

CIRCUIT DESCRIPTION

CD-66796-01  
ISSUE 4B  
APPENDIX 2D  
DWG ISSUE 16D

PBX SYSTEMS  
NO. 756A  
ALARM, TRANSFER AND TEST CIRCUIT

CHANGES

D. Description of Changes

D.1 The rating of this circuit is changed from AT&TCo  
Standard to Mfr Disc.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3224-WVS-RVL

CIRCUIT DESCRIPTION

CD-66796-01  
ISSUE 4B  
APPENDIX 1D  
DWG ISSUE 15D

PBX SYSTEMS  
NO. 756A  
ALARM, TRANSFER AND TEST CIRCUIT

CHANGES

D. Description of Changes

- D.1 The 12 break contact of relay ATA1 is removed from the AP ground supply to the dial tone start keys for stations 40, 41, and 42.
- D.2 This change is made on a D no-record basis as agreed to by the WE Standards Engineer.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3221-WVS-RGP

PBX SYSTEMS  
NO. 756A  
ALARM, TRANSFER & TEST CIRCUIT

TABLE OF CONTENTS	Page	<u>2. GENERAL METHOD OF OPERATION</u>
<u>SECTION I - GENERAL DESCRIPTION</u> .....	1	
<u>1. PURPOSE OF CIRCUIT</u> .....	1	2.01 Normally, relays AT, ATA, TR, and if App Fig. 11 is provided, relays AT1 and ATA1 are operated. They release only under trouble conditions. When a fuse operates in any of the PBX or power circuits, and indicating lamp lights within the PBX and in the attendant equipment. Also the central office is alerted via the WCT and WCR lead.
<u>2. GENERAL METHOD OF OPERATION</u> .....	1	
<u>SECTION II - DETAILED DESCRIPTION</u> ...	2	
<u>1. ALARMS</u> .....	2	2.02 In the event of commercial power failure where the power plant does not include a battery, all relays release and three central office trunks are automatically transferred directly to stations 30, 31, and 32. When App Fig. 11 is provided, any three stations (40, 41, and 42) are transferred to CO trunks 5, 6, and 7. The central office also receives an alarm signal when the trouble relay releases. The PBX is therefore not isolated when all power fails.
<u>A. General</u> .....	2	
<u>B. Local Distribution Fuse Alarm</u> .....	2	
<u>C. Power Plant Fuse Failure</u> ....	2	
<u>D. Fuse Failure or Trouble Alarm at an Externally Mounted Unit</u> .....	2	
<u>E. Marker Alarm</u> .....	2	
<u>2. CENTRAL OFFICE TRUNK TRANSFER AND FLEXIBLE NIGHT CONNECTIONS</u> ..	4	2.03 The operation of the night service key releases a relay which prepares the central office trunk circuits for night connections to be established by the attendant. If a power failure occurs after the attendant has established the night connections and disconnected, central office trunks 0, 1, and 2 will be directly connected to stations 30, 31, and 32. When App Fig. 11 is provided, any three stations (40, 41, and 42) are transferred to CO trunks 5, 6, and 7.
<u>A. Power Failure and Restoration</u> .....	4	
<u>B. Attendant Establishes Flexible Night Connections</u> ..	4	
<u>C. Power Failure and Restoration During Night Service</u> .....	4	
<u>3. TEST CIRCUIT</u> .....	4	
<u>4. DIRECT STATIONS SELECTION BUSY LAMP BATTERY CUTOFF</u> .....	5	
<u>SECTION III - REFERENCE DATA</u> .....	5	
<u>1. WORKING LIMITS</u> .....	5	2.04 A dial tone start key must be provided at each of these stations. To bring in dial tone to the station line, the dial tone start key is depressed until dial tone is heard and then it is released so that dialing may proceed.
<u>2. FUNCTIONAL DESIGNATIONS</u> .....	5	
<u>3. FUNCTIONS</u> .....	5	
<u>4. CONNECTING CIRCUITS</u> .....	5	
<u>5. MANUFACTURING TESTING REQUIREMENTS</u> .....	6	2.05 When the marker encounters a trouble of the type that operates the marker alarm relays, a trouble signal is transmitted to the alarm circuit. If the trouble persists, successive trouble signals will occur. The alarm circuit counts these trouble indications and weighs them against the number of marker seizures. An alarm is operated only if two trouble signals are transmitted to the alarm circuit before two calls have been completed from a dial pulse register. This latter conditional requirements may mean a maximum of five marker functions.
<u>SECTION IV - REASONS FOR REISSUE</u> ....	6	
<u>SECTION I - GENERAL DESCRIPTION</u>		
<u>1. PURPOSE OF CIRCUIT</u>		
1.01 The alarm, transfer and test circuit provides alarm indications to the attendant and/or central office when troubles arise in the PBX, automatically transfers three station lines directly to the central office in the event of power failure, provides test line tip and ring leads, and provides test ground, regular battery and high-resistance test battery.		2.06 When the alarm operates, the marker trouble lamps lock in as a permanent indication of the trouble location. To extinguish the alarm, the trouble has to be

cleared and the alarm reset key operated manually.

2.07 The operation of the night service key releases relay BCO to disconnect the 10 volt ac from the busy lamps in the attendant consoles.

## SECTION II - DETAILED DESCRIPTION

### 1. ALARMS

#### A. General

1.01 Under normal operating conditions, relay TR is operated.

1.02 Whenever a local distribution fuse, marker or power alarm occurs, the operate path for relay TR opens and relay TR releases causing an alarm signal to be transmitted to the attendant equipment and to the central office.

#### B. Local Distribution Fuse Failure

1.03 When a -48 volt local distribution fuse fails, relay FA operates.

1.04 If the +48 volt fuse fails, relay R operates.

1.05 Either relay in operating causes the FA lamp to light and the TR relay to release.

1.06 Relay TR released:

- (a) Lights the TR lamp in the unit equipment.
- (b) Lights the TR lamps in the attendant equipment.
- (c) Transmits an alarm to the central office via the WCT and WCR leads.

1.07 The alarm is retired by replacing the blown fuse which releases the FA or R relay.

1.08 Relay FA or R released extinguishes the FA lamp and permits relay TR to reoperate.

1.09 Relay TR operated extinguishes the TR lamps and retires the alarm indication to the central office.

#### C. Power Plant Fuse Failure

1.10 When a -48 volt fuse in the power plant fails, relay RB operates.

1.11 If the 10 volt ac fuse fails in the power plant, relay S operates. The S relay operates from 10 volts ac rectified by the S varistor.

1.12 Relay RB or S operated lights the PA lamp and releases relay TR.

1.13 Relay TR released:

- (a) Lights the TR lamp in the unit equipment.
- (b) Lights the TR lamps in the attendant equipment.
- (c) Transmits an alarm to the central office via the WCT and WCR leads.

1.14 The alarm is retired by replacing the blown fuse in the power plant.

1.15 When this is done, the RB or S relay releases and the TR relay reoperates restoring the circuit to normal.

#### D. Fuse Failure or Trouble Alarm at an Externally Mounted Unit

1.16 When a fuse fails or a trouble alarm occurs in an externally mounted unit, relay EXT operates from ground via lead EXT.

1.17 Relay EXT operated lights the EXT lamp and releases relay TR.

1.18 Relay TR released:

- (a) Lights the TR lamp in the unit equipment of the alarm, transfer and test circuit.
- (b) Lights the TR lamps in the attendant equipment.
- (c) Transmits an alarm to the central office via the WCT and WCR leads.

1.19 Lamps at the location of the externally mounted unit indicate the type of trouble condition that occurred.

1.20 The alarm is retired by correcting the trouble condition. When this is done, ground is removed from lead EXT and relay EXT releases.

1.21 Relay EXT released allows relay TR to reoperate thus restoring the circuit to normal.

#### E. Marker Alarm

1.22 Every time the marker is seized, the marker timing relays MTA and MTB operate and connect ground to lead MT. Relay HO operates from the ground supplied to lead MT.

1.23 If the marker encounters trouble in establishing a connection, one or more of the marker relays listed in Table

A may operate.

TABLE A  
MARKER ALARM FUNCTIONS

Function	MARKER RELAY DESIGNATIONS
Tens Alarm Units Alarm	TAL UAL UAL1 & UAL1A UAL2
Junctor Register Alarm Test Miscellaneous Alarm Release Alarm Tens Release Alarm Trouble Advance Alarm Link Alarm	JRAL TS MAL RLAL TRAL TAAL LAL1 LAL2 & LAL2A LCK1 LCK2
Time Out Camp-On Alarm Cross Check Alarm	TAOL & TOALA COAL XCAL

- 1.24 The operation of any of the marker alarm relays (TAL through LAL2 & LAL2A) listed in Table A, grounds lead AT to operate relay A1.
- 1.25 Relay A1 locks operated and prepares the operate path for relay A2. Relay A2 remains shunted down by ground supplied through the contacts of relay HO operated.
- 1.26 When the marker completes its function, marker relays MTA and MTB release causing relay HO to release.
- 1.27 Relay HO released removes the shunt from relay A2 and relay A2 operates in series with relay A1.
- 1.28 Relay A2 operated connects relay AL to lead AT.
- 1.29 The alarm circuit has thus counted the first marker trouble and has prepared itself to transmit an alarm if another marker trouble occurs within the next four or five marker operations.
- 1.30 The slow release of relay HO insures that any trouble arising at the end of the marker operation will result in relay A1 locking operated.
- 1.31 If during the second seizure, the same or any other marker alarm relay operates due to a trouble, ground is connected to lead AT to operate relay AL.
- 1.32 Relay AL operated:
- (a) Locks operated under control of the alarm release key.
  - (b) Connects ground to leads CA, JA, KA, LAL (ZE Option), LA, OA, RA, TA, and UA to hold the marker alarm relay operated.
- (c) Releases relay TR which functions as described under local distribution fuse failure.
- (d) Provides an additional open in the relay A1 operate path.
- 1.33 Relay AL can be released only by manually operating the alarm reset key.
- 1.34 The marker alarm relay operated lights its associated alarm trouble lamp.
- 1.35 Once the AL relay operates, any marker alarm relay which operates is held operated and any subsequent troubles will not register in the alarm sequence relays.
- 1.36 Assuming that a register is in terminating condition and has seized the marker for the third marker operation, relay A3 operates from ground supplied by relay A2 and register relay DC operated via lead RT1. Relay A3 locks operated and prepares the operate path for relay A4. When the marker and register release, the ground on the RT1 lead is removed and relay A4 operates. Relay A4 operated holds relay A2 operated and releases relay A1.
- 1.37 Assuming that neither register is in terminating condition during the fourth marker operation, relay HO operates and releases but performs no useful function.
- 1.38 Assuming that a register is in a terminating condition and has seized the marker for the fifth marker operation, ground on lead RT1 will shunt down relay A3. When the marker and register release, the ground on lead RT1 is removed and relay A4 releases. Relay A4 released releases relay A2 and the marker alarm sequence relays are again normal.

1.39 If during the second marker seizure and the subsequent marker operations described above, no marker alarm relays operate, the action is as described except that when relay A2 releases the sequence alarm relays are ready for another trouble indication.

1.40 If marker relay TS operates instead of one of the marker alarm relays, the alarm circuit functions described above will be performed.

1.41 The operation of any of the marker alarm relays (TOALA, COAL or XCAL) listed in Table A grounds lead TT, causing the alarm, transfer, and test circuit to disregard its alarm signal versus marker operation - counting circuitry and operate relay AL immediately.

## 2. CENTRAL OFFICE TRUNK TRANSFER AND FLEXIBLE NIGHT CONNECTIONS

### A. Power Failure and Restoration

2.01 When a power failure occurs, relays TR, NS, AT, and ATA release. Relay TR released transmits an alarm signal to the central office via the WCT and WCR leads. Relays AT and ATA released connect central office trunks 0, 1, and 2 directly to station lines 30, 31, and 32. When App Fig. 10 is provided, relay ATA released restores relays AT1 and AT1A to normal. These relays transfer three station lines (40, 41, and 42) to central office trunks 5, 6, and 7.

2.02 A ST pushbutton (FS4) is provided at each of these three stations for a manual ground start to the central office. In order to get dial tone or raise the operator after the station lifts the receiver, the ST pushbutton is operated until dial tone is heard or the operator answers and then it is released.

2.03 When power is restored, relays TR and NS reoperate. Relay TR operated retires the alarm to the central office. Relay NS operated reoperates relays AT and ATA. This restores central office trunks 0, 1, and 2 and station lines 30, 31, and 32 to normal. When App Fig. 10 is provided, relay ATA operates operating relays AT1 and AT1A. Relays AT1 and AT1A operated restore central office trunks 5, 6, and 7 and the three station lines 40, 41, and 42 to normal.

### B. Attendant Establishes Flexible Night Connections

2.04 Relays AT and ATA remain operated until a power failure occurs. The operation of the night service key releases relay NS.

### 2.05 Relay NS released:

(a) Connects ground to the even and odd central office trunk circuits over leads NSE and NSO.

(b) Removes ground to lead NSA to release auxiliary position circuit relay NSA when remote trunk answering is provided.

(c) Connects leads NCO-9 to CNO-9 to prepare the central office trunk circuits for flexible night connections that are to be set up by the attendant.

(d) Removes the operating ground for relays AT and ATA leaving them locked up under control of relay AT.

2.06 The attendant may disconnect flexible night connections by releasing the night service key. The night service key released operates relay NS. Relay NS operated causes the central office trunk circuits to disconnect from the connected stations unless they are busy.

### C. Power Failure and Restoration During Night Service

2.07 If a power failure occurs after the attendant has established flexible night connections, relays AT and ATA release and remain released until the attendant operates relay NS by restoring the night service key. Relays AT and ATA released connect central office trunks 0, 1, and 2 directly to station lines 30, 31, and 32. When App Fig. 10 is provided, relay ATA released restores relays AT1 and AT1A to normal. These relays transfer three station lines (40, 41, and 42) to central office trunks 5, 6, and 7.

2.08 When power is restored, relays AT and ATA remain released. The TR lamps light as an indication to the attendant that a power failure has occurred and that the flexible night connections as established have been disconnected. Station lines 30, 31, and 32 remain connected to the central office trunks 0, 1, and 2. When App Fig. 10 is provided, three station lines (40, 41, and 42) remain connected to central office trunks 5, 6, and 7. These station lines and central office trunk circuits are made busy by applying ground through relays AT, ATA, AT1, and AT1A released to the associated S and IT- leads to the marker.

### 3. TEST CIRCUIT

3.01 A -48 volt test battery termination is provided on two slides to facilitate maintenance work. In addition, a -48 volt termination with 1000 ohms series resistance is provided on slide 6. The high re-

sistance termination is used for testing apparatus such as dry reed relays, which would be damaged by excessive current flow.

3.02 Line circuit 39 is a regularly assigned test line circuit; a pair of test terminals, T and R, are brought out on slide 2 for connection to this test line.

4. DIRECT STATION SELECTION BUSY LAMP BATTERY CUTOFF

- 4.01 The operation of the night service key releases relays BCO and NS.
- 4.02 Relay BCO released removes ground from lead S1 to the tie trunk circuit, and disconnects the 10-volt ac supply from the busy lamps in the attendant consoles. This prevents the busy lamps associated with night connected stations or with stations busy due to a call in progress from lighting.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 None.

2. FUNCTIONAL DESIGNATIONS

<u>Designation</u>	<u>Meaning</u>
A1 } A2 } A3 } A4 }	Marker Alarm Sequence Relays
AL	Marker Alarm Relay
AR	Alarm Reset Key
AT,ATA, } AT1,ATA1 }	Automatic Transfer Relays
BCO	Battery Cutoff Relay
EXT	Alarm Relay for Externally Mounted Units
FA	Fuse Alarm Relay
HO	Hold-Over Relay
NS	Night Service Relay
R	+48V Supply Alarm Relay
RB	Ringing Battery Alarm Relay
S	10V AC Supply Alarm Relay
TR	Trouble Relay

3. FUNCTIONS

- (a) To cause an alarm signal when any of the fuses in the PBX operates.
- (b) To cause an alarm signal when two or more troubles occur in the marker during two successive operations or within two successive marker operations in which the register is terminating a call.
- (c) To cause an alarm signal when a fuse operates or a trouble occurs in an externally mounted unit.

(d) To extend to the central office all of the above alarms and to function with either a marginal or reverse-battery alarm system at the central office.

(e) To extend an alarm to the central office in the event of a commercial power failure.

(f) To automatically transfer a maximum of six station lines directly to the central office in the event of a power failure.

(g) To provide test ground, regular battery, and high resistance test battery for test purpose.

(h) To provide T and R terminals for a test line.

(i) To provide the attendant a means of establishing night connections between any central office trunk and any station.

4. CONNECTING CIRCUITS

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

- (a) Line, Link, and Marker Circuit - SD-65741-01.
- (b) Dial Pulse Register Circuit - SD-65742-01.
- (c) Two-Way Trunk Circuit to Central Office - SD-65752-01.
- (d) Cordless Position Circuit - SD-65757-01.
- (e) Auxiliary Relay Circuit - SD-65942-01.
- (f) Auxiliary Position Circuit - SD-66910-01.
- (g) Station Message Register Pulse and Surcharge Circuit - SD-5E021-01.
- (h) No. 556A PBX Cord, Telephone, Dial, Battery, Buzzer, and Ringing Circuits - SD-65658-01.
- (i) Power Supply Circuits - SD-81326-01 or SD-81600-01, or SD-81599-01.
- (j) Extension Alarm Circuit - SD-95484-01.
- (k) 608A or 608B Auxiliary Signal, Fuse Alarm, Battery Cut-off and Miscellaneous Circuit - SD-66722-01.

(l) 608D Auxiliary Signal, Fuse Alarm, Battery Cut-Off and Miscellaneous Circuit - SD-67039-01.

(m) Make Busy and Busy Display Circuit - SD-5E029-01.

(n) Tie Trunk Circuit - SD-65756-01.

(o) Trunk Finder Circuit - SD-1E050-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall be capable of performing all the service functions specified in this circuit description and of meeting all the requirements of the Circuit Requirement tables.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3221-WVS-RGP

SECTION IV - REASONS FOR REISSUE

D. Description of Changes

D.1 Diodes A and B are added to the Apparatus Index.

D.2 Options ZL and ZK are added to the Option Index.

D.3 Option ZK is designated and rated Mfr Disc.

D.4 Option ZL is added as Standard to light the FA lamp when fuse FA operates.

D.5 On sheet B4, the option shown for central office trunks 5, 6, and 7 is corrected to read XY.

D.6 Circuit Note 104 is revised to reflect Issue 14B.