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# STEP-BY-STEP SYSTEMS
# NO. 1 OR 350A
# SWITCH TROUBLE ALARM CIRCUIT
# CONNECTOR SHELF AND PBX TRUNK SHELF CIRCUITS
# NO. 355A
# MISCELLANEOUS ALARM CIRCUIT
# CONNECTOR SHELF CIRCUITS

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## SECTION I - GENERAL DESCRIPTION

### 1. PURPOSE OF CIRCUIT

1.01 This circuit is used to provide alarms for connectors and PBX trunks and to extend ringing current busy flash, busy tone and pickup leads, with provision for sectionalizing these leads to assist in locating trouble.

## SECTION II - DETAILED DESCRIPTION

### 1. PERMANENT SIGNALS

1.01 In case of a permanent signal on a connector or PBX trunk ground over lead SUPV 1 or SUPV 2 will be connected through the PS lamp and associated resistance to the relays on the alarm frame. Due to the high-resistance of these relays the lamp will not light at once but after a predetermined interval the relay circuit will function to sound the audible alarm and light the aisle pilot lamps at which time the resistance will become low and the PS lamp will light. Figure 18 provides for separate alarms for SUPV 1 and SUPV 2 for PBX trunks and level hunting connectors arranged for joint control in offices where other connectors are arranged for calling party control. In a 355A office the PS lamp lights immediately.

### 2. RELEASE ALARM

2.01 When the release magnet of a connector is operated ground through the release magnet will operate relay RLS. This will connect ground through lamp RLS but due to the resistance of the alarm frame timing relays, the lamp will not light at this time. The associated alarm frame circuits will function after a short delay period to sound the audible alarm and light the pilot lamps at which time the resistance will become low and lamp RLS will light. If a traffic register is associated with this relay it will





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reqister the calls handled by the connector. With option O (A&M Only) relay RLS will lock up on its secondary winding until the register has operated. Figure 17 provides for separate peg count for toll rotary connectors on the same shelf as local rotary connectors.

3. BUSY TONE AND FLASH, AND PICKUP

3.01 Busy tone and pickup leads are carried through this circuit to the connectors and PBX trunks as required to provide for sectionalizing these leads as an aid in locating trouble. When trouble is indicated the keys in these leads on the various shelves are operated one at a time until the trouble indication disappears. This indicates the shelf on which the trouble exists. Whenever one of these keys is operated the guard lamp of Fig. 15 is lit. In addition, a resistance lamp per shelf in the pickup lead is provided in order to prevent a ground on one shelf from affecting circuits on other shelves. In case of a low-resistance ground, this lamp will light each time the pickup alarm circuit is connected to the pickup leads.

4. RINGING LEADS AND RINGING AND TRIP BATTERY FUSE ALARM

4.01 The fuses for the ringing leads are located on the shelf as shown in Fig. 7 to 12. In case a ringing fuse blows the ringing bus bar will be connected to a 0.180-ampere 48-volt battery fuse which will in turn blow. The alarm associated with this fuse will then indicate the fact that a ringing fuse has blown. The same arrangement is used in connection with the tripping battery of Fig. 12, except when 48-volt negative trip battery is used. With option H, the individually mounted -48 volt trip battery fuse is in series with the C fuse. This is necessary in order to obtain 48-volt battery for the trip battery fuse from the rear of the fuse panel.

5. BATTERY FUSE ALARM - FIG. 6

5.01 Whenever a 48-volt battery fuse blows lamp FA of Fig. 6 will light and the associated relays in the alarm frame circuit will sound the audible alarm and light the aisle pilot lamps.

6. RINGING GENERATOR SUPPLY FOR 5 CODE TERMINAL PER LINE CONNECTORS - FIG. 13

6.01 The five generator code leads for terminal per line connectors are carried through sectionalizing switches and resistances in Fig. 13. The resistances are used since in this connector there is no resistance in the ringing lead. Connection is also provided to the intercepting trunk circuit in order to match the ringing code on lines to be intercepted when one station or more on a line requires intercepting service.

7. AUTOMATIC DISCONNECT OF CONNECTORS - FIG. 5, 21, 22, OR 23

7.01 When the calling party fails to replace the receiver on-hook after the called party hangs up, the connector is automatically disconnected within a predetermined time.

FIG. 5 - OPTION ZD - OR FIG. 21 - MFR DISC.

7.02 Either direct ground with option ZF in Fig. 5 or option ZA in Fig. 21 or ground on ICT lead from the intercept trunk, if trunk is idle, through the thermal relay winding over lead AUT DISC operates the thermal relay within the prescribed time to close contact 1 and 2. This short circuits the winding of the relay and operates the connector RLS magnet to the first step to release the connector.

FIG. 22 - LEVEL AND ROTARY HUNTING CONNECTORS

7.03 When the intercept trunks and trunks arranged to trip ringing without charging are idle, relay IB is normal. Direct ground with option ZJ or ground from the intercept trunk with option ZI over lead ICT1 operates a thermal relay in the connector within the prescribed time to release the connector.

FIG. 23 OR 25 - ALL CONNECTORS EXCEPT LEVEL AND ROTARY HUNTING

7.04 When the intercept trunks and trunks arranged to trip ringing without charging are idle, relay IB is normal. Direct ground with option ZJ or ZO or ground from

intercept trunk with option ZI or ZN operates the thermal relay, within the prescribed time to close contacts 1B and 2B. This short circuits the winding of the thermal unit and operates the connector RLS magnet on its first step to release the connector.

7.05 If the connector group is not equipped with intercept trunks or trunks arranged to trip ringing without charging, option ZJ is furnished to start the disconnect timing feature.

7.06 When either the intercept trunks or trunks arranged to trip ringing without charging are busy, relay IB (Fig. 22, 23, or 25 is operated, thus disabling the timing feature.

## SECTION III - REFERENCE DATA

### 1. WORKING LIMITS

1.01 None.

### 2. FUNCTIONAL DESIGNATIONS

2.01 See SECTION II.

### 3. FUNCTIONS

3.01 To give a visual alarm in case of a permanent signal condition on a connector or PBX trunk and to provide connection to the alarm frame circuits in order to give audible alarms and to light the pilot lamps or aisle pilots.

3.02 To provide for tests of the alarm frame circuits.

3.03 To extend the busy tone lead to local and combination connectors and PBX trunks and to toll connectors, and to provide for sectionalizing this lead as an aid in locating trouble.

3.04 To extend the busy flash lead to toll and combination connectors and to provide for sectionalizing this lead as an aid in locating trouble.

3.05 To give a visual alarm in case of a stuck release magnet and to provide for the operation of audible alarms, aisle pilots and peg count registers.

3.06 To provide for extending the pickup lead to connectors requiring pickup, and for sectionalizing this lead as an aid in locating trouble.

3.07 To give a visual signal in case of a blown fuse and to provide for audible alarms and operation of aisle pilots.

3.08 To provide fusing for ringing and tripping battery supply.

3.09 To extend 5 code ringing to terminal per line connectors and to provide for sectionalizing the associated leads as an aid in locating trouble and to provide for extending the ringing code leads for each 100-line group to the associated intercepting trunk circuits.

3.10 To provide for lighting a guard lamp on the shelf wherever a sectionalizing key is operated.

3.11 To provide a timing interval of 12 to 30 seconds before closing a circuit to release all connectors except level and rotary hunting on calling party holds.

3.12 To provide a circuit to start a timing interval of 25 to 37 seconds in level and rotary hunting connectors before a circuit is closed to release the connector on calling party holds.

### 4. CONNECTING CIRCUITS

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

(a) Local, Toll, and Comb Connectors - SD-31170-01, SD-30220-01, SD-31737-01.* Rotary and Level Hunting Connectors - SD-31088-01* and SD-31738-01.*

(b) PBX Trunks - SD-31757-01.

(c) Switch Trouble Alarm Circuit - Alarm Frame Circuit for Connectors - SD-32046-01.

(d) Miscellaneous Alarm Circuit - Aisle Pilots - SD-31970-01.

(e) Miscellaneous Alarm Circuit - Alarm Controls - SD-31980-01, SD-32192-01.

(f) Power Ringing Circuit - SD-80885-01.

(g) Tone Supply - SD-31521-01.

(h) Trip Battery Supply - SD-80598-02.*

(i) 60-and 120-IPM Interrupter Circuit - SD-31606-01.*

(j) Traffic Register Circuit - SD-31109-01, SD-30896-01.*

(k) Pickup Supply - SD-80885-01.*

(ℓ) Ringing Interrupter and Alarm Circuit
10-party TPL - SD-31187-01,
10-party TPS - SD-31298-01,
8-party TPS - SD-31336-01,

(m) Interrupter Relay Circuit - SD-32135-01.

(n) Intercepting Trunk Circuit - SD-31337-01.

(o) OGT Circuit Arranged to Trip Ringing Without Charging - SD-31840-01.*

(p) Common Systems Auxiliary Line Circuit - SD-99484-01.

(q) 350A or 355A Test Line Circuit - SD-31932-01.

(r) Precise Ringing and Tone Plant - SD-81866-01.

* Typical

## SECTION IV - REASONS FOR REISSUE

### D. Description of Circuit Changes

D.01 Figure 25 is added to C battery Circuit Note 101.

D.02 Battery G is changed to battery C in Fig. 15.

D.03 Lamp 2Y is replaced by M1 lamps on a line-out basis.

D.04 Thermal relay contact numbering (Fig. 5) is clarified.

D.05 CAD 58 is changed to show punchings 17, 18, 19, and 20.

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