ENDED TRUNK
CIRCUIT
MF PULSING
AUTOMATIC NUMBER IDENTIFICATION
MULTIPLE WINK OR POLAR MARGINAL
COIN SIGNALS
HIGH LOW SUPERVISION
COIN AND NON-COIN

CHANGES

D. Description of Changes

D.01 The circuit is modified, per option M,
to automatically make the circuit busy
if the associated carrier system fails.

AT&T BELL LABORATORIES

DEPT 55212-RBC

AT&T NETWORK SYSTEMS
DEPT 20610-JAM-RW-JLP

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COIN COLLECT (MULTIWINK CONTROL) - SC6.	7	<u>1. PURPOSE OF CIRCUIT</u>	
COIN RETURN (POLAR MARGINAL) - SC7	8	1.01 This circuit is for use in completing dial zero ANI, special toll ANI, or special toll non-ANI calls from coin cus- tomer lines in a crossbar No. 3 office to a distant TSP(S) office for person-to-person direct distance dialing.	
COIN RETURN (MULTIWINK CONTROL) - SC8.	8	1.02 This circuit can be used for a tempo- rary operator assistance trunk with no sender, non-ANI.	
<u>5. RECALLING THE CUSTOMER (POLAR MAR- GINAL) - SC9</u>	9	1.03 The circuit can be arranged to auto- matically return the initial coin when the operator answers. Also, the cir- cuit can be arranged for coin service im- provements (dial-tone-first).	
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1.04 This circuit is arranged to recognize coin and noncoin calls and to disable the coin collect and coin return features on a noncoin call.

2. GENERAL DESCRIPTION OF OPERATION

SEIZURE

2.01 When the marker determines that a trunk circuit of this type is required to complete a call, it selects an idle circuit on an idle trunk switch and connector frame. The marker also selects an idle outgoing sender if it is required. The marker establishes a linkage between the customer line appearance and the trunk switch appearance of this circuit. After determining that connections to the trunk circuit are in order, the marker releases, and the customer line is connected to the tip and ring of this circuit. After the sender outpulses, the call is completed to the TSP(S) office. At this time if the call originated from a coin line and the feature "automatic" return of initial coin on operator answer is provided, the circuit automatically returns the initial deposit.

AUTOMATIC COIN RETURN ON ABANDONED CALLS

2.02 If the customer abandons the call before the TSP(S) takes over control of the call the linkage to the coin line is released. The customer's line is held by the auxiliary coin line circuit until the auxiliary coin line circuit returns the initial coin deposit.

SENDER TIME-OUT

2.03 If the sender cannot complete its functions the sender releases the channel and sets the line to lockout and releases. The line lock-out circuit connects an overflow signal to the customer's line.

OPERATOR COIN CONTROL

2.04 The operator can return or collect coins at the coin station by operating the coin return key or coin collect key, respectively. The signal is sent from the operator's position to this circuit, and then this circuit applies the correct potential on the tip to the coin station.

RECALLING THE CUSTOMER

2.05 If the operator wishes to recall the customer, the ringing key at the distant switchboard is operated. The signal is

sent from the operator's position to this circuit, and then this circuit applies ringing voltage to the customer line.

DISCONNECT

2.06 When the calling customer disconnects first at the end of the call, this circuit signals TSP(S). The TSP(S) or the assistance operator then collects or returns the coins in the coin box, followed by a disconnect signal. The disconnect signal releases the linkage to the customer line, and the circuit is restored to normal.

2.07 If TSP(S) disconnects first, a disconnect signal is sent which releases the linkage to the customer line.

SECTION II - DETAILED DESCRIPTION

1. TRUNK SELECTION AND SEIZURE BY THE MARKER WHEN A SENDER IS USED

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 frame that has at least one idle trunk without establishing a connection to the frame through its connector. Ground on lead FT 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 trunks of the desired route. The marker connects a resistance battery through a marker relay coil to TF lead to operate the trunk F relay, which locks to the TF lead.

1.02 The operation of F:

- (a) Grounds leads JC and SW to the trunk switch and connector circuit operating associated trunk connector relays JC and SW, respectively.
- (b) Locks directly to lead TF.
- (c) Operates relay SL.
- (d) Connects sleeve lead S to lead SL to allow the marker to operate the hold magnet in the trunk switch and connector circuit.
- (e) Transfers the T and R leads from this trunk to the marker for continuity, ground, ect, 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.

(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 RC1, 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 and connector 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 and connector circuit does not function and the marker causes a trouble record to be made.)

1.05 At the same time that 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 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.

1.06 Operation of relay ON in the outgoing sender provides a ground to operate relay D in the trunk circuit. Relay D in operating:

(a) 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.

(b) Opens relay TC operate path.

(c) Opens the tip and ring leads to the called end supervisory relay CS while the sender is attached.

1.07 The operation of relay S1:

(a) Provides a locking path for itself through relay CS2 operated, or relay L operated and relay CL released.

(b) Completes the operate path for relay L enabling it to be operated when leads T and R are connected to the customer line.

(c) Operates relay S2.

1.08 The operation of relay S2:

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

(b) Opens the operate path of relay F.

(c) Opens MB lead.

(d) Enables a ground to lead S to the trunk switch and connector circuit for holding the switch connections.

(e) Provides an additional locking path for CN relay.

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

(g) Breaks an additional point between marker trunk test leads TT and TG.

1.09 A short time after the operation of relay S1, the marker disconnects from the circuit, releasing relay F. Relay F in releasing, connects leads T, R, and S to the customer line. The customer supervisory relay L then operates over the customer loop. 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 some coin telephones. 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 some coin telephones, and thus allows the operator to collect a single nickel, if necessary.

1.10 Relay PB controls the application of -48 volt or +48 volt talking battery. Two relay PB make-contacts are used in

series in lead +48 to the power, ringing, and tone distribution circuit to prevent a nominal 96 volts being applied across the secondary winding of relay L in a trouble condition. A nominal 96 volts would be applied across the secondary winding of relay L when the circuit was idle if only one PB make-contact were used and that make-contact were shorted. It is not necessary to use two PB break-contacts in series with the -48 volt supply to prevent applying 96 volts across the secondary winding of relay L while the circuit is in use on a coin call if a single relay PB break-contact is shorted. This is because with the 200-type coin telephone, the operator could not collect or return a single nickel; and therefore, a trouble would be reported.

1.11 The operation of relay L:

(a) Provides a holding path for relay S1 with relay CL released. The S1 being slow to release holds from the time the marker releases relay F until relay L is operated. Relay S1 will also hold if the customer dials extra pulses in error after cut-through.

(b) Operates relay Ll.

1.12 The operation of relay Ll:

(a) Completes the talking path through capacitors R and T.

(b) With relay CL released, short-circuits the high-resistance windings of relays RC and CS.

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

1.14 The outgoing sender performs its function after receiving reverse battery and ground from the TSP(S) office. When the sender functions are completed, relay ON in the sender releases, which releases relay D. Relay D in releasing allows the reversed signals of battery on the tip and ground on the ring to operate relay CS, which in turn operates relay CS1. The operation of relay CS1:

(a) Provides a second path in series with a relay Ll make-contact to short the high-resistance winding of relays CS and RC.

(b) Operates relay CS2.

1.15 The operation of relay CS2:

(a) Provides a holding path for relay S1 when relay CL operates.

(b) Operates relay CR where the circuit is arranged for automatic return of initial coin upon operator answer.

(c) Operates relay CL where automatic return of initial coin upon operator answer is not provided.

1.16 Relay CR in operating starts a sequence which results in the talking battery being removed from the tip and ring toward the calling coin station and coin return potential, either -130 volts or +130 volts, being applied on the tip. After approximately 500 to 595 milliseconds, the coin return potential is removed, after which the talking battery is restored. Relay CL is operated in this sequence, also.

1.17 Relay CL in operating breaks the first holding path for relay S1 so that the call is now completely under control of TSP(S).

1.18 The call is now completed to the operator at the TSP(S) office and conversation can proceed.

2. TRUNK SELECTION AND SEIZURE BY THE MARKER WITHOUT A SENDER

2.01 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 and connector 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 trunk switch and connector frame is idle. The marker then connects to the idle frame and selects and seizes one of the trunks of the desired route. The marker connects resistance battery through the coil of a marker relay to the TF lead of the trunk. An idle trunk will have continuity through the F relay to ground. The F relay operates from this marker resistance battery.

2.02 The operation of relay F:

(a) Locks directly to lead F.

- (b) Operates relay S1.
 - (c) Enables relay CN to be operated by the marker over lead CN if the call is a coin call.
 - (d) Connects +130 volts through resistor E to lead JC to the trunk switch and connector circuit operating an associated trunk connector relay.
 - (e) Transfers leads T, R, and S from the trunk circuit to the marker for continuity, ground, etc. tests.
- 2.03 Relay CN in operating:
- (a) Prepares the operate path of relays RCL, CC, and CR.
 - (b) If the circuit is arranged for coin service improvements, operates relay PB.
- 2.04 Positive 130 volts connected to the JC lead causes the trunk circuit to function in conjunction with the marker to set up the call. The battery-start arrangement is preferred over the ground-start arrangement found in other types of outgoing trunks, because of the coin control functions of this circuit.
- 2.05 The operation of relay S1:
- (a) Provides a locking path for itself through relay CS2 operated, or through relay L operated and relay CL released.
 - (b) Completes the operating path for relay L enabling it to be operated when leads T and R are connected to the customer line.
 - (c) Operates relay S2.
- 2.06 The operation of relay S2:
- (a) Connects ground to lead S to the trunk switch and connector circuit for holding the switch connections.
 - (b) Opens the operate path of relay F.
 - (c) Opens leads FT to indicate the circuit is busy.
- 2.07 A short time after the operation of relay S1, the marker disconnects from the trunk circuit releasing relay F. The release of relay F connects leads T and R to the customer line. The customer supervisory relay L then operates over the customer loop. 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 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) are not provided in the office, the -48 volt talking battery disables the nickel trap in the coin telephone, and thus allows the operator to collect a single nickel, if necessary.

2.08 In the case where relay PB controls the application of -48 volt or +48 volt talking battery, two relay PB make-contacts are used in series in lead +48 to the power, ringing, and tone distribution center to prevent a nominal 96 volts being applied across the secondary winding of relay L in a trouble condition. A nominal 96 volts would be applied across the secondary winding of relay L when the circuit was idle if only one PB make-contact were used and that make-contact were shorted. It is not necessary to use two PB break-contacts in series with the -48 volt supply to prevent applying 96 volts across the secondary winding of relay L while the circuit is in use on a coin call if a single relay PB break-contact is shorted. This is because with the 200-type coin telephone, the operator could not collect or return a single nickel; and therefore a trouble would be reported.

2.09 The operation of relay L:

- (a) Provides a holding path for relay S1 with relay CL released. Relay S1 being slow to release holds over from the time the marker releases relay F until relay L is operated. Relay S1 will also hold if the customer dials extra pulses in error after cut-through.

- (b) Operates relay L1.

2.10 The operation of relay L1:

- (a) Completes the talking path through capacitors T and R.

- (b) With relay CL released, short-circuits the high-resistance windings of relays CN and CS. This puts a low bridge towards the TSP(S) to give off-hook supervision.

2.11 When the operator at TSP(S) answers, battery and ground are applied on the tip and ring, respectively, which operates relay CS. Relay CS in operating operates relay CS1. Relay CS1 in operating:

- (a) Provides a second path in series with relay L1 operated to short the high-resistance windings of relays CS and RC when relay CL operates.

(b) Operates relay CS2.

2.12 The operation of relay CS2:

- (a) Provides a holding path for relay S1 when relay CL operates.
- (b) Operates relay CR where the circuit is arranged for automatic return of initial coin upon operator answer.
- (c) Operates relay CL where automatic return of initial coin upon operator answer is not provided.

2.13 Relay CR in operating starts a sequence which results in the talking battery being removed from the tip and ring toward the calling coin station and coin return potential, either -130 volt or +130 volt, being applied on the tip. After approximately 500 to 595 milliseconds, the coin potential is removed, after which the talking battery is restored. Relay CL is operated in this sequence, also.

2.14 Relay CL in operating:

- (a) Breaks the first holding path for relay S1 so that the call is now completely under control of TSP(S).
- (b) Breaks one of the shorting paths of the high-resistance windings of relays CS and RC.

2.15 The call is now completed to the assistance operator at the TSP(S) office and conversation can proceed.

3. CALL ABANDONED BY CUSTOMER BEFORE TSP(S) ANSWERS

3.01 When the customer abandons the call at this time, relays L and L1 release, which releases relay S1.

3.02 If the call is a noncoin call, relay S1 in releasing releases relay S2, which:

- (a) Disconnects ground from lead S to the trunk switch and connector circuit to release the linkage to the calling customer.
- (b) Releases sender, if attached, which releases relay D, if operated.

3.03 Relay D in releasing:

- (a) Grounds lead FT to the trunk switch and connector circuit indicating there is an idle trunk circuit on this frame.

(b) Connects relay F to lead TF of the trunk switch and connector circuit to indicate that this circuit is idle.

The circuit is now restored to normal.

3.04 If the call is a coin call, relay S1 releases releasing relay S2, which removes ground from sleeve lead S to the trunk switch and connector circuit (and to the outsender link if the sender is attached) to release the linkage to the calling line. This trunk circuit is now restored to normal. The auxiliary coin line circuit then, in this case, returns the coin.

4. COIN CONTROL FROM DISTANT TSP(S) OVER TIP AND RING

COIN COLLECT (POLAR MARGINAL) - SC5

4.01 On coin calls relay CN is operated by the marker through F relay contacts operated.

4.02 The operation of the coin collect key at the distant TSP(S) office causes the removal of the regular signaling battery and ground, and the connection of positive coin voltage to the tip conductor and negative 48 volts to the ring conductor at the distant office end of this trunk. There is a 50-millisecond delay between the removal of regular signaling battery and the connection of the coin collect potential. The coin collect potential then operates relay RC while releasing relays CS and CS1. Relay CS2 is slow to release and holds until relay RC1 operates. The operation of relay RC operates relay RC1. The operation of relay RC1:

- (a) Provides a shorting path in series with relay CS2 operated to give low bridge towards TSP(S) during the coin cycle regardless of what the customer may be doing.

(b) Operates relay CC.

4.03 The operation of relay CC:

- (a) Locks to relay CT released.
- (b) Extends coin collect potential through resistor B to a contact of relay CB.
- (c) Provides a holding path for relay S2.
- (d) Provides a holding path for relay L with relay S1 operated.
- (e) Operates relay CB.

4.04 The operation of relay CB:

- (a) Connects coin potential to the tip of the customer line after it has disconnected talking battery.
- (b) Provides a second holding path for relay L with relay S1 operated.
- (c) Provides a second shorting path in series with relay CS2 operated to give low bridge towards TSP(S) during the coin cycle.
- (d) Starts the CT timer.

4.05 The timed interval for the application of the coin collect potential to the line starts now and continues until relay CT operates. The operation of relay CT:

- (a) Locks through relay CB operated.
- (b) Removes coin collect potential from the customer line.
- (c) Releases relay CC if the coin collect key has been released.

4.06 It is necessary for the coin collect key to be released before relay CC can release and coin potential can be removed from the customer line. When the coin collect key is restored to normal, relays CS and CS1 operate while relays RC and RCl release. With this arrangement the operation of relay CT releases relay CC. The release of relay CC:

- (a) Releases one of two holding paths for relay L.
- (b) Releases relay CB.
- (c) Releases the additional holding path provided for relay S2 when relay CC operated.

4.07 The release of relay CB:

- (a) Opens the final holding path for relay L.
- (b) Reconnects talking battery to the customer line.
- (c) Removes the line discharge network consisting of capacitor A and resistors C and D from the customer line. This network

is connected to the line for at least 0.4 second (the release time of relays CC and CB), after the coin potential is removed to insure that the line is fully discharged before reconnecting the talking battery.

- (d) Releases relay CT.

COIN COLLECT (MULTIWINK CONTROL) - SC6

4.08 Relay CS releases releasing CS1.

- (a) Relay CS1 released causes relay ST to operate.

4.09 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 CTL contact.
- (e) Prepares CTL timer.

4.10 Relay CS1 reoperates, operating ORC. Relay ORC operated:

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

4.11 Relay CS1 releases, operating OAC relay. Relay OAC operated:

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

4.12 The procedure discussed above continues until relay CCC is operated.

4.13 When the counter reaches the coin collect stage, relay CCC is operated and prepares ground path to relay CC. After CTL times out, which is a check for more pulses, it releases ST which allows the operation of CC.

4.14 The ST relay released:

- (a) Resets CTL timer, relay CTL releases.

- (b) Relay SP releases.
- 4.15 The CC relay operated:
 - (a) Locks to relay CT released.
 - (b) Extends coin collect potential through resistor B to a contact of relay CB.
 - (c) Provides a holding path for relay S2.
 - (d) Provides a holding path for relay L with relay S1 operated.
 - (e) Operates relay CB.
- 4.16 The CB relay operated:
 - (a) Connects coin potential to the tip of the customer line after it has disconnected talking battery.
 - (b) Provides a second holding path for relay L with relay S1 operated.
 - (c) Provides a second shorting path in series with relay CS2 operated to give low bridge towards TSP(S) during the coin cycle.
 - (d) Starts the CT timer.
 - (e) Resets wink-counter.
- 4.17 The time interval for the application of the coin collect potential to the line starts now and continues until CT operates.
- 4.18 The operation of relay CT:
 - (a) Locks through relay CB operated.
 - (b) Removes coin collect potential from the customer line.
 - (c) Releases relay CC if the coin collect key has been released.
- 4.19 The release of relay CC:
 - (a) Releases one of two holding paths for relay L.
 - (b) Releases relay CB.
 - (c) Releases the additional holding path provided for relay S2 when relay CC operated.

- 4.20 The release of relay CB:
 - (a) Opens the final holding path for relay L.
 - (b) Reconnects talking battery to the customer line.
 - (c) Removes the line discharge network consisting of capacitor A and resistors C and D from the customer line.

This network is connected to the line for at least 0.4 second (the release time of relays CC and CB), after the coin potential is removed to insure that the line is fully discharged before reconnecting the talking battery.

 - (d) Releases relay CT.
 - (e) Releases the last of two extra shorting paths in series with relay CS2 operated that were used to insure the low bridge towards TSP(S) during the coin cycle.

4.21 The circuit is now in the normal talking condition.

COIN RETURN (POLAR MARGINAL) - SC7

4.22 When the coin return key at the distant TSP(S) office is operated, the regular signaling battery and ground at the distant office is disconnected. After a 50-millisecond delay positive coin control voltage is connected to the ring conductor and negative 48-volt battery connected to the tip conductor. This operates relays RC and RCl while holding relays CS and CS1 operated. With relays RCl and CS1 operated, relay CR operates. The subsequent operation of relay CB performs the same functions as described in 4.01 through 4.05 with the exception that coin return potential is connected to the customer line.

4.23 When the key used in the coin control operation is restored to normal, relays RC, RCl, CR, and CB release in the same manner as described in 4.06 and 4.07 with relay CR taking the place of relay CC.

COIN RETURN (MULTIWINK CONTROL) - SC8

4.24 When the coin return key at the distant TSP(S) office is operated, the counting procedure is the same as described in 4.08 through 4.12. The counter operates

CRC which operates CR in the same procedure as described in 4.13 through 4.16. The same functions are performed as described in 4.13 through 4.18 with the exception that coin return potential is connected to the customer line.

4.25 When the coin control operation is restored to normal CR, CB release in the same manner as described in 4.19 and 4.20 with relay CR taking the place of relay CC.

5. RECALLING THE CUSTOMER (POLAR MARGINAL) - SC9

5.01 Recalling the customer is not a normal operating function in the completion of a call over this circuit. It is used principally to recall the customer after a call is completed to request overtime payment.

5.02 When the ringing key is operated, repeated reversals of normal current release and operate relays CS and CS1 repeatedly while relay CS2, being slow to release, holds over the pulsing and remains operated. Relays CS and CS1 released, after the first current reversal, operates relay RA. When normal current operates relays CS and CS1 with relay RA operated, relay RB operates. Relay CS and CS1 again release after the second current reversal and with relays RA and RB operated, relay R operates. Relays RA and RB are slow to release and hold over the successive current reversals once operated. The operation of relay R:

- (a) Provides a holding path for relay L operated through resistor A.
- (b) Disconnects talking battery from the leads T and R and connects ringing voltage to the customer line.

5.03 When the ringing key is released, relays CS and CS1 operate if not already operated from the current reversal cycle. With relays CS and CS1 operated, relay RA releases. Relay RA in turn releases relays RB and R. The release of R disconnects the ringing voltage from the customer line and restores talking battery.

6. RECALLING THE CUSTOMER (MULTIWINK CONTROL) - SC10

6.01 The counting procedure is the same as previously discussed in 4.08 through 4.12. On the fifth and last on-hook signal

the RBC relay operates. The operation of RBC relay causes the operation of the R relay. This in turn operates relay R1.

6.02 The operation of relay R:

- (a) Provides a holding path for relay L operated through resistor A.
- (b) Disconnects talking battery from the leads T and R; connects ringing voltage to the customer line.

6.03 The operation of relay R1:

- (a) Provides locking path for R relay.
- (b) Release relay RBC by resetting wink-counter.
- (c) Starts timer which times for 2.0 to 2.4 seconds.

6.04 The CT timer now operates relay CT. This releases the R relay which in turn releases relay R1. Now the CT timer is reset and CT released. The release of relay R disconnects the ringing voltage from the customer line and restores talking battery.

7. RINGBACK (NONCOIN)

7.01 On noncoin calls the ringback signal is the same as for coin calls for either the polar marginal or multiple wink options. However, when option R 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 R is provided so that ringback is permitted at all times.

8. SIGNALING THE ASSISTANCE OPERATOR

8.01 If the calling customer wishes to signal the assistance operator at the TSP(S) office after the operator has answered, the switchhook is depressed and released. Relay L follows the operation of the switchhook and relay L1 follows the operation of relay L.

8.02 The operation and release of relay L1 closes and opens the short circuit on the high-resistance windings of relays CS and RC, giving a flashing high-bridge, low-bridge signal to TSP(S). The control circuit at the TSP(S) office recognizes this signal and flashes a supervisory lamp in the distant office as a recall signal.

9. OPERATOR ATTACHED STATE

9.01 The wink counter receives two pulses and the OAC relay is operated. This is achieved by the same method discussed in 4.08 through 4.12. The ORC relay and other associated relays are released as in 4.13 through 4.16. The PB relay is now operated through a 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.

10. OPERATOR RELEASED STATE

10.01 The sequence of events to achieve the operator attached state is the same as discussed in 9.01 with the exception that the ORC relay is operated instead of the OAC relay and OR instead of PB relay. The operation of OR causes the release of PB. The release procedure is the same as discussed in 9.01 with the exceptions discussed above.

11. HOLD AND DISCONNECT

11.01 The connection is held under complete control of TSP(S) once the distant office has answered. When the calling customer disconnects, relay L releases which in turn releases relay L1. The release of relay L1 connects the high-resistance and low-resistance windings of relays RC and CS in series with resistor F as a disconnect signal to TSP(S). Before TSP(S) or the operator disconnects, the proper coin signal is given to either collect or return the coins followed by a cleanup cycle to return any coins remaining in the coin box. The distant office then disconnects which causes relays CS, CS1, and CS2 to release in the trunk circuit. Relay CS2 released, releases relay S1 which in turn releases relay S2.

11.02 The release of relay S2:

- (a) Removes ground from lead S to the trunk switch and connector circuit thus releasing the connections through the switch frames.
- (b) Releases relay CL.
- (c) Grounds lead FT to the trunk switch and connector circuit indicating there is an idle trunk on this frame.
- (d) Connects relay F to lead TF to the trunk switch and connector circuit to indicate that this circuit is idle.

The circuit is now restored to normal.

11.03 If the TSP(S) disconnects first, relays CS, CS1, and CS2 release. The release of relay CS2 releases relay S1. The release of relay S1:

- (a) Releases relay L which in turn releases relay L1 and gives a high bridge towards TSP(S).
- (b) Releases relay S2.

11.04 The release of relay S2:

- (a) Removes ground from lead S to the trunk switch and connector circuit thus releasing the connection through the switch frames.
- (b) Releases relay CL.
- (c) Grounds lead FT to the trunk switch and connector circuit indicating there is an idle trunk on this frame.
- (d) Connects relay F to lead TF to the trunk switch and connector circuit to indicate that the circuit is idle.

The circuit is now restored to normal.

12. TESTING

12.01 Routine tests are made on this trunk by setting up a test connection to this trunk from the test circuit to distant office incoming trunk test line. The test 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, 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).

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

SECTION III - REFERENCE DATA1. WORKING LIMITS

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

1.02	Customer Coin Control Supervision.	<u>Designation</u>	<u>Meaning</u>
	Coin Control Battery -125 -135 volts	OAC	Operator Attached Counter
	Max Ext Circuit Loop Res - 4000 ohms	OR	Operator Released
	Min Ins Res - 10,000 ohms	ORC	Operator Released Counter
	Max Earth Pot. - \pm 10 volts	PB	Positive Battery
1.03	Trunk Supervision - RC - S-530	R	Ringing
	Max Ext Ckt Loop Res (-45 volt min, +130 volt Max) - 3900 ohms	RI	Ringing Auxiliary 1
	Min Ins Res - 30,000 ohms	RA	Recall
		RB	Recall
1.04	Trunk Supervision - CS - 280AE	RBC	Recall Counter
	Max Ext Ckt Loop Res (ground to -45 volt min) - 7600 ohms	RC	Ringing Control
	Min Ins Res - 30,000 ohms	RC1	Ringing Control Auxiliary 1

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

<u>Designation</u>	<u>Meaning</u>
CB	Coin Battery
CC	Coin Collect
CCC	Coin Collect Counter
CL	Unknown
CN	Coin Call
CR	Coin Return
CRC	Coin Return Counter
CS	Called Supervisory
CS1	Called Supervisory Auxiliary 1
CS2	Called Supervisory Auxiliary 2
CT	Coin Timer
CTL	Counter Time
D	Traditional
F	Frame
L	Line
L1	Line Auxiliary

S1	Traditional
S2	S1 Auxiliary
SP	Stop
ST	Start
TRN	Transfer

3. FUNCTIONS

3.01 When a circuit is available for seizure, provides a ground on lead FT on the trunk switch and connector circuit to indicate to the marker that there is an idle trunk on the frame.

3.02 Provides an F relay associated with lead TF which is an idle trunk indication and is operated by the marker when seizing this trunk and which transfers the line tip and ring and line S lead to the marker for the marker to make continuity false ground tests, etc, during the buildup of the connection.

3.03 Provides for the removal of ground from the FT lead and the opening of the TF lead during the operation of this circuit to present a busy condition to the marker.

3.04 When the marker seizes this trunk it operates relay F. Relay F operated operates relay S1 which operates relay S2 to temporarily hold the connection following the disconnection of the marker until the customer line supervisory circuit takes control.

- 3.05 Provides for holding the connection over extra dial pulses.
- 3.06 Permits the customer to abandon the call and release the connection before the operator has answered.
- 3.07 Provides for the automatic return of the initial coin by this trunk without coin supervision if the call is abandoned by the customer anytime after the trunk is seized by the marker but before TSP(S) has answered.
- 3.08 Provides means for TSP(S) to hold or release the connection independent of the customer.
- 3.09 Provides switchhook supervision to the operator.
- 3.10 Provides means for reringing on the customer line.
- 3.11 Provides supervision to the operator who controls the operation of the coin control feature.
- 3.12 Provides for opening the 48-volt talking battery circuit during the operation of the coin control and ringing features.
- 3.13 Provides at the end of each operation of the coin control feature approximately a one-half second open interval to insure that the line is fully discharged. This interval also permits the coin magnet to restore to normal before the talking battery is again connected to the line.
- 3.14 Provides, independent of the customer, for a guaranteed low-bridge signal to TSP(S) during coin cycles and a guaranteed high bridge to TSP(S) once TSP(S) disconnects while the circuit is releasing.
- 3.15 Provides connections to an associated make-busy jack on the test circuit. Insertion of the make-busy plug into this jack will operate relay D from ground on lead MB from the test circuit. The operation of relay D makes this circuit test busy to a marker.

- 3.16 Provides for connection to the traffic usage recorder circuit.
- 3.17 To provide operator-attached and operator-released signaling capabilities.

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) Test Circuit - SD-26411-01.
 - (c) Power, Ringing, and Tone Distribution Circuit - SD-26414-01.
 - (d) Traffic Usage Recorder Circuit - SD-96494-01.
 - (e) Outgoing Sender Link Circuit - SD-26395-01.

5. MANUFACTURING TESTING REQUIREMENTS

- 5.01 This outgoing trunk circuit shall be capable of performing all the functions and working limits specified in SECTION III - REFERENCE DATA, and it shall be capable of meeting all the requirements of the Circuit Requirements Table.

6. TAKING EQUIPMENT OUT OF SERVICE

TRUNK MAKE BUSY

- 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, S2, and ST (if provided) 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 and connector circuit. The trunk is then seized normally by the marker as directed by the 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-LCB

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