

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

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

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. GENERAL METHOD OF OPERATION

2.01 Normally, relays AT, ATA and TR are operated. They release only under trouble conditions. When a fuse operates in any of the PBX or power circuits, an indicating lamp lights within the PBX and in the attendant equipment. Also the central office is alarmed via the WCT and WCR leads.

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. The central office also receives an alarm signal when the trouble relay releases. The PBX is therefore not isolated when all power fails.

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.

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.

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 requirement may mean a maximum of five marker functions.

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 operate 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
Junction Register Alarm Link Alarm	JRAL LAL1 LAL2 & LAL2A LCK1 LCK2
Test Miscellaneous Alarm Release Alarm Tens Release Alarm Trouble Advance Alarm Time Out	TS MAL RLAL TRAL TAAL TOAL & TOALA

- 1.24 The operation of any of the marker alarm relays listed in Table A due to a trouble connects ground to 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 H0 operated.
- 1.26 When the marker completes its function, marker relays MTA and MTB release causing relay H0 to release.
- 1.27 Relay H0 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 H0 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, 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 H0 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 Relay AL operates over lead TT every time the marker time-out relay TOALA operates regardless of whether there has been a marker trouble during the previous marker seizure or not.

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.

2.02 A ST push button (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 push button 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.

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, relay 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.

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. These station lines and central office trunk circuits are made busy by applying ground through relays AT and ATA 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 resistance 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 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)	Marker Alarm Sequence Relays
A2)	
A3)	
A4)	
AL	Marker Alarm Relay
AR	Alarm Reset Key
AT)	Automatic Transfer Relays
ATA	
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	Ringling 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 operate.
- (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 three 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 purposes.
- (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 Surcharge Circuit - SD-66922-01.
- (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.
- (j) Extension Alarm Circuit - SD-95484-01.

5. MANUFACTURING TEST 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.

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 To cause a local alarm signal when a fuse failure or a trouble alarm occurs in an externally mounted unit and to extend such an alarm to the central office.

B. Changes in Apparatus

<u>B.1 REMOVED</u>	<u>REPLACED BY</u>
T-R - 55D Conn. Block - Fig. 7	T-R - 73C Conn. Block - Fig. 7
48V-GRD - 55C Conn. Block - Fig. 8	48V-GRD - 73B Conn. Block - Fig. 8
48V-HRB-GRD - 55E Conn. Block - Fig. 9	48V-HRB-GRD - 73A Conn. Block - Fig. 9

B.2 ADDED - FS1, APP. FIG. 4

- EXT Lamp - 2Y - M Option
- EXT Relay - 1/2AK4 - M Option (EXT Relay mounted with the TR Relay)
- FA Resistor - KS-14603, L2A, 511 - F Option
- R1 Resistor - KS-14603, L2A, 511 - F Option

D. Description of Changes

D.1 In the Supporting Information Table, reference to the 756A Feature Cable is added and the references to ED- Equipment Drawings have been replaced by references to the J- Equipment Drawings.

D.2 In FS1, option N is designated and option M is added to provide a fuse failure and trouble alarm for externally mounted units.

D.3 In FS1, option K is designated and options J and H are added to provide for remote trunk answering as an optional feature.

D.4 In FS1, option G is designated and option F is added to remove a hazard. The added resistors prevent excessive current from being drawn should the fuse alarm leads become accidentally grounded.

D.5 In FS2, a relay contact designation is corrected in the line, link and marker circuit shown in the double line box.

D.6 In FS3, the schematic for the test battery terminations is changed to reflect the reduction of the number of test battery terminations provided in the PBX.

D.7 In Apparatus Figure 4, F and M options are added.

D.8 In Apparatus Figures 7,8 and 9, the codes of the connecting blocks are changed on a no record basis.

D.9 In Circuit Note 102, options F,H,J and M are added.

D.10 In Circuit Note 102, the quantity of Apparatus Figure 8 provided is changed from five to one.

D.11 In Circuit Note 104, options F,H,J and M are added and rated STD; and options G,K and N are added and rated MFR DISC.

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