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STEP BY STEP SYSTEMS
NO. 1, 350A, 355A, 360A OR 35-E-97
COIN CONNECTOR CIRCUIT
ONE RING

CHANGES

D. Description of Changes

- D.1 Circuit Note 106 is changed to expand the information regarding the use of positive 48-volt talk battery.
- D.2 Information Note 306 is removed since it does not apply.
- D.3 The changes described in D1 and D2 are made on a No-Record basis per agreement with Western Electric company.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5223-VJA-MR

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit provides the final connection between the calling and called stations.

1.02 When this circuit is used with the Coin Control Trunk Circuit, it provides the operator the means of controlling coins and reringing the called station.

2. GENERAL DESCRIPTION OF OPERATION

2.01 This connector when seized by a closure of its input loop will function to ground the sleeve and prepare to receive the last two digits of the called number. When the first digit is dialed, the vertical stepping mechanism follows the pulses and steps the shaft vertically to the level corresponding to the digit dialed. The second digit operates the rotary stepping mechanism which follows the pulses, and rotates the shaft horizontally until the bank terminal corresponding to the digit dialed is reached. The connector then makes a busy test of the called line. If the party is busy, the circuit functions to return busy tone to the calling party. If the called party is idle, the circuit functions to impress ringing voltage on the line to ring the party. Ringing continues until the called party answers or until the calling party disconnects. When the called party answers the circuit functions to remove ringing voltage and supply talking battery.

2.02 If the calling party is an operator and if the call is to a coin or noncoin station, this circuit with the associated Coin Control Trunk Circuit will provide the operator with the means to rering the called station, and to a coin station the control of the disposal of coins.

2.03 Disconnect of this circuit is under control of the calling party except when automatic disconnect of calling line on calling party hold is required.

SECTION II - DETAILED DESCRIPTION1. SEIZURE

1.01 When this circuit is seized by a selector, a loop is extended across the incoming tip and ring leads causing the A to operate. A operated in turn operates B. The operation of B:

- (a) Returns ground to the sleeve S lead.
- (b) Grounds the MS lead to start the source of ringing supply.
- (c) Prepares the circuit for operating the stepping magnet.
- (d) Prepares certain holding circuits which will be described later.
- (e) For operation in a No. 360A office (Q option) this seizure sequence is the same except when A operates it operates B from battery supplied on the MS lead. This battery is furnished by the associated Miscellaneous Alarm Circuit. The purpose of this arrangement is to also operate the motor start relay in the Miscellaneous Alarm Circuit.

2. VERTICAL STEPPING

2.01 When dial pulses are received from the calling station, A responds to the pulses by releasing and reoperating. When A releases on the first open period of the dial, ground from its back contact through the front contact of B will energize the C relay and the vertical magnet in series. The vertical magnet operates, causing the shaft to step in a vertical direction, and operates the vertical off-normal springs. The C relay operates before the vertical magnet to close a circuit for the succeeding pulses to the vertical magnet, since the original operating circuit is opened by the vertical off-normal (VON) springs. When A reoperates on the closed period of the dial, ground is removed from the C and the vertical magnet. The vertical magnet releases; however, the C being slow to release will remain operated until the end of the digit. B is also slow to release and remains operated during each digit. If a digit greater than one was dialed, the action as described continues until the desired level is reached. When the dial comes to rest at the end of the first digit, C restores, transferring the stepping magnet circuit to E and the rotary magnet.

3. ROTARY STEPPING (LINE SELECTION)

3.01 When the next digit is dialed, the pulses will again cause A to release and reoperate as previously described. "A" in so functioning will operate the rotary magnet to step the shaft and wipers in a horizontal direction in response to the number dialed.

B again remains operated as during vertical stepping over the digit dialed. E operates in multiple with the rotary magnet and due to its slow release feature remains operated during rotary stepping. On the first rotary step the rotary off-normal (RON) springs operate opening the operate circuit for the E relay but do not open the holding path for E. E relay closes a circuit for testing the called line.

4. TESTING THE CALLED LINECALLED LINE BUSY

4.01 If the called line is busy, the sleeve terminal of the called line will be grounded and while E is still operated, G will operate. As E releases, G locks to ground on B. G opens the operating path of the rotary magnet and connects busy tone to the calling party.

4.02 When the calling party disconnects, A, B, and G will release. B removes ground from the sleeve and with A released energizes the release magnet, thereby restoring the switch to normal.

CALLED LINE IDLE

4.03 If the called line is idle, battery through the line circuit cutoff relay is connected to the sleeve terminal of the called line. Under this condition upon the release of E, ground on B will operate the cutoff relay and K will operate on its primary winding to make its 1 and 2B contacts. K is slow to operate to allow time for the cutoff relay to operate and remove L of the line circuit before ringing is applied to the line. Ground from B also acts as a guarding potential on the S wiper until K operates, and connects direct ground to the sleeve of the subscriber line. The circuit through the primary winding of K serves only to close make contacts 1 and 2B, which closes a local circuit from ground on B through its secondary winding to battery on E and the rotary magnet to fully operate the relay. The current through E and the rotary magnet is not sufficient to operate them.

4.04 When E released, it opened the operate path for the rotary magnet. This prevents the rotary magnet from stepping if a subsequent pulse is transmitted to the rotary magnet.

4.05 The operation of K:

- (a) Closes the tip and ring wipers through to the ringing leads on F.
- (b) Connects ringing current to the primary winding and the ring conductor ringing lead of F, to start automatic ringing of the called subscriber.

- (c) Opens the rotary magnet operate path.
- (d) Grounds the sleeve wiper.
- (e) Prepares the X lead circuit.

5. RINGING THE CALLED LINE

5.01 Ringing is now impressed on the called line through the back contact of F. A small portion of the ringing current is permitted to pass through capacitor A, to serve as an audible ringing signal to the calling party. The ringing will continue until the called subscriber answers, whereupon F will operate from the dc component of the ringing current, which energizes the primary winding sufficiently to close contacts 1 and 2 of F. This contact closure completes the secondary winding path to ground. The secondary winding then being energized, fully operates F, and it remains operated until the switch releases.

5.02 The operation of F:

- (a) Removes ground from the MS lead except in a No. 360A office.
- (b) Removes ringing current.
- (c) Connects the tip and ring to capacitors R and T.
- (d) Operates the D relay which supplies talking battery to the called station.

When this circuit is equipped to work with coin station sets arranged for coin first operation, option ZC is furnished to provide for -48 volt talking battery on the ring and ground on the tip. When this circuit is equipped to work with coin station sets arranged for dial tone first operation, option ZD is furnished. Option ZD provides for applying +48 volt talking battery on the ring and ground on the tip to cancel the nickel trap feature or permit totalizer readout and to disable the TOUCH-TONE® dial when an operator is connected.

5.03 The operation of D:

- (a) Reverses the battery and ground to the calling end for the purpose of supervision or for registered service.
- (b) With V option, Fig. 1, or S option, Fig. 2, removes ground from SUPV 1 lead, or with W option, Fig. 1, or R option, Fig. 2, removes release battery from AUT DISC lead.
- (c) Connects a circuit from contact 2 of J to the ring lead for the purpose of holding D when J operates during coin control and rering functions.
- (d) Grounds lead OH to send an off-hook signal to the Coin Control Trunk Circuit.

6. COIN CONTROL AND RERING FEATURES

6.01 When coin control and rering features are required, the Coin Control Trunk Circuit is used with this circuit.

COIN CONTROL

6.02 The operator can control the coins at the called station by operating the coin collect or return key. When this key is operated, the tip and ring are opened by an on-hook signal or a wink 75-130 ms, which releases A. A released grounds the X lead, thereby starting the operation of the coin control trunk. At the end of the wink, A reoperates and removes ground from lead X, which prepares the coin control trunk to function further. The coin control trunk then grounds lead H and connects coin collect, or return potential, to leads RA and TA when this circuit is equipped to work with coin station sets arranged for coin first operation, option ZC. When this circuit is equipped to work with coin station sets arranged for dial tone first operation, option ZD, the coin control trunk is arranged to apply coin control battery to the TA lead only with the RA lead opened in the coin control trunk. This arrangement permits operation of the coin magnet by releasing the ground isolation relay. Relay J operates from ground on lead H.

6.03 The operation of J:

- (a) Connects the tip and ring leads of the called station to the RA and TA leads.
- (b) Bridges the tip and ring with resistor A to hold D operated if the called party is off-hook. D is held operated under this condition so as to prevent a false on-hook signal indication at the switchboard.

6.04 The coin control sequence continues for a minimum of 900 ms or as long as the switchboard coin collect or return key is operated. Upon the release of the key or at the end of the minimum timing interval, the coin control trunk functions to remove coin collect or return potential. After a specified line discharge period, ground is removed from lead H, thus restoring relay J to normal.

RERING

6.05 The operator can rering the called party against off- or on-hook.

RERING AGAINST OFF-HOOK

6.06 Under this condition the operation is exactly the same as in the Coin Control paragraph, except the operator operates the ringing key and the coin control trunk functions to connect continuous ringing to leads

RA and TA. When relay J operates, it connects continuous ringing voltage to the tip and ring of the called party. When the ringing key is released or at the end of the minimum timing interval, the coin control trunk functions to remove ringing potential from the line. After a specified line discharge period, ground is removed from lead H, thus restoring J to normal.

RERING AGAINST ON-HOOK

6.07 Under this condition, the operation is similar to the coin control or rering against off-hook sequences. Like the rering against off-hook, the operator operates the ringing key which institutes the wink. At the end of the wink, the coin control trunk functions to open lead C1 for approximately two-tenths of a second, which releases F. F released reconnects machine ringing to the line, to ring the called station. Ringing continues until the called station answers or until the operator disconnects. When the called station answers, F will operate and lock on its secondary to ground on lead C.

7. DISCONNECT

CALLED PARTY FIRST TO DISCONNECT

7.01 D releases when the called subscriber disconnects. The D released reverses the battery and ground to the switchboard, thereby giving an on-hook signal. When the calling party disconnects, A and B will release which in turn allows K to release. B removes sleeve ground which releases the preceding switch train and F. With A, B, and K released the release magnet becomes energized and the switch will release, thereby restoring the circuit to normal.

CALLED PARTY LAST TO DISCONNECT

7.02 With V option, Fig. 1, or S option, Fig. 2, the release of the connector is entirely under control of the calling party. When the calling party disconnects, A and B release, B removes ground from the sleeve and releases K and F. This releases D by opening the tip and ring leads. With A, B, and K released the release magnet becomes energized and the switch will release thereby restoring the circuit to normal.

AUTOMATIC DISCONNECT OF CALLING LINE ON CALLING PARTY HOLD (W OPTION) FIG. 1 OR (R OPTION) FIG. 2

7.03 If the calling party fails to disconnect after the called party disconnects, with W option Fig. 1 or R option Fig. 2 provided, the connector will be automatically released after predetermined time.

7.04 When the called party disconnects, D will release, thereby completing the release

battery path through a make contact on F, resistor C and to the AUT DISC lead which connects to a timer in the alarm circuit. This circuit causes the timer to start; however, not enough current is drawn to operate the release magnet. After a predetermined time the timer functions to apply ground on the AUT DISC lead, thereby energizing the release magnet. Resistor C limits the current through the release magnet so that it will operate only on its first step to open springs 1 and 2 which release B. B released removes sleeve ground thus permitting the preceding switches to restore and open the loop to release A. The release of A fully operates the release magnet, thereby restoring the circuit to normal.

8. SUPERVISORY NO. 1 (V OPTION) FIG. 1 OR (S OPTION) FIG. 2

8.01 If the called station disconnects before the calling station, a path is closed through a break contact of D and a make of F to the SUPV 1 lead for operating a supervisory signal.

9. TEST JACK

9.01 Test jack springs 3 and 4, or with Y option, the operation of the MB key, may be used to busy the switch to incoming calls. The test jack may be used for making local tests on this switch to cause it to function in the same manner as described for an originating call. Spring 6 of the test jack provides means for testing relay J from the front of the switch. The make-busy feature of the test jack is also duplicated by the removal of the switch from its jacks since the springs are arranged to place ground on sleeve lead S when the switch is removed from its position.

9.02 When this circuit is associated with the Coin Control Trunk Circuit and it is necessary to make this circuit busy for testing maintenance, etc, make the associated coin control trunk busy. This will automatically make this circuit busy and eliminate unwanted relay operations in the associated Coin Control Trunk Circuit.

10. CONTACT PROTECTION

10.01 The contact protection network C is used to protect contacts which operate the stepping magnets. Contact protection network F is used to protect the contacts which break the ringing current when F operates.

11. OPERATION IN A 35-E-97 OFFICE (Y OPTION) FIG. 1 OR FIG. 2

11.01 When this circuit is used in a 35-E-97 office, the lead designations differ from those used in this description as indicated on the SD. With this exception, an

idle circuit is indicated by 500-ohm battery on the C lead. The circuit operation is identical to that described.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 The battery voltage shall be: -45 volts min, -52 volts max; +45 volts min, +52 volts max.

1.02 See drawing for working limits and tripping ranges.

2. FUNCTIONAL DESIGNATIONS

None.

3. FUNCTIONS

3.01 To return ground on the sleeve lead for holding the preceding switches in their operated position, and to prevent the intrusion from selectors hunting for an idle connector.

3.02 To step the shaft in a vertical and in a rotary direction in response to dial pulses.

3.03 To make a busy test on the called line.

3.04 To return a busy tone to the calling party if the line tested is busy.

3.05 To place a busy condition on the called line if the line tested is idle.

3.06 To ring the called subscriber and trip the ringing when the called party answers.

3.07 To give the calling party audible ringing induction while the called party is being signaled.

3.08 To start and stop the source of ringing supply if required.

3.09 To connect the talking leads through to the called line.

3.10 To furnish talking battery to the called and calling parties.

3.11 To function with the Coin Control Trunk Circuit using ac inband signaling method to control the disposal of coins and rering features.

3.12 To release under control of the calling party.

3.13 To automatically disconnect the calling line after a predetermined interval on calling party hold, permitting release of connector and freeing called line.

3.14 To provide for operation with coin station sets arranged for dial tone first operation.

4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a keysheet, the connecting information shown thereon should be followed.

(a) Miscellaneous Alarm Circuit (Connector Shelf) (No. 1 or 350A, 355A) - SD-32045-01; (35-E-97) - SD-30908-01.

(b) Miscellaneous Alarm Circuit (360A) - SD-31209-01.

(c) Power Ringing Circuit (No. 1) - SD-80884-01; (350A) - SD-80884-01 (typical); (355A) - SD-80780-01 (typical); (360A) - SD-80416-01 (typical).

(d) Power Shelf Circuit (35-E-97) - H62707.

(e) Selector Bank Multiple Circuit (No. 1 or 350A, 355A) - SD-32123-01.

(f) Local Selector Circuit (360A) - SD-30200-02 (typical); (35-E-97) - SD-30902-01 (typical).

(g) Coin Control Trunk Circuit - (No. 1 or 350A, 355A, 360A, 35-E-97) - SD-32289-01.

(h) Connector Bank Multiple Circuit (No. 1 or 350A, 355A) - SD-32128-01.

(i) Subscribers Line Circuit (No. 1 or 350A, 35-E-97) - SD-32133-01; (355A) - SD-32133-01 (typical); (360A) - SD-31531-01.

(j) Intercepting Trunk Circuit (No. 1 or 350A, 360A, 35-E-97) - SD-31337-01; (355A) - SD-31995-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This connector circuit shall be capable of performing all the service functions specified in the circuit description and meeting all the requirements of the Circuit Requirements Table.

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 Provision is made to permit this circuit to work with coin station sets arranged for dial tone first operation.

D. Description of Changes

D.1 Fig. 1 and 2 are changed to add option ZD which provides for positive talking battery on the ring and ground on the tip for

use with coin station sets arranged for dial tone first operation. Existing negative talking battery on the ring and ground on the tip is now shown as option ZC.

D.2 Circuit Note 101 is changed to show the addition of the positive 48-volt talk fuse.

D.3 Circuit Notes 102 and 104 are changed to reflect the use of options ZC and ZD.

D.4 Circuit Note 106 and Information Note 306 are added.

D.5 Test Note 25 is added to the Circuit Requirements Table for testing relay D when option ZD is furnished.

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