PBX SYSTEMS
NO. 701A, 701B, 711A, 711B OR 740E
CONNECTOR CIRCUIT
ROTARY HUNTING
ONE RING

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Option F is designated and superseded by Option F.

D.2 Circuit Note 104 is revised.

D.3 This Circuit replaces SD-66143-01.

D.4 Circuit Note 110 is added.

D.5 Option ZA is designated and Option A is added.

1. PURPOSE OF CIRCUIT

1.1 This circuit is used in a dial system PBX as a connector for completing calls dialed from local stations thru regular selectors or for completing calls dialed over a tie line through incoming selectors to local stations, to stations in groups or to loud speaking telephones in groups.

2. WORKING LIMITS

2.1

	Pulsing From Called Sta.	Subscriber Supervision Tripping
Max. Ext. Ckt. Loop	750ω*850ω** 1000ω***	1000ω	1030ω
Min. Ins. Res.	15,000ω	15,000ω

*When Using 1000ω Loop - Leak B In Pulsing Test Set.
**When Using 1200ω Loop - Leak A In Pulsing Test Set.
***When Using 248 or Mod. 222 Type (B) Pos. Relay On Switches and 1400ω Loop - Leak A In Pulsing Test Set.

3. FUNCTIONS

3.01 To respond to dial pulses and step the brushes to the desired line terminals in the multiple.

3.02 To make a busy test of the line selected.

3.03 To automatically select an idle line in a PBX line group.

3.04 To furnish an audible busy signal to the calling station if the called line or the last line in a PBX line group is busy.

3.05 To supply interrupted ringing current to the called station when the terminals of the called line have been found to be idle.

3.06 To supply an audible ringing tone to the calling station when ringing current is being supplied to the called line.

3.07 To trip the machine ringing when the receiver at the called station is removed from the switchhook. "Y" wiring.

3.08 To supply talking battery to the called and calling stations.

3.09 To reverse battery to the calling party when the called party answers in order to give supervision to repeating tie lines.

3.10 To place a busy condition on the sleeve of the called line.

3.11 To furnish a ground on the sleeve for the purpose of holding the switches preceding the connector.

3.12 To restore to normal when the receiver at the calling station is replaced on the switchhook.

4. CONNECTING CIRCUITS

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

4.1 PBX Selector Circuit - SD-66359-01*

4.2 PBX Incoming Selector Circuit - SD-66360-01*

4.3 PBX Line Circuit - SD-66715-01*

4.4 Miscellaneous Alarm Circuit - SD-65761-01*

4.5 Power Ringing Circuit - SD-81337-01*

4.6 Ringing Leads Circuit - SD-65771-01*

4.7 Dial Conference Circuit - SD-66461-01*

*Typical

DESCRIPTION OF OPERATION

5. SEIZURE

When this circuit is seized, relay (A) operates over the station loop or over a tie line loop or from an incoming repeater, when such is used in connection with repeating tie lines. Relay (A) operated, operates relay (B). Relay (B) operated, grounds the sleeve thus holding the preceding switches in their operated position, opens the release circuit and prepares a circuit for the vertical magnet.

6. VERTICAL STEPPING

At each interruption of the dial relay (A) releases and reoperates, operating the vertical magnet in series with relay (C). Relay (C) operates on the first release of relay (A). Relays (B) and (C) are slow to release and remain operated during the pulsing of a digit. The vertical magnet steps the shaft and brushes to the desired level. On the first vertical step, the V.O.N. springs operate opening the operating path of relay (C) and closing a holding circuit for relay (C) under control of its make contact. The operated V.O.N. springs also partially prepare the release magnet circuit. When the dial restores to normal, relay (A) remains operated and relay (C) releases thereby preparing the circuit for rotary stepping.

7. ROTARY STEPPING

The next set of interruptions of the dial received by this circuit again release and reoperates relay (A), operating the rotary magnet in parallel with relay (E), relay (J) being non-operated. Relay (E) operates on the first release of relay (A). Relay (E) is slow releasing and remains operated during dial impulses. The rotary magnet steps the shaft and brushes around to the terminals of the called line. Relay (E) prepares the busy test circuit and short circuits contacts 9 and 10 of relay (G), through which the rotary magnet circuit is taken, so that the operation of relay (G), while the sleeve brush passes over busy contacts, will not open the rotary magnet circuit.

8. TESTING - IDLE LINES

On the completion of the dial interruptions of the last digit relay (E), being slow in releasing, remains operated a short time after the brushes make contact with the terminals of the called line, during which a busy test is made. On the release of relay (E), if the line is idle, relay (K) operates through its primary winding in series with the cut-off relay in the called line circuit. Relay (K) operates sufficiently to close its 2T Contact. When the 2T contact is closed, the "S" winding is energized and relay (K) fully operates. The operation of relay (K) places a direct ground on the sleeve terminal for the purpose of operating the cut-off relay in the line circuit of the called line and to place a busy condition on the sleeve terminal in the multiple bank. Relay (K) operated also opens the rotary magnet circuit in order to prevent further stepping of the brushes, if the calling party should again operate the dial, and prepares a reversing circuit to the calling line.

9. TESTING - BUSY LINE

If the called line is busy a ground from the "S" terminal operates relay (G) before the release of relay (E). On the release of relay (E), relay (G) is locked up from ground at relay (B) to battery through the release magnet. Busy tone is now supplied to the calling station over the tip side of the line. The switch will remain in this position until the receiver at the calling station is replaced on the switchhook.

10. TESTING - PBX LINE GROUPS

In a PBX line group the "S" and "H" leads of all lines except the last line in each group are connected together ("X" wiring). If the first line is busy, a ground from the "S" terminal operates relay (G) before the release of relay (E). On the release of relay (E), relay (J) operates through its "R" winding, "K" option, or its "S" winding, "Q" option, and the (A) resistance to ground on the "H" lead. Relay (G) now locks under control of relay (J) and the rotary interrupter springs to ground on the (B) relay. Relay (J) operated closes a circuit to operate relay (E) which, when operated, operates the rotary magnet in parallel. The operation of the rotary magnet steps the brushes to the terminals of the next line and releases relay (G). The reason for having the locking circuit of relay (G) under control of the rotary magnet is for the purpose of locking relay (G) until the rotary magnet is fully operated, at which time the brushes are centered on the terminals so as to prevent false operation due to the breaking of the circuit at the above terminal before the mechanism has completed a full step. Similarly relay (J) is locked in series with resistance (C) under control of relay (G). The reason for having the rotary magnet operation delayed until (E) operates is to give time for (E) to soak before its circuit is opened by relay (G) after the rotary magnet operates in order to insure holding the (E) relay. The release of relay (G) allows the rotary magnet to release. If the sleeve terminal of this line is grounded, due to the line being busy, relay (G) again operates which again causes the rotary magnet to operate and step the brushes to the terminals of the next line,

the (J) relay holding operated thru resistance (B) to the "H" terminal. This operation continues until the terminals of an idle line or the terminals of the last line in a group are reached. When the brushes stop on terminals of an idle line in a group, the circuit functions as described in paragraph 8. In the case of the first line or an intermediate line of a group being idle the operation of the (K) relay opens the "H" lead to prevent the (J) relay from operating and reversing battery ("J" Option) to the calling end before the called party answers. When all the lines in a group are busy and the terminals of the last line are reached, relay (J) releases on the release of relay (G). The ground from the "S" terminals of the last line, however, again operates relay (G) before the release of relay (E). On the release of relay (E) relay (G) is locked up from ground at relay (B) to battery through the release magnet. A busy tone is now supplied to the calling station over the tip side of the line. The circuit remains in this condition until the receiver at the calling station is replaced on the switchhook. The purpose of operating relay (J) in series with resistances (A) and (B) and locking it in series with resistance (C) is to prevent overheating the (J) relay and also to prevent placing a direct ground on terminal "H" on the last line of a group and operating the (J) relay in another switch which may be connected to this terminal.

11. RINGING

11.1 "Y" Wiring

On the operation of relay (K) the ringing circuit is cut through and ringing current is supplied to the called station through the "P" winding of relay (F). The ringing current passes through condenser (B) and out over the tip of the line or tie line and gives the calling station an audible ringing tone as an indication that the bell at called station is being rung. Relay (F) is designed so as to not operate on ringing current. When the receiver is removed from the switchhook at the called station the direct current which is superimposed on the ringing current operates relay (F) sufficiently to close its #2 contact. On the closing of this contact the "S" winding of relay (F) is energized and the relay then fully operates. The operation of relay (F) cuts off the ringing current and closes the talking circuit. With "Q" option relay (F) also closes ground to the primary winding of relay (J).

11.2 "V" Wiring

No ringing is supplied and the (F) relay ("S" winding) operates in multiple with the "S" winding of the (K) relay.

12. TALKING

When the talking circuit is closed, relay (J) operates on both windings over the called subscriber's loop and reverses battery to the calling subscriber. The purpose of this reversal is to give a signal to a repeating tie line which may have dialed the connection, when the called party answers. Talking battery is now supplied to the called party from relay (J) and to the calling party through relay (A). The connection is controlled by the calling station.

13. RELEASE

When the receiver at the calling station is replaced on the switchhook, relay (A) releases which in turn allows relay (B) to release. Relay (B) opens the locking circuit of relay (K). On the release of relays (A), (B), & (K) the release magnet is energized, battery being supplied through an auxiliary relay in the alarm circuit. The operation of the release magnet allows the switch shaft to return to normal. When the switch is returned to its normal position, the release magnet circuit is opened by contacts #1 and #2 of the vertical off normal springs. When the called party hangs up first the (J) relay releases and reverses the (A) relay battery to the calling party and in the case of a tie line connection gives a disconnect signal to the distant end.

14. TEST JACK

The test jack allows the test man to connect a test set to this circuit for the purpose of making routine or other tests.

15. CONTACT PROTECTION

15.1 The A network is to protect the pulsing contacts of relay A.

15.2 The F network is to protect contacts on relay F which interrupt the ringing current.

16. OPTION H

Option H is used when the reversal of battery and ground toward the calling party is not required.

17. OPTION E & F

It is possible to get three line finders and associated connectors connected to two station lines in such an arrangement that it requires manual release. This occurs frequently in heavy traffic. This condition is established when a call is being disconnected. Both the calling and called parties have disconnected but the switches has not released. Both of the cutoff relays of the disconnected stations have not released and an unguarded with battery connected to the

line finder sleeve terminals. Two line finders that are hunting wipe across the unguarded Mutiple sleeve terminals and stop. The "A" relay of the connector that is now connected to the called end of the disconnected call will hold in series with the "J" relay which in turn maintains reversed battery toward the calling end. The "A" relay of the connector which is now connected to the calling end of the disconnected call will hold in series with the reversed battery. To overcome this lock-up, Option E is added which reverses the battery toward the called end so that if a switch is connected during the unguarded interval the "J" relay will release causing the disconnected selector connector to release.

BELL TELEPHONE LABORATORIES, INCORPORATED

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