

PANEL SYSTEMS  
TRUNK LINE  
2-WAY TO FINAL MULTIPLE, LINE SWITCH  
LINE FINDER OR MANUAL SWITCHBOARD  
TO DESKS

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Connecting information for T, R  
and S leads has been added for  
operation of this circuit in conjunc-  
tion with crossbar offices.

All other headings, No change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3340-AJB-GRM



This Method of Operation was Prepared from Issue 12 of Drawing ES-239444.

#### METHOD OF OPERATION

Panel System - Trunk Line - Two Way to Final Multiple, Line Switch - Line Finder or Manual Switchboard - To Desks

#### DEVELOPMENT

##### 1. PURPOSE OF CIRCUIT

- 1.1 This circuit provides means for establishing incoming and outgoing service to and from desks and may be used in offices with either line switches or line finders and with either battery or ground on the cutoff relays. It is also arranged for similar service to manual switchboards.

##### 2. WORKING LIMITS

###### 2.1 Figure A

###### 2.11 B6 (SLV) Relay.

The external sleeve resistance is minimum 32 ohms to ground and maximum 220 ohms to battery for lines to manual switchboards.

###### 2.12 B124 (SLV) Relay.

The maximum external sleeve resistance is 231 ohms for the first line of a P.B.X. group not connected to line finders or line switches.

###### 2.13 B244 (SLV) Relay.

For an individual line or the last line of a P.B.X. group the external sleeve resistance is maximum 231 ohms to battery, minimum 640 ohms to ground when used with line switch circuits and minimum 1045 ohms to ground when used with line finder circuits. For the first lines of a P.B.X. group (M wiring) the external sleeve resistance is maximum 231 ohms to battery and minimum 95 ohms to ground for both line switch and line finder circuits.

###### 2.2 Figure B.

- 2.21 External sleeve resistance is minimum 32 ohms to ground and maximum 315 ohms to battery, for lines to manual switchboard (C wiring).



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issues.

2.22 For the first lines of a P.B.X. group ("M" wiring) the external sleeve resistance is maximum 231 ohms to battery and minimum 95 ohms to ground for both line switch and line finder circuits.

2.23 For an individual line or the last line of a P.B.X. group (A wiring) the external sleeve resistance is maximum 231 ohms to battery, and minimum 640 ohms to ground when used with line switch circuits and minimum 1045 ohms to ground when used with line finder circuits.

### 2.3 Figure C.

2.31 For the first lines of a P.B.X. group the external sleeve resistance is maximum 132 ohms to ground and minimum 1520 ohms to battery.

2.32 For an individual line or the last line of a P.B.X. group the external sleeve resistance is maximum 132 ohms to ground and minimum 585 ohms to battery.

## OPERATION

### 3. PRINCIPAL FUNCTIONS

- 3.1 To give a flashing signal to the desk operator on incoming calls.
- 3.2 To establish steady busy signals on incoming and outgoing calls.
- 3.3 To keep busy signals lighted until panel apparatus or switch-board operator disconnects.
- 3.4 To permit dialing over the trunk.
- 3.5 To transfer to repair clerk's desk when required.

### 4. CONNECTING CIRCUITS

- 4.1 Trunk key and lamp circuit.
- 4.2 Subscriber's line equipment, in a manual or panel office.
- 4.3 Final selector circuit.
- 4.4 Auxiliary signal, make busy and transfer circuit.



## 5. DESCRIPTION OF OPERATION

### 5.1 Incoming Calls

When the tip, ring and sleeve terminals of this circuit are seized by the final selector, or when the plug of a calling cord is inserted in a jack associated with this circuit at the manual switchboard, the (SLV) relay operates from battery over the (S) lead, and provides a circuit for holding the (L) relay locked through its locking winding. The (L) relay operates through its primary winding on ringing current, and locks through its secondary winding to ground in the auxiliary signal circuit. The (L) relay operated, causes the lamp at the desk to flash. The call is answered by operating a key at the desk, thereby operating the (B) and (CO) relays. The (B) relay operated, short-circuits the (A) resistance and the (A) condenser and bridges the primary winding of the (L) relay across the trunk, thereby tripping machine ringing. The operation of the (CO) relay releases the (L) relay and replaces interrupted battery over the "L" lead by steady battery causing the desk lamp to burn steadily as a busy signal. The (CO) relay operated, also locks under control of the (SLV) relay.

## 6. OUTGOING CALLS

To originate a call from a desk over a panel line circuit, the trunk key is operated, operating the (B) and (CO) relays. The operation of the (CO) relay lights the desk busy lamp. The operation of the (B) relay bridges the (L) relay winding across the line thereby operating the line relay in the line circuit which causes the (SLV) relay to operate. Upon receiving the dial tone the attendant at the desk dials the desired number. During the dialing of each digit the (B) and (CO) relays release so as to allow the dial equipment to function under control of the dial. A call to a manual switchboard is performed in the same manner except that the dial is not used, the call being passed to the operator at the switchboard.

## 7. DISCONNECTION

When the trunk key is restored to normal on a panel connection the (B) relay releases opening the D.C. bridge across the line. When the panel apparatus restores to normal the (SLV) relay releases in turn releasing the (CO) relay. The release of the (CO) relay extinguishes the busy lamps. When the trunk key is restored to normal on a connection



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to a manual switchboard, the (B) relay releases opening the D.C. bridge across the line causing a disconnect signal to be given at the switchboard. When disconnection takes place at the switchboard, the (SLV) relay releases, in turn releasing the (CO) relay which extinguishes the busy lamps.

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