

11

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

CHANGES

D. Description of Changes

D.1 Note 112 is revised to permit the use of option V, Fig. 19, with precise tone when an office was previously equipped with V option. However, when new connector shelves are added to an office, option Q should be specified.

D.2 "Precise ringing and tone supply" is added to Fig. B.

F. Changes in CD Sections

F.1 Add "or precise ringing and tone plant - SD-81866-01" to 4.06 in Section 4. CONNECTING CIRCUITS.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-LCB  
WECO DEPT 5152-RTO-WEA

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

CHANGES

D. Description of Changes

- D.1 Precise tone lead designations are added to figures A, B and 24.
- D.2 Notes 103, 105 and 106 are revised and note 112 is added to explain the use of figure 19 when precise tone is implemented.
- D.3 Ringing lead designations are added to figure F.
- D.4 Fig. 2 lead designations to Fig. A and Fig. B are revised.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5225-ICB  
WECO DEPT 5152-RAF-WEA

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

CHANGES

D. Description of Changes

- D.1 Figs. 16 and 20 are rerated to Mfr. Disc. to discontinue the use of terminal per line connections on this circuit.
- D.2 The use of Fig. 53 with Fig. 16 is rated Mfr. Disc. The use of Figs. 52 and 58 with Fig. 20 is rated Mfr. Disc.
- D.3 Reference to Issue 28D is added to Note 105. Note 111 is modified to remove information concerning T.P.L. connectors.
- D.4 BSP information is added to the Supporting Information column.
- D.5 Remove "AUX TRUNK CKT" from LT1-B lead of Fig. 2.
- D.6 Add connecting information to TS1 lead of Figs. 22,25,59 and 60.
- D.7 Add to Note 103 concerning Figs. 22 and 25.

F. Changes in CD Section

- F.1 Under 4. CONNECTING CIRCUITS, add:
  - 4.16 Common Systems Auxiliary Line Circuit - SD-99484-01.
  - 4.17 350A or 355A - Test Line Circuit - SD-31932-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5225-LCB  
WECCO DEPT 5152-JMS-WEA

CIRCUIT DESCRIPTION

CD-32045-01  
ISSUE 8D  
APPENDIX 5B  
DWG ISSUE 27B

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

CHANGES

C. Changes in Circuit Requirements Other Than Those Caused  
by Changes in Apparatus

C.1 The maximum voltage across the themal relay associated  
with the RLS relay is changed from 31 to 26.5 volts to  
show the correct value.

D. Description of Changes

D.1 "Auxiliary Trunk Circuits" is added to the low tone busy  
lead in Fig. 2.

D.2 In Fig. 1 the SUPV 2 lead is given a QZ option and rated  
Mfr Disc.

D.3 In Note 105 ZQ option is designated Mfr Disc.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 5823

RRD-Mr

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

CHANGES

C. Changes in Circuit Requirements Other Than Those Caused by  
Changes in Apparatus

C.1 A release current flow requirement of 115 ma test and 121 ma readj for RLS relay is added. Revised operate and nonoperate current flow requirements necessitated by the addition of the release requirement are also shown.

C.2 The residual of the RLS relay is changed from S-2 to 10-14.

C.3 A note for the IB relays in Fig. 22 and 25 is added when testing for their operate current flow requirements.

D. Description of Changes

D.1 "Local or Combination Connectors" is added to the title of Fig. 1.

D.2 In Fig. 18, the title is changed to specify its use for Local Level Hunting Connectors.

D.3 In Note 103, the Permanent signal Alarm Feature is specified for Local or Combination Connectors.

D.4 The circuit is rated A&M Only for use in No. 350A office.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2363-MKD-RJJ, Jr.

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

**CHANGES**

**B. Changes in Apparatus**

**B.1 ADDED**

1 - 4-uf B. capacitor, ZP option, Fig. 2

**D. Description of Changes**

D.1, Option ZP is added in Fig. 2 to supply busy tone to both local and toll leads of combination connectors over separate leads and to toll connectors.

D.2 Fig. 3, Busy Flash Key and Fig. 24, Busy Tone Key for Toll Connectors are rated Mfr Disc. and reference to them is removed from Note 111.

D.3 Reference to ZP option is added in Notes 103, 105, and Options Used table.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-MKD-RJJ,Jr.

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

CHANGES

B. CHANGES IN APPARATUS

B.1 Superseded

Superseded By

1 - 310A (IB) Relay  
Fig. 23

1 - 310C (IB) Relay  
Fig. 25

D. DESCRIPTION OF CHANGES

D.1 Fig. 25 is added to provide a new IB relay which is capable of mounting an individual cover. Notes 103 and 105 are revised to show this change.

D.2 Prior to issue 24AC Note 103 made reference to "trunks arranged to trip ringing without charge" and Fig. 23.

D.3 Prior to issue 24AC Fig. 23 was standard.

F. CHANGES IN DESCRIPTION OF OPERATION

F.1 In paragraph 11 include Fig. 25 with Fig. 23 and include options "ZN" and "ZO" with options "Z1" and "ZJ", respectively.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-MPC-RJJ

CIRCUIT DESCRIPTION

CD-32045-01  
Issue 8-D  
Appendix 1-D  
Dwg. Issue 23-D

400

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

CHANGES

- C. CHANGES IN CIRCUIT REQUIREMENT TABLE  
OTHER THAN THOSE APPLYING TO ADDED OR  
REMOVED APPARATUS
- C.1 Nonoperate values for the 307A relay  
were added.

D. DESCRIPTION OF CIRCUIT CHANGES

- D.1 CAD Fig. 58 is revised to agree with  
WECo drawings on a no record basis.
- D.2 Equipment Note 204 is added.
- D.3 Reference to Options 2H and 2K is  
removed from Options Used table.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2363-MKD-FBB-C4

STEP BY STEP SYSTEMS  
NO. 1 OR 350A  
SWITCH TROUBLE ALARM CIRCUIT  
CONNECTOR SHELF AND P.B.X. TRUNK SHELF CKTS.  
NO. 355A  
MISCELLANEOUS ALARM CIRCUIT  
CONNECTOR SHELF CIRCUITS

## CHANGES

## A. CHANGED AND ADDED FUNCTIONS

A.1 Provision is added for toll connectors to return busy tone in place of busy flash to the toll operator.

## B. CHANGES IN APPARATUS

## B.1 Added

1 - UA135 (IB) relay - Fig. 22	
1 - Toggle Sw. 21191 BK	
(ZL) option)	) - Fig. 24
1 - 552A Key (ZM option)	
1 - 0.5 MF Capacitor	)

## B.2 Superseded                      Superseded by

1 - 307A (RLS)	1 - 310A (IB)
relay,	relay,
ZD option,	Fig. 23
Fig. 5	

## D. DESCRIPTION OF CIRCUIT CHANGES

D.01 Fig. 22 is added for use with level and rotary hunting connectors when automatic disconnect on calling party holds is required and the connector group is equipped with trunks arranged to trip ringing without charging.

D.02 Fig. 23 is added for use with all connectors except level and rotary hunting when the connectors are arranged for automatic disconnect.

D.03 ZD and ZF options if Fig. 5 are rated Mfr. Disc. replaced by Fig. 23.

D.04 Fig. 21 is rated Mfr. Disc.

D.05 In Figs. 22 and 23, Option ZI is shown for use when plugging up line circuits are furnished. Option ZJ is provided when no plugging up line circuits are furnished.

D.06 Fig. 3, Busy Flash Key, is rated A&M Only.

D.07 Fig. 24, Toll Busy Tone Key is added.

D.08 Note 103 is revised to show the use of Figs. 22 and 23 and Options ZI and ZJ.

D.09 Reference to Figs. 22, 23 and 24 and Options ZI, ZU, ZL and ZM is added to Note 105 and Options Used table.

D.10 Cross Connection Figs. 57, 58, 59 and 60 are added. Option ZK is shown in Fig. 58.

D.11 Note 301 is added.

## 1. PURPOSE OF CIRCUIT

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

## 2. WORKING LIMITS

2.1 None.

## 3. FUNCTIONS

3.01 To give a visual alarm in case of a permanent signal condition on a connector or P.B.X. 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 P.B.X. 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

When this circuit is listed on a key-sheet the connecting information thereon is to be followed.

- 4.01 Local, Toll and Comb. Connectors - SD-31170-01, SD-30220-01, SD-31737-01.\* Rotary & Level Hunting Connectors - SD-31088-01\* and SD-31738-01.\*
- 4.02 P.B.X. Trunks - SD-31757-01.
- 4.03 Switch Trouble Alarm Circuit - Alarm Frame Circuit for Connectors - SD-32046-01.
- 4.04 Misc. Alarm Circuit - Aisle Pilots - SD-31970-01.
- 4.05 Misc. Alarm Circuit - Alarm Controls - SD-31980-01, SD-32192-01.
- 4.06 Power Ringing Circuit - SD-80885-01.\*
- 4.07 Tone Supply - SD-31521-01.
- 4.08 Trip Battery Supply - SD-80598-02.\*
- 4.09 60 and 120 IPM Interrupter Circuit - SD-31606-01.\*
- 4.10 Traffic Register Circuit - SD-31109-01, SD-30896-01.\*
- 4.11 Pickup Supply - SD-80885-01.\*
- 4.12 Ringing Interrupter and Alarm Circuit
  - 10 party TPL - SD-31187-01
  - 10 party TPS - SD-31298-01
  - 8 party TPS - SD-31336-01
- 4.13 Interrupter Relay Circuit - SD-32135-01.

- 4.14 Intercepting Trunk Circuit - SD-31337-01.
- 4.15 OGT Circuit, Arranged to Trip Ringing Without Charging - SD-31840-01.\*

#### \*Typical Circuit

#### DESCRIPTION OF OPERATION

##### 5. PERMANENT SIGNALS

5.1 In case of a permanent signal on a connector or P.B.X. 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. Fig. 18 provides for separate alarms for SUPV. 1 and SUPV. 2 for P.B.X. 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.

##### 6. RELEASE ALARM

6.1 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 aisle 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 register the calls handled by the connector. With Option "G" (A&M Only) the RLS relay will lock up on its secondary winding until the register has operated. Fig. 17 provides for separate peg count for Toll Rotary Connectors on the same shelf as Local Rotary Connectors.

##### 7. BUSY TONE AND FLASH, AND PICKUP

Busy tone and pickup leads are carried through this circuit to the connectors and P.B.X. 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.

8. RINGING LEADS AND RINGING AND TRIP BATTERY FUSE ALARM

The fuses for the ringing leads are located on the shelf as shown in Figs. 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 48v negative trip battery is used. With H option, 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.

9. BATTERY FUSE ALARM - FIG. 6

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.

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

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.

11. AUTOMATIC DISCONNECT OF CONNECTORS, FIG. 5, 21, 22 or 23.

11.1 When the calling party fails to replace his receiver on hook after the

called party hangs up, the connector is automatically disconnected within a predetermined time.

11.2 Fig. 5 (ZD option) or Fig. 21 (Mfr. Disc.)

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.

11.3 Fig. 22 - Level and Rotary Hunting Connectors

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

11.5 Fig. 23- All Connectors Except Level and Rotary Hunting

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

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

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