

CIRCUIT DESCRIPTION

CD-66909-01
ISSUE 2D
APPENDIX 2D
DWG ISSUE 8D

PEX SYSTEMS
NO. 756A
STATION DIAL TRANSFER
CONTROLLER CIRCUIT

CHANGES

D. Description of Changes

- D.1 The rating of this circuit is changed from AT&TCo
Standard to A&M Only.
- D.2 Option T is designated and shown on CAD Fig. 1.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3224-WVS-RVL

CIRCUIT DESCRIPTION.-

CD-66909-01
ISSUE 2D
APPENDIX 1B
DWG ISSUE 7B

PBX SYSTEMS
NO. 756A
STATION DIAL TRANSFER
CONTROLLER CIRCUIT

CHANGES

B. Changes in Apparatus

B.1 Added

RCA and RCB diodes, 446F, App Fig. 1, option V

D. Description of Changes

D.1 Option X is designated and rated Mfr Disc. to remove a locking path for relay AR-.

D.2 Option W is designated and rated Mfr Disc.

D.3 Option V is added as Standard to prevent a station that flashes for dial tone from being connected to a station that the attendant direct station selects at the same time.

D.4 Circuit Note 104 is revised to reflect Issue 7B.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3224-WVS-RVL

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TABLE A - DEFINITIONS OF TERMS

TERM	DEFINITION
PARTY A	An outside party connected to a PBX station through a central office trunk.
STATION B	A PBX station connected to an outside party A through a central office trunk.
STATION C	A PBX station to which party A requests transfer.
STATION D	A PBX station to which an incoming call is transferred by station C.
CONTROLLER CIRCUIT	Station dial transfer controller circuit. Working with the station dial transfer trunk circuits with add-on conference and associated with the 10 central office trunks.
TRANSFER TRUNK CIRCUIT	Two identical trunk circuits (No. 0 and No. 1) associated with a station C by switching circuits.
SWITCHHOOK FLASH	Operation of switchhook and release in not less than 75 ms nor more than 850 ms.

B. Association of the Controller Circuit With Central Office and Transfer Trunk Circuits

2.02 The station dial transfer controller circuit gives every central office trunk circuit access to both transfer trunk circuits.

C. Assignment of Switch Verticals

2.03 The two transfer trunk circuits are permanently assigned to the first two verticals of crossbar switch No. 9. The horizontal of crossbar switch No. 9 are connected in series with the other crossbar switches of the 756A PBX.

2.04 Transfer trunk No. 0 is used as a first choice. If a second station requests transfer, transfer trunk No. 1 is used. In case a third station requests service when both trunks are busy, the controller will direct this call to the attendant.

D. Transferring Party A to Another Station

2.05 When station B flashes, the central office trunk involved in this connection activates the controller circuit.

2.06 When the controller is activated, it performs the following functions:

- (a) Obtains a transfer trunk circuit according to the preference circuit, unless both transfer trunks are busy.
- (b) Puts party A on hold at the central office trunk.

2.07 The transfer trunk circuit, when called, obtains control of the transfer call performing all supervisory actions according to the requests made by station B.

2.08 At this point, the controller circuit acts as a connecting means between the central office trunk involved in the transfer call and the transfer trunk circuit.

2.09 Station C is attached at the transfer trunk end and when it hangs up performs the following functions:

- (a) Releases itself from the connection.
- (b) Releases the transfer trunk circuit involved in the operation.
- (c) Releases part of the controller circuit associated with the particular central office trunk circuit.
- (d) Restores the central office trunk circuit to the state which existed before transfer took place.
- (e) Station B and party A are now connected together as they were originally through the central office trunk circuit.

2.10 If station B hangs up, it performs the following functions:

- (a) Releases itself from the connection.
- (b) Releases part of the transfer trunk circuit involved in the connection.

- (c) Prepares the transfer trunk circuit for further transferring.
- (d) Releases part of the central office trunk.
- (e) Transfers control of the circuit to station C for further transferring.

E. Second Transfer of Party A

2.11 Assuming party C has hung up, station P and party A are connected through the central office trunk as previously described. Operation of the switchhook by station B will have the same effect as described for the first transfer to a station C.

2.12 Assuming party B has hung up, operation of the switchhook by station C causes the following operations:

- (a) Activates part of the transfer trunk which in turn activates part of the controller circuit.
- (b) Prepares the transfer trunk circuit for subsequent operations.

2.13 When the part of the controller associated with the central office trunk is activated, it performs the following functions:

- (a) Prepares the central office trunk for calling the marker.
- (b) Activates the marker through the central office trunk circuit to connect station C to a dial pulse register.
- (c) Returns dial tone to station C.
- (d) Prepares to repeat the dialing of station C into the dial pulse register. Station C may now dial the number of station D.

2.14 When dialing is completed, the marker functions to connect station D to station C through the central office trunk, part of the controller circuit, and through the transfer trunk circuit.

2.15 If station D hangs up, it performs the following functions:

- (a) Releases itself from the connection.
- (b) Releases part of the transfer trunk circuit involved in connecting itself.
- (c) Releases part of the controller circuit, which in turn restores the central office trunk circuit to the state which existed before station C flashed the switchhook.
- (d) After station D hangs up, operation of the switchhook by station C will have

the same effect as described for the second transfer to a station D.

2.16 When station C hangs up the following release actions are performed:

- (a) Releases itself from the connection.
- (b) Releases the transfer trunk circuit.
- (c) Releases part of the controller circuit associated with the particular central office trunk circuit.
- (d) Restores the central office trunk circuit to the state which existed before transferring took place.

2.17 Calling the attendant from any PRX station during transfer is done by dialing zero. The transfer trunk circuit activates the marker which in turn abandons the call to an attendant trunk setting up a station recall condition to the attendant. The red lamp associated with the particular central office trunk circuit flashes at 120 ipm and continuous ringing is applied.

SECTION II - DETAILED DESCRIPTION

1. GENERAL

1.01 When the dial transfer feature is provided, an incoming trunk call is first terminated on the called PRX station or tie line by the PBX attendant using normal procedure.

1.02 If the terminating station is reached by tie line, a switchhook flash at the distant PBX station results in a flashing recall signal at the attendant position.

1.03 When the trunk call is terminated on a local PBX station, a switchhook flash results in dial tone to the station. Transfer to another station or tie line is effected without recalling the attendant.

1.04 When necessary, the PBX attendant may be recalled to a trunk terminated on a local PRX station by dialing 0. This results in a flashing recall signal to the attendant.

2. FIRST TRANSFER OF PARTY A - STATION B TRANSFERS TO STATION C (SC1)

A. Controller Circuit Attached to Central Office Trunk No. 0

2.01 Assume an established talking connection between party A and station B through the central office trunk No. 0. Also assume that transfer trunk circuit No. 0 is idle. Station B depresses the switchhook momentarily.

2.02 Relay S in the central office trunk follows the operation of the switchhook. The central office trunk functions identically as

in station recall, grounding the TPO lead and so operating relay TPO.

2.03 Relay TPO operated:

- (a) Locks through its own contact under control of relays FF and DR in the central office trunk.
- (b) Prepares operating paths for relays TOA and TOB.
- (c) Operates relay GP.

2.04 Relay GP operated:

- (a) Prevents starting other transfers while the controller is in the process of obtaining a transfer trunk circuit.
- (b) Operates relay TOA.

B. Transfer Trunk Circuit No. 0 Attached

2.05 Relay TOA operated:

- (a) Operates relay STB in transfer trunk circuit No. 0 through the contacts of relay CT7 in the transfer trunk circuit and TPO in the controller circuit.
- (b) Operates relay TRO through the same path.
- (c) Prepares operating paths for relays STO and ARO.
- (d) Prepares a path for transferring control of the central office trunk.
- (e) Prepares operating paths for relays RLBY, MCA, MCB, and RLDT in the transfer trunk circuit.
- (f) Prepares paths for connecting station B to the transfer trunk circuit.
- (g) Prepares a path for calling in party A.

2.06 Relay STB operated in the transfer trunk circuit proceeds to activate the transfer trunk circuit and together with the controller circuit activates the marker for establishing dial tone.

2.07 Relay TPO operated:

- (a) Provides a holding path for party A.
- (b) Connects station B to the transfer trunk circuit and splits the central office trunk.
- (c) Releases relay FF in the central office trunk.
- (d) Transfers control of the central office trunk to the transfer trunk circuit.

- (e) Operates relay B in the transfer trunk circuit under control of relay MCB in the same circuit.

2.08 Relay FF released in the central office trunk:

- (a) Releases relay DR in the central office trunk.
- (b) Removes ground from the starting lead, releasing relay TPO.

2.09 Relay TPO released:

- (a) Permits other central office trunks to request transfer through station B when relay GP is released.
- (b) Releases relay GP.

C. Controller Circuit Attached to Central Office Trunk No. 1

2.10 Assume an established talking connection between party A and station B through another central office trunk No. 1. Also assume that transfer trunk No. 0 is busy through central office trunk No. 0. Party B depresses the switchhook momentarily.

2.11 Relay S in the central office trunk follows the operation of the switchhook. The central office trunk functions identically as in station recall grounding the TP1 lead and thereby operating relay TP1.

2.12 Relay TP1 operated:

- (a) Locks through its own contact under control of relays FF and DR in the central office trunk.
- (b) Prepares operating paths for relays T1A and T1B.
- (c) Operates relay GP.

2.13 Relay GP operated:

- (a) Prevents starting other transfers while the controller is in the process of obtaining a transfer trunk circuit.
- (b) Operates relay T1B.

D. Transfer Trunk Circuit No. 1 Attached

2.14 Relay T1B operated:

- (a) Operates relay STB in transfer trunk circuit No. 1 through the contacts of relay CTZ in the transfer trunk circuit and TP1 in the controller circuit.
- (b) Operates relay TR1 through the same path.
- (c) Prepares operating paths for relays ST1 and AR1.

- (d) Prepares a path for transferring control of the central office trunk.
- (e) Prepares operating paths for relays RLBV, RLDT, MCA, and MCB in the transfer trunk circuit.
- (f) Prepares paths for connecting station B to the transfer trunk circuit.
- (g) Prepares a path for calling in party A.
- (c) Prepares operating paths for relay HM in the transfer trunk circuits and hold magnets THM90 and THM91.
- (d) Prevents register relay AC from operating.

2.21 In the sequence of operation, marker relay SMRAB operates, operating relay HM in the transfer trunk circuit and hold magnet THM90. Relay HM operated in the transfer trunk circuit directs subsequent requests for transfer to station dial transfer trunk circuit No. 1.

2.15 Relay STB operated in the transfer trunk circuit No. 1 proceeds to activate the transfer trunk circuit and together with the controller circuit activates the marker for establishing dial tone.

2.16 Relay TP1 operated:

- (a) Provides a holding path for party A.
- (b) Connects station B to the transfer trunk and splits central office trunk No. 1.
- (c) Releases relay FF in central office trunk No. 1.
- (d) Transfers control of the central office trunk to the transfer trunk circuit.
- (e) Operates relay B in transfer trunk No. 1 under control of relay MCB in the same circuit.

2.17 Relay FF released in central office trunk No. 1:

- (a) Releases relay DR in the central office trunk.
- (b) Removes ground from the starting lead, releasing relay TP1.

2.18 Relay TP1 released:

- (a) Permits other central office trunks to request transfer through station B when relay GP is released.
- (b) Releases relay GP.

E. Marker Starting and Register Attached

2.19 The transfer trunk circuit activates the marker by operating relay TR1 for the purpose of obtaining a dial pulse register. In the process of obtaining the register, relay TRP1 in the marker operates. This operates relay TRT1.

2.20 Controller relay TRT1 operated:

- (a) Prepares operating paths for marker relays U9 and U8.
- (b) Operates relay SMC9.

3. STATION B DISPOSES OF DIAL TONE, PARTIAL DIAL, NO ANSWER, BUSY, OR 120-IPM TONE (SC2)

3.01 If station B has received dial tone or 120-ipm tone or the called station C is busy or does not answer, the call may be cancelled and station B may return to party A by flashing the switchhook.

3.02 When station B depresses the switchhook, the transfer trunk circuit proceeds to release the connection by operating relay RLS in the transfer trunk circuit.

3.03 Transfer trunk relay RLS operated releases transfer trunk relay STB performing the following functions:

- (a) Releases relays TOA and TRO.
- (b) Releases hold magnet TH90.
- (c) Releases the transfer trunk circuit and thereby makes it available for subsequent requests for transfer.

4. STATION B RECALLS THE ATTENDANT (SC3)

4.01 Station B may recall the attendant by dialing zero. The transfer trunk circuit activates the controller circuit which in turn flashes the red lamp associated with the particular central office trunk at 120 ipm signaling the attendant. Continuous ringing is also applied.

4.02 The marker circuit senses the dialing of zero by operating transfer trunk relay DBO through the contacts of marker relay TKBO. Relay DBO operated in the transfer trunk circuit operates controller relay ARO.

4.03 Relay ARO operated:

- (a) Locks under control of relays AC, FF, and SR in the central office trunk 0.
- (b) Flashes the red lamp associated with the central office trunk No. 0 at 120 ipm.
- (c) Prevents relays TPO and STO from operating.

- (d) Applies continuous ringing to signal the attendant.
- (e) Operates relay FF in the central office trunk No. 0. Relay FF operated operates relay DR also in the central office trunk which in turn causes the line lamp at the 6-button key telephone set (if provided) to flash at 120 ipm.

4.04 When the attendant answers the recall by operating the pickup key, central office trunk relay AC operates, releasing relay ARO, and relay FF in the central office trunk No. 0. Relay FF released in trunk No. 0 releases relay DR also in the trunk and transfers the line lamp at the 6-button key telephone set (if provided) from 120 ipm to steady battery.

5. SECOND TRANSFER OF PARTY A - STATION C TRANSFERS TO STATION D (SC4)

5.01 Assume an established talking connection between party A and station C through transfer trunk No. 0. Also assume that central office trunk No. 0 is involved in this connection. Station C operates the switchhook momentarily.

5.02 The transfer trunk circuit senses the operation of the switchhook by releasing relay CTZ. Transfer trunk relay CTZ releasing operates relay STO in the controller circuit performing the following functions:

- (a) Operates relay HD in the central office trunk.
- (b) Starts the marker through the central office trunk by operating marker relay TRO.
- (c) Prepares an operating path for relays MCA and MCB in the transfer trunk circuit and relay CCC in the marker circuit.
- (d) Operates relay RCO which prevents relay AC in the register from operating.

5.03 Central office trunk relay HD operated prepares the central office trunk for obtaining a dial pulse register and performs the following functions:

- (a) Connects relay SL to the sleeve lead.
- (b) Prepares an operating path for relay TT.
- (c) Locks to off-normal ground.

5.04 Operation of relay TRO in the marker starts the marker for the purpose of obtaining a dial pulse register. In the sequence of operation, the marker obtains a dial pulse register and attaches it to the central office trunk.

5.05 When station C completes dialing the number of station D into the register, the register notifies the marker to connect station D to the central office trunk as it does on any other central office to station call.

5.06 When the called station D answers, stations C and D can talk to each other but not to party A. Station C or D can call in party A by flashing the switchhook.

6. STATION C DISPOSES OF DIAL TONE, PARTIAL DIAL, NO ANSWER, BUSY, OR 120-IPM TONE (SC5)

6.01 If station C has received dial tone or 120-ipm tone or the called station D is busy or does not answer, the call may be cancelled and station C may return to party A by flashing the switchhook.

6.02 When station C depresses the switchhook, the transfer trunk circuit releases the connection by operating relay DLBA in the transfer trunk circuit.

6.03 Transfer trunk relay DLBA operated releases central office trunk relays HM, RT, and TLA and hold magnet THM00 restoring central office trunk No. 0 to normal as it was before station C flashed for dial tone.

6.04 At this time, station C is connected to party A through the central office trunk and transfer trunk circuit. Also the dial pulse register is cleared and made available for subsequent calls.

7. STATION C RECALLS THE ATTENDANT (SC3)

7.01 Station C may recall the attendant by dialing zero. The transfer trunk circuit activates the controller circuit which in turn flashes the red lamp associated with the particular central office trunk at 120 ipm signaling the attendant. Continuous ringing is also applied.

7.02 The marker circuit senses the dialing of zero by operating transfer trunk relay DCO through the contacts of marker relay TKBO. Relay DCO operated in the transfer trunk circuit operates controller relay APO.

7.03 Relay ARO operated:

- (a) Locks under control of relays AC, FF, and SR in the central office trunk No. 0.
- (b) Flashes the red lamp associated with the central office trunk No. 0 at 120 ipm.
- (c) Prevents relays TPO and STO from operating.
- (d) Applies continuous ringing to signal the attendant.

- (e) Operates relay FF in the central office trunk No. 0. Relay FF operated operates relay DR also in the central office trunk which in turn causes the line lamp at the 6-button key telephone set (if provided) to flash at 120 ipm.

7.04 When the attendant answers the recall by operating the pickup key, central office trunk relay AC operates releasing relay ARO, and relay FF in the central office trunk No. 0. Relay FF released in trunk No. 0 releases relay DR also in the trunk and transfers the line lamp at the 6-button key telephone set (if provided) from 120 ipm to steady battery.

8. ALL TRANSFER TRUNKS BUSY (SC6)

8.01 If both transfer trunk circuits are busy and another station requests transfer the call is routed to the attendant.

8.02 Relay GP operated in the controller circuit operates controller relay ATB which in turn operates relay ARO performing the following functions:

- (a) Locks to ground under control of the central office trunk.
- (b) Flashes the red central office trunk lamp at the attendant console at 120 ipm.
- (c) Applies continuous ringing to the attendant.
- (d) Releases controller relay TPO which in turn releases relays GP and ATB.

9. DISCONNECTS

A. After Dialing Zero Station B Disconnects Before Attendant Answers

9.01 If station B hangs up before the attendant answers, the central office trunk releases and the signals at the attendant console disappear.

B. Station C Hangs Up After Answering

9.02 Station C releases from the connection when it hangs up. This also releases the transfer trunk circuit by releasing transfer trunk relay STB.

9.03 When relay STB releases, it releases part of the controller circuit associated with central office trunk No. 0 by releasing relays TOA and TPO.

C. Station B Hangs Up After Station C Has Answered

9.04 When station C has answered station B may release from the connection by hanging up either before or after party A has been

called in. When station B releases, it frees the central office line end and therefore makes it available for subsequent transfers.

9.05 The transfer trunk circuit reacts to the disconnection of station B by operating transfer trunk relay DLBA. Transfer trunk relay DLBA operated releases central office trunk relays HM, RT, and TLA and hold magnet THM00 restoring central office trunk No. 0 to normal as it was after the attendant had answered the incoming call from party A.

D. After Dialing Zero Station C Disconnects Before Attendant Answers

9.06 Disconnection of station C before the attendant answers will cause part of the controller circuit associated with central office trunk No. 0 to release. The transfer trunk circuit will be released and available for subsequent requests for transfer.

9.07 The transfer trunk circuit reacts to disconnection of station C by operating transfer trunk relay DLC. Transfer trunk relay DLC operated releases relay STB in the same circuit. When relay STB releases, it releases the transfer trunk circuit and part of the controller circuit associated with central office trunk No. 0 by releasing relays TOA and TPO.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 The maximum external loop resistance is 1500 ohms. The minimum insulation resistance is 10,000 ohms.

1.02 Voltage Limits

<u>Minimum</u>	<u>Maximum</u>
-45 volts	-52 volts

2. FUNCTIONAL DESIGNATIONS

<u>Designation</u>	<u>Meaning</u>
ARO-9	Attendant Recall
ATB	All Trunks Busy
GP	Group Preference
RC0,1	Register Control
S4C9	Select Magnet Connector
T(0-9)A,B	Transfer Trunk Preference
TP0-9	Tens Preference
TR0-9	Transfer
TRT1	Transfer Trunk

ST0-9

Station Transfer

3. FUNCTIONS

3.01 To give every central office trunk access to both station dial transfer trunk circuits.

3.02 To attach a transfer trunk to that part of the controller circuit associated with the particular central office trunk circuit involved in the transfer.

3.03 To prevent interference between simultaneous requests for transfer.

3.04 To transmit dial tone to a transferring station B when a dial pulse register has been attached to a transfer trunk circuit.

3.05 To transmit pulses into the register when pulsing starts after a register is attached.

3.06 To activate the particular central office trunk involved in the transfer for calling a dial pulse register when station C has been attached to the transfer trunk.

3.07 To restore the central office trunk involved in the transfer to normal after station C has hung up.

3.08 To provide means for signaling the attendant when station B or C has dialed zero.

4. CONNECTING CIRCUITS

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

4.02 This circuit is connected to the following circuits which are part of the 756A PBX system:

- (a) Line, Link, and Marker Circuit - SD-65741-01.
- (b) Two-Way Central Office Trunk Circuit - SD-65752-01.
- (c) Ringing Circuit - SD-81298-01 and Power Supply Circuit - SD-81326-01 or Power Supply Circuit - SD-81577-01 alone, or Power Supply Circuit - SD-81600-01 alone.
- (d) Station Dial Transfer Trunk Circuit with Add-On Conference - SD-66921-01.
- (e) Cordless Position Circuit - SD-65757-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 The station dial transfer controller circuit shall be capable of performing all of

the functions given in this circuit description; the relays with which it is equipped shall meet all requirements of the Circuit Requirements table.

6. ALARM INFORMATION

6.01 An operated fuse supplying the dial transfer controller circuit results in visual and audible signals at the attendant position and in the alarm, transfer, and test circuit. If alarm sending is provided, a major alarm is transmitted to the plant service center.

6.02 Replacing the operated fuse silences the audible alarm and extinguishes the alarm lamps.

7. TAKING EQUIPMENT OUT OF SERVICE

7.01 The station dial transfer controller circuit may be taken out of service by the following procedures in sequence:

- (a) Determine that the circuit is not in use by observing that all relays are released.
- (b) Determine that all central office trunks in the PBX are not in use by observing that all relays are released.
- (c) Block relays TP0-9 released.
- (d) Remove all battery supply fuses.
- (e) Remove all crown plug assemblies associated with this circuit and replace them with connector plug assemblies.

SECTION IV - REASONS FOR REISSUED. Description of Changes

D.1 On sheet B1, the numbering of the off-normal break contacts of trunk hold magnets THM 90 and 91 is changed from 4 and 5 to 1 and 2 to agree with a 324AK switch.

D.2 The value of resistance for the windings of relays ST(0 through 9) is changed from 950 to 2450 ohms.

D.3 Circuit Note 101 is change to replace fuse C with fuse SDT.

D.4 CAD 1 is changed to show SDT battery and ground in place of C battery and ground.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3221-WVS-RGP