CIRCUIT DESCRIPTION

CD-66921-01
ISSUE 2D
APPENDIX 3D
DWG ISSUE 12D

PBX SYSTEMS
NO. 756A
STATION DIAL TRANSFER
TRUNK CIRCUIT
WITH ADD-ON CONFERENCE

CHANGES

D. Description of Changes

D.1 This drawing is reissued to add relay BA which was mysteriously removed on issue 9D.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3223-WVS-FLS

CIRCUIT DESCRIPTION

CD-66921-01
ISSUE 2D
APPENDIX 2D
DWG ISSUE 11D

PBX SYSTEMS
NO. 756A
STATION DIAL TRANSFER
TRUNK CIRCUIT
WITH ADD-ON CONFERENCE

CHANGES

D. Description of Changes

D.1 The rating of this circuit is changed from AT&TCo Standard to A&M Only.

D.2 Corrections are made on FS 7 and CAD Fig. 1 on a "no-record" basis.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3224-WVS-RVL

PBX SYSTEMS
NO. 756A
STATION DIAL TRANSFER
TRUNK CIRCUIT
WITH ADD-ON CONFERENCE

CHANGES

D. Description of Changes

D.1 Options K and M are added to the Option Index.

D.2 Option K is designated and rated as Standard to provide a release path for relay TR- in the station dial transfer controller circuit.

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

D.4 Circuit Note 104 is revised to reflect Issue 10B.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3224-WVS-RVL

PBX SYSTEMS
NO. 756A
STATION DIAL TRANSFER
TRUNK CIRCUIT
WITH ADD-ON CONFERENCE

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The station dial transfer trunk circuit working with the station dial transfer controller circuit allows any PBX station to transfer an incoming call to any other PBX station (including a station reached by a tie trunk) without the assistance of the attendant. Add-on conference is provided by allowing a maximum of two stations to converse simultaneously with the incoming party.

2. GENERAL DESCRIPTION OF OPERATION

A. Definitions and Operation Charts

2.01 Table A defines terms used in this description. A block diagram showing the station and switching actions involved in transferring the outside party to another station is shown in the circuit notes.

B. Assignment of Switch Verticals

2.02 The two transfer trunk circuits are permanently assigned to the first two verticals of crossbar switch 9. Transfer trunk 0 is used as a first choice. If a second station requests transfer, transfer trunk 1 is used. In case a third station requests service when both trunks are busy, the transfer must be handled by the attendant.

C. Transferring Party A to Another Station

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

2.04 When the controller is thus 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.

2.05 The transfer trunk circuit, when called, performs the following functions:

(a) Activates the marker to connect station B to a dial pulse register.

(b) Returns dial tone to station B.

(c) Makes itself busy for subsequent requests for transfer.

(d) Prepares to repeat the dialing of station B into the dial pulse register. Station B may now dial the number of station C.

2.06 When dialing is completed, the marker functions to connect station C to station B through the transfer trunk circuit and part of the controller circuit associated with the particular central office trunk. At this point, stations B and C can talk to each other but not to party A.

TABLE A

DEFINITION 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 (0 and 1) associated with a station C by PBX switching circuits.
SWITCHHOOK FLASH	Operation of switchhook and release in not less than 75 ms nor more than 850 ms.

2.07 Either station B or C can call in party A by operating the switchhook momentarily. Stations B and C and party A are now mutually connected and can talk to each other. Subsequent flashing by either station cannot change the connection unless station A or B hangs up.

2.08 If station C hangs up, it 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.

Station B and party A are now connected together as they were originally through the central office trunk circuit.

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

(a) Releases itself from the connection. It may then make or receive other calls in a normal manner.

(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.

D. Second Transfer of Party A

2.10 Assuming party C has hung up, station B and party A are connected through the central office trunk as they were originally. Operation of the switchhook by station B causes the same effects as were described for the first transfer to a station C.

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

(a) Activates part of the transfer trunk.

(b) Prepares the central office trunk for calling the marker.

2.12 The central office trunk circuit, when called, performs the following functions:

(a) Activates the marker to connect station C to a dial pulse register.

(b) Returns dial tone to station C.

(c) Prepares to repeat the dialing of station C into the dial pulse register. Station C may now dial the number of station D.

2.13 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. At this point, stations C and D can talk to each other but not to party A.

2.14 Either station C or D can call in party A by operating the switchhook momentarily. Stations C and D and party A are now connected together and can talk to each other. Subsequent flashing by either station does not change the connection unless one of the stations hangs up.

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

(a) Releases itself from the connection. It may then make or receive other calls in a normal manner.

(b) Releases part of the transfer trunk involved.

(c) Prepares the transfer trunk circuit for further transferring.

(d) Puts party A on hold.

After station D hangs up, operation of the switchhook by station C activates part of the transfer trunk and prepares the central office trunk for calling in the marker.

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 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 transferring took place.

Station D and party A are now connected via the central office trunk.

2.17 If any time during the transferring of calls, the called station is busy or does not answer when rung, the calling station cancels the call to this station by a second switchhook operation. This dismisses the PBX switching circuits and returns the transferring station to party A for further consultation.

2.18 The action of cancelling by operation of the switchhook, including cancelling after partial dialing, may be taken at any time prior to answer by the called party.

2.19 The number of transfers between stations is unlimited and the two stations connected to the transfer trunk circuits may make transfers independently.

2.20 Calling the attendant from any PBX station during transferring 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 PBX 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 and 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 PBX station by dialing 0. This results in a flashing recall signal to the attendant.

2. FIRST TRANSFER OF PARTY A (SC1)

A. Central Office Trunk Response

2.01 Assume an established talking connection between party A and station B through central office trunk 0. Also assume that transfer trunk circuit 0 is idle. Party 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 as in station recall, grounding the TP lead and thus operating relay TPO in the controller circuit.

B. Controller Circuit Attached

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 in the controller circuit.

(c) Operates relay GP in the controller circuit.

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 in the controller circuit.

C. Transfer Trunk Circuit 0 Attached

2.05 Relay TOA operated:

(a) Operates relay STB in the transfer trunk through the contacts of relay CTZ in the transfer trunk and relay TPO in the controller circuit.

(b) Operates relay TRO in the controller circuit through the same path.

(c) Prepares an operating path for relay STO in the controller circuit.

(d) Prepares an operating path for relay RLDT.

(e) Prepares a path for transferring control of the central office trunk.

(f) Prepares an operating path for relay MCB.

(g) Prepares an operating path for relay MCA.

(h) Prepares paths for connecting station B to the transfer trunk circuit.

(i) Prepares a path for calling in party A.

(j) Prepares an operating path for relay RLBY.

(k) Prepares an operating path for relay ARO in the controller circuit.

2.06 Relay STB operated:

(a) Locks under control of relays RLS and CTZ.

(b) Prepares operating paths for relays DLBA, STC, HM, CTZ, and W. Also prepares operating paths for relays DLB and DLC via timers.

(c) Prepares locking paths for relays TT and BY.

(d) Operates relay MCB.

2.07 Relay TRO operated in the controller circuit:

(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 under control of relay MCB.

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 TP, releasing relay TPO.

2.09 Relay TPO in the controller circuit released:

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

(b) Releases relay GP in the controller circuit.

2.10 Relay GP in the controller circuit released permits other central office trunks to request transfer through station B.

2.11 Relay MCB operated:

(a) Prepares an operating path for relay B.

(b) Prevents relay STO from operating when station C answers.

(c) Provides a parallel path for controlling the timer circuit which operates relay DLB.

(d) Prepares a locking path under control of relays CB and DLB.

2.12 Relay B operated:

(a) Operates relay BA.

(b) Prevents operation of relay RLBY once station C has answered.

(c) Prepares an operating path for relay P when a dial pulse register has been attached.

D. Marker Starting

2.13 Relay BA operated:

(a) Prepares an operating path for controller circuit relay TRT1.

(b) Prevents relay DLB from operating (via the timer circuit) when relay BB operates.

(c) Prevents relays W and CTZ from operating when relay BB operates.

(d) Operates relay BB.

(e) Prevents relay RLS from operating when called station C is rung or is busy.

(f) Prepares an operating path for relay U9 in the marker circuit under control of relay TRT1 in the controller circuit.

(g) Prepares a locking path for relay HM.

(h) Operates relay TR1 in the marker.

2.14 Relay BN operated:

(a) Prepares a holding path for relay DLC.

(b) Prepares a locking path for relay RLS.

(c) Supplies a holding path for relay MCB.

(d) Prevents controller relay STO from operating when station C answers.

(e) Prepares an operating path for relays W and CTZ.

(f) Prepares an operating path via the timer circuit for relay DLB.

(g) Provides a locking path under control of relay DLB.

2.15 Operation of marker relay TR1 starts the marker 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 in the controller circuit.

2.16 Controller relay TRT1 operated:

(a) Prepares operating paths for marker relays U9 and U8.

(b) Operates relay SMC9 in the controller circuit.

(c) Prepares operating paths for relays HM in the transfer trunk circuits and trunk hold magnets THM90 and THM91 in the controller circuit.

(d) Prevents register relay AC from operating.

2.17 In the sequence of operation, marker relay SMRAB operates. Relay SMRAB operated extends ground over lead TU(TT-) to the TMS remote scanner and operates relay HM in the transfer trunk and trunk hold magnet THM90 in the controller.

2.18 Relay HM operated:

(a) Prevents controller relay TRT1 from reoperating when the marker is completing another operation.

(b) Prevents marker relay TR1 from reoperating when the marker has attached a dial pulse register to the transfer trunk circuit.

(c) Prevents marker relay U8 or U9 from operating.

(d) Directs subsequent requests for transfer to transfer trunk 1.

(e) Locks under control of relay BA.

E. Register Attached

2.19 Operation of trunk hold magnet THM90 connects the tip, ring, and sleeve to the dial pulse register. A 100-ohm ground over the S lead operates relay SL. At this time station B hears dial tone.

2.20 Relay SL operated:

(a) Prepares a path for operating relay RLS under control of relays BA and P.

(b) Provides a holding path for relay HM under control of relay STB.

3. STATION B TRANSFERS TO STATION C (SC2)

A. Calling Station C

3.01 After receiving dial tone from the register, station B dials the number of station C.

3.02 After the register has received the proper number of digits, it reverses the tip and ring. This operates relay P which is polarized by diodes A and B. At the same time, the register calls the marker.

3.03 Relay P operated operates relay MC which performs the following functions:

(a) Operates marker relay CCC which cancels the camp-on function if the called line is busy.

(b) Prepares operating paths for relays TT, DBO, BY, DB9, and RS.

(c) Locks under control of the marker.

(d) Releases relay P.

(e) Starts ringing when relay RS operates.

3.04 When the marker completes the call to station C, relay RS operated:

(a) Prepares a holding path for relay STC.

(b) Prepares a path for applying ringing to station C.

(c) Prepares an operating path for relay RLS.

(d) Operates relay CTD.

3.05 Relay CTD operated:

(a) Operates relay STC under control of relays RS and STB.

(b) Prepares a locking path under control of relays STC and CB.

3.06 Relay STC operated:

(a) Provides a holding path for relays RS and CTD.

(b) Opens a holding path for relay MCB.

(c) Provides a holding path for relay HM.

(d) Opens the operating circuit for relay P and closes the ring side of the talking path.

(e) Prepares an operating path for relay C.

(f) Provides an alternate operating path for relay CCC in the marker.

(g) Prepares a locking path for relay C.

(h) Releases relay SL and connects 100-ohm resistance to the sleeve.

3.07 After the marker has completed its functions, it releases itself and the dial pulse register from the connection. Release of the marker causes relay MC to release. Relay MC released with relay RS operated connects a ringing supply through the primary winding of relay RT to station C. Audible ringing feedback is transmitted through capacitor FB to station B.

B. Called Station C Answers (SC3)

3.08 When called station C answers, relay RT operates on its primary winding and performs the following functions:

(a) Locks under control of relay STC.

(b) Provides a holding path for relay STC.

(c) Releases relay RS.

3.09 When station C answers, relay C operates and performs the following functions:

(a) Operates relay CA.

(b) Prepares an operating path for relay MCA.

(c) Provides an operating path for relay P in the central office trunk when a dial pulse register has been attached.

3.10 Relay CA operated:

(a) Prevents relay DLC from operating via the timer circuit when relay CB operates.

(b) Prevents relays W and CTZ from operating when CB operates.

(c) Operates relay CB.

(d) Prevents relays DLBA and RLDT from operating.

(e) Prevents relay BB from operating when station C transfers.

(f) Provides an operating path for relay STO in the controller circuit and for relay RLBY.

3.11 Relay CB operated:

(a) Provides an operating path for controller relay STO.

(b) Provides alternate holding paths for relays MCB and STB.

(c) Releases relay CTD.

(d) Prepares an operating path for relays W and CTZ and for relay DLC via the timer circuit.

(e) Locks to ground under control of relay CA.

3.12 Relay CTD released transfers control of relay STC to relay CB only.

C. Station B Calls in Party A (SC4)

3.13 Station B or station C can call in party A by flashing the switchhook. When station B operates the switchhook, the tip and ring loop is opened, releasing relay B.

3.14 Relay B released releases slow release relay BA which in turn operates relay W. Relay BA releases if the switchhook is held operated more than about 150 ms.

3.15 When the switchhook is released, relays B and BA reoperate thus operating relay CTZ. At this point, stations B and C and party A are mutually connected and can talk to each other.

D. Station C Calls in Party A (SC5)

3.16 If station C operates the switchhook, relay C releases which in turn releases slow release relay CA. Relay CA releases if the switchhook is held operated more than about 150 ms.

3.17 Relay CA in releasing operates relay W. When the switchhook is released, relays C and CA reoperate thus operating relay CTZ. At this point, stations B and C and party A are mutually connected and can talk to each other.

4. STATION B DISPOSES OF DIAL TONE OR PARTIAL DIAL (SC6)

4.01 If station B has received dial tone or has partially dialed, the call can be canceled and the station may return to party A by flashing the switchhook.

4.02 When station B depresses the switchhook, relay B releases which in turn releases relay BA. Relay BA released operates relay RLS through the contacts of relay SL.

4.03 Relay RLS operated:

(a) Prevents relay TR1 in the marker from operating when relay HM releases.

(b) Releases relays STB and DB9A and relays T0A and TR0 in the controller circuit.

(c) Locks to ground under control of relay BB.

4.04 Controller relay TR0 released releases relay B which in turn releases relay BA. Relay BA released removes ground from lead TU(TT-) to the TMS remote scanner and operates relay DLB. Relay DLB operates in about 800 ms and releases relays BB and MCB.

4.05 Relays BA and STB released release relays HM, DLB, and THM90 in the controller circuit. When the connection is released, the register is released and relay SL also releases.

4.06 At this time, station B is connected to party A through the central office trunk, the register is released, and the transfer trunk used to call in the register is cleared and made available for subsequent requests for transfer.

5. STATION B DISPOSES OF DON'T ANSWER (SC7)

5.01 If the called station C does not answer, station B may cancel the call and return to party A by flashing the switchhook.

5.02 When station B depresses the switchhook, relay B releases which in turn releases relay BA. Relay BA released operates relay RLS through the contacts of relay RS.

5.03 Relay RLS operated:

(a) Prevents relay TR1 in the marker from operating when relay HM releases.

(b) Releases relays STB and DB9A and relays TOA and TRO in the controller circuit.

(c) Locks to ground under control of relay BB.

5.04 Relay TRO released releases relay B which in turn releases relay BA. Relay BA released removes ground from lead TU(TT-) to the TMS remote scanner and operates relay DLB. DLB operated releases relays BB and MCB.

5.05 Relays BA and STB released release relays HM, DLB, and STC. Relay STC released releases relays RS and CTD. When the connection is released, the register is released.

5.06 At this time, station B is connected to party A through the central office trunk, the register is released, and the transfer trunk used to call in the register is cleared

and made available for subsequent requests for transfer.

6. STATION B DISPOSES OF BUSY LINE (SC8)

6.01 If the called station C is busy, station B may cancel the call and return to party A by flashing the switchhook.

6.02 When station B depresses the switchhook, relay B relay B releases which in turn releases relay BA. Relay BA released operates relay RLS through the contacts of relay BY which was operated by the marker because of the busy condition.

6.03 Relay RLS operated:

(a) Prevents relay TR1 in the marker from operating when relay HM releases.

(b) Releases relays STB and DB9A and relays TOA and TRO in the controller circuit.

(c) Locks to ground under control of relay BB.

6.04 Controller relay TRO released releases relay B which in turn releases relay BA. Relay BA released removes ground from lead TU (TT-) to the TMS remote scanner and operates relay DLB. Relay DLB operated releases relays BB and MCB.

6.05 Relays BA and STB released release relays HM, DLB, and THM90 in the controller circuit. When the connection is released, the register is released.

6.06 At this time, station B is connected to party A through the central office trunk, the register is released, and the transfer trunk used to call in the register is cleared and made available for subsequent requests for transfer.

7. STATION B DIALS 0 TO CALL ATTENDANT (SC9)

7.01 Station B may recall the attendant 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.

A. Marker Responds to 0 Dialed by Station B

7.02 When station B dials zero, the register and marker function to connect the calling station to an attendant trunk. Relay P operates operating relay MC. When relay TKBO in the marker operates, relay DBO operates via contacts of relay MC.

7.03 Relay DBO operated:

(a) Operates relay RLS.

(b) Operates relays ACA and ACB in the marker.

(c) Operates relay ARO in the controller.

(d) With option N, operates relay LCO to open leads FFA and FFB to prevent the false flashing of the SL lamp in the attendant console associated with an attendant trunk.

7.04 Relay RLS operated:

(a) Prevents relay TR1 in the marker from operating when relay HM releases.

(b) Releases relays STB and DB9A and relays TOA and TRO in the controller circuit.

(c) Locks to ground under control of relay BB.

7.05 Controller relay TRO released releases relay B which in turn releases relay BA. Relay BA released removes ground from lead TU(TT-) to the TMS remote scanner, and operates relay DLB. Relay DLB operated releases relays BB and MCB.

7.06 Relays DA and STB released release relays HM, DLB, and THM90 in the controller circuit. When the connection is released, the register is released.

B. Call Abandoned After Dialing Zero

7.07 Relays ACA and ACB operated in the marker release relays DCKA and DCKB which in turn operate relays RLA, RLB, RLAA, RLAB, RLBA, and RLBB.

7.08 Operation of the marker relays stops marker timing and releases the marker.

C. Attendant Recall

7.09 Relay ARO operated:

(a) Locks under control of relays AC and HD in the central office trunk.

(b) Flashes the red lamp associated with the central office trunk at 120 ipm.

(c) Prevents relays MCA and STO from operating.

(d) Applied continuous ringing to signal the attendant.

D. Attendant Answers (SC10)

7.10 When the attendant answers the recall by operating the pickup key, relay AC operates and releases relay ARO which in turn silences the audible signal and transfers the red lamp from 120 ipm to steady battery. At this time station B, party A, and the attendant are mutually connected through the

central office trunk and may talk to each other.

8. DIAL 9 TRUNK ACCESS DENIED

8.01 The transfer trunk circuit is arranged to deny access to central office trunks and to return 120-ipm tone if trunk access code 9 is dialed by any station.

A. Station B Dials 9 (SC11)

8.02 When station B dials 9, the register and marker function in a normal manner for connecting a dial 9 call. When marker relay TKB9 operates, it operates relay DB9 via contacts of relay MC.

8.03 Relay DB9 operated:

(a) Locks to ground under control of relay MC.

(b) Operates relay DB9A.

(c) Operates relays ACA and ACB in the marker.

8.04 Relay DB9A operated:

(a) Locks to ground under control of relay RLS.

(b) Provides 120-ipm tone to station B.

(c) Prepares an operating path for relay RLS.

B. Station B Disposes of 120-ipm Tone (SC12)

8.05 If station B has dialed 9 and received 120-ipm tone, it may release the call and return to party A by a switchhook flash.

8.06 When the switchhook is operated momentarily at station B, relay B releases momentarily which in turn releases relay BA. Relay BA released operates relay RLS through the contacts of relay DB9A.

8.07 Relay RLS operated releases the transfer trunk circuit and connects station B to party A through the central office trunk. The register is cleared and made available for subsequent calls.

9. DIAL REPEATING TIE TRUNK ADDED TO TRANSFER TRUNK CIRCUIT

9.01 Dial repeating tie trunks with reverse battery supervision may be added to the transfer trunk circuit.

A. Station B Dials a Tie Trunk Number (SC13)

9.02 When station B dials a tie trunk number (eg, 86), the register and marker function to connect the calling station to a tie trunk via the transfer trunk. When the tie trunk is connected, relay P operates, operating relay MC.

9.03 Relay MC operated prepares a path for operating relay TT via the marker and grounds marker lead CCC to cancel the camp-on function.

9.04 The marker, when connected, operates relay TT which performs the following functions:

(a) Prevents relay MC from operating when relay P reoperates as a result of answer by the distant PBX station.

(b) Provides an alternate holding path for relay STB.

(c) Locks to ground under control of relay STB.

(d) Prepares a holding path for relay W.

9.05 When the marker completes the call to the tie trunk it releases, releasing relay P. Station B may now dial the number of the station at the distant PBX.

9.06 If a supervisory signal is received from the distant PBX indicating that the called station is busy or does not answer, station B may cancel the call and return to party A by a switchhook flash.

B. Station at the Distant PBX Answers (SC13)

9.07 If the distant station answers, reverse battery supervision provided by the trunk operates relay P.

9.08 Station B may call in party A by flashing the switchhook. A switchhook flash at the distant PBX station has no effect unless station B has hung up.

9.09 The station at the distant PBX may recall the attendant by flashing which causes relay P to release momentarily. This operates relay ARO, signaling the attendant.

10. SECOND TRANSFER OF PARTY A (SC14)

A. Central Office Trunk Response

10.01 Assume an established talking connection between party A and station C through transfer trunk 0. Also assume that station C operates the switchhook momentarily.

10.02 When station C depresses the switchhook, relay C releases which in sequence releases relay CA and relay W. When relay C reoperates, relay CA operates, releasing relay CTZ.

B. Marker Starting

10.03 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 by operating relay TR-.

(c) Prepares an operating path for relays MCB and MCA and for relay CCC in the marker.

(d) Operates relay RCO in the controller circuit, which in turn prevents relay AC in the register from operating.

10.04 Central office trunk relay HD operated prepares the central office trunk for obtaining a dial pulse register by performing the following funtions:

(a) Connects relay SL to the sleeve lead.

(b) Prepares an operating path for relay TT.

(c) Locks to off-normal ground.

10.05 Operation of relay TR- in the marker starts the marker for the purpose of obtaining a dial pulse register. In the sequence of operations, the marker obtains a dial pulse register and attaches it to the central office trunk.

C. Register Attached

10.06 When the select magnet timing relay in the marker operates, ground is transmitted through the operated trunk magnet relay in the marker to operate central office trunk relay HM over lead ST. Relay HM and hold magnet THM-- in the marker operate in parallel.

10.07 Relay HM operated in the central office trunk:

(a) Holds operated to off-normal ground through operated central office relays HD, SL, and relay MC normal.

(b) Operates relays MCB and MCA in the transfer trunk through the controller circuit.

(c) Operates relay CCC in the marker.

(d) Releases relay RCO in the controller circuit.

11. STATION C TRANSFERS TO STATION D

A. Calling Station D (SC15)

11.01 Operation of magnet THM-- connects the tip and ring to the dial pulse register. At this time, station C hears dial tone. After receiving dial tone from the register, station C dials the number of station D.

11.02 After the register has received the proper number of digits, it reverses the tip and ring. This operates relay P in the central office trunk.

11.03 Relay P operated:

(a) Operates relay MC in the central office trunk.

(b) Operates relays MCB and MCA at the transfer trunk.

(c) Operates relay CCC in the marker.

11.04 The central office trunk connects station D to station C through the central office trunk, controller circuit, and transfer trunk circuit as it does on any other central office to station call.

11.05 Relay MCB operated:

(a) Prepares an operating path for relay B.

(b) Releases relay STO in the controller.

(c) Locks to ground under control of relays CB and DLB.

11.06 Relay MCA operated:

(a) Prepares an operating path for relays DC0 and DC9.

(b) Locks to ground under control of the marker.

11.07 After the marker has completed its functions, it releases itself and the dial pulse register from the connection. Release of the marker causes relay MCA to release. Ringing is applied to station D from the central office trunk. Audible ringing feedback is transmitted to station C through capacitor FB of the central office trunk.

B. Called Station D Answers (SC16)

11.08 When the called station D answers, relay RT operates in the central office trunk. Closing the tip and ring at station D operates relay B which in turn operates relays BA and BB.

11.09 At this time 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.

12. STATION C DISPOSES OF DIAL TONE OR PARTIAL DIAL (SC17)

12.01 If station C has received dial tone or has partially dialed, the call may be canceled and the station may return to party A by flashing the switchhook.

12.02 When station C depresses the switchhook, relay C releases which in turn releases relay CA. Relay CA released operates relays RLDT and W.

12.03 Relay RLDT operated operates relay DLBA which does the following:

(a) Releases relays DC9A and RLBY.

(b) Releases relays HM, RT, and TLA in the central office trunk and THM-- in the marker circuit, restoring the central office trunk to normal as it was before station C flashed for dial tone.

12.04 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.

13. STATION C DISPOSES OF DON'T ANSWER (SC18)

13.01 If the called station D does not answer, station C may cancel the call and return to party A by flashing the switchhook.

13.02 When station C operates the switchhook momentarily, relay C releases momentarily which in turn releases relay CA. Relay CA released operates relay BB via the central office trunk and also operates relay W.

13.03 Relay BB operated operates relay DLB via the timer which releases relays BB and MCB and operates relay DLBA.

13.04 Relay DLBA operated releases relays HM, RT, TLA, and RS in the central office trunk and THM-- in the marker circuit, restoring the central office trunk to normal as it was before station C flashed for dial tone.

13.05 At this time, station C is connected to party A through the transfer trunk and the central office trunk.

14. STATION C DISPOSES OF BUSY LINE (SC20)

14.01 If called station D is busy, station C may cancel the call and return to party A by flashing the switchhook.

14.02 The central office trunk, finding the called station D busy, transmits a ground through the RLS lead and operates relay RLBY. Also, relay B operates from the busy tone trunk, operating relays BA and BB in sequence.

14.03 Relay RLBY operated prepares an operating path for relay DLBA and locks to ground under control of relay DLBA.

14.04 When station C operates the switchhook momentarily, relay C releases momentarily which in turn releases relay CA. Relay CA released operates relay DLBA and also operates relay W.

14.05 Relay DLBA operated:

(a) Releases relay RLBY.

(b) Releases relays HM, RT, and TLA in the central office trunk, and THM-- in the marker circuit, restoring the central office trunk to normal as it was before station C flashed for dial tone.

14.06 THM-- releasing releases the busy tone trunk and releases relay B in the transfer trunk circuit.

14.07 Relay BA releasing operates relay DLB via the timer which in turn releases relays BB and MCB.

14.08 Relay DLB operated operates relay DLBA. This removes ground from lead GRD insuring that the central office trunk is restored to normal.

14.09 At this time, station C is connected to party A through the transfer trunk and the central office trunk.

15. STATION C DIALS 0 TO CALL ATTENDANT (SC21)

15.01 Station C may recall the attendant 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.

A. Marker Responds to 0 Dialed by Station C

15.02 When station C dials zero, the register and marker function to connect the calling station to an attendant trunk. When relay P in the central office trunk is operated, relay MCA operates via lead MCC. Relay MCA operates in parallel with relay MC in the central office trunk. When marker relay TKBO operates, relay DCO operates via contacts of relay MCA.

15.03 Relay DCO operated:

(a) Operates relays ACA and ACB in the marker.

(b) Locks to ground under control of relay MCA.

(c) Operates relay ARO in the controller circuit.

(d) Operates relay BB.

(e) With option N, operates relay LCO to open leads FFA and FFB to prevent the false flashing of the SL lamp in the attendant console associated with an attendant trunk.

B. Abandoned Call

15.04 Relays ACA and ACB operated in the marker release relays DCKA and DCKB which in turn operate relays RLA, RLB, RLAA, RLAB, RLBA, and RLBB in the marker.

15.05 Operation of the marker relays stops marker timing and releases the marker.

15.06 Controller relay ARO operated:

(a) Locks to ground under control of relays CA and AC in the central office trunk.

(b) Flashes the red lamp associated with the central office trunk at 120 ipm and also applies continuous ringing to the attendant.

(c) Prevents relay MCA and controller relay STO from reoperating.

15.07 Relay BB operated operates relay DLB via the timer which releases relays BB and MCB and operates relay DLBA.

15.08 Relay DLBA operated releases relays HM, HD, and TLA in the central office trunk and THM-- in the marker circuit, restoring the central office trunk to normal as it was before station C flashed for dial tone.

C. Attendant Answers (SC22)

15.09 When the attendant answers the recall by operating the pickup key, central office trunk relay AC operates and releases controller relay ARO which in turn silences the audible signal and transfers the red lamp from 120 ipm to steady. At this time, station C, party A, and the attendant are mutually connected through the transfer trunk and the central office trunk and may talk to each other.

16. STATION C DIALS 9 (SC23)

16.01 When station C dials 9, it receives 120-ipm tone as an indication that the call will not be completed.

A. Marker Functioning

16.02 When station C dials 9, the register and marker function in a normal manner for connecting a dial 9 call. When marker relay TKB9 operates, it operates relay DC9 via contacts of relay MCA.

16.03 Relay DC9 operated:

(a) Locks to ground under control of relay MCA.

(b) Operates relay DC9A.

(c) Operates relays ACA and ACB in the marker which in turn release the marker.

16.04 Relay DC9A operated:

(a) Prevents controller relay STO from reoperating.

(b) Prepares an operating path for relay BB under control of relay CA.

(c) Provides 120-ipm tone to station C.

(d) Locks to ground under control of relay DLBA.

B. Station C Disposes of 120-ipm Tone (SC24)

16.05 If the station C party has dialed 9 and has received 120-ipm tone, the call may be released and the party may return to party A by flashing the switchhook.

16.06 When station C operates the switchhook momentarily, relay C releases momentarily which in turn releases relay CA. Relay CA released operates relay BB via the contacts of relay DC9A.

16.07 Relay BB operated operates relay DLB via the timer which releases relays BB and MCB and operates relay DLBA.

16.08 Relay DLBA operated releases relays HM and HD in the central office trunk and THM-- in the marker circuit, restoring the central office trunk to normal as it was before station C flashed for dial tone.

17. DIAL REPEATING TIE TRUNK ADDED (SC25)

17.01 Station C may add a tie trunk with reverse battery supervision to the central office trunk through the transfer trunk.

A. Station C Dials a Tie Trunk Number

17.02 When station C dials a tie trunk number (eg, 86) the register and marker function to connect the central office trunk to a tie trunk. Central office trunk relay P operates, operating relay MC in the central office trunk and relay MCA.

17.03 The marker, when connected, operates relay TT in the central office trunk and relay TTA in the transfer trunk, performing the following functions:

(a) Prevents relay MCA and controller relay STO from reoperating when relay MCB releases.

(b) Releases relay MCB.

(c) Prepares an operating path for relay RLDT under control of relay PA.

(d) Locks to ground under control of relays DLBA and STC.

(e) Prepares an operating path for relay PA.

17.04 When the marker completes the call to the tie trunk it releases, releasing relay P in the central office trunk. At this time station C hears dial tone from the distant PBX. Station C may now dial the number of the station at the distant PBX.

17.05 If a supervisory signal is received from the distant PBX indicating that the called station is busy or does not answer, station C may cancel the call and return to party A.

17.06 To cancel the call and return to party A, station C flashes the switchhook.

17.07 When station C depresses the switchhook, relay C releases which in turn releases relay CA. Relay CA released operates relay RLDT through the normal contacts of relays PA and TTA.

17.08 Relay RLDT operated operates relay DLBA which does the following:

(a) Releases relays DC9A, RLBY, and TTA.

(b) Releases relays HM, RT, TLA, and TT in the central office trunk and THM-- in the marker circuit, restoring the central office trunk to normal as it was before station C flashed for dial tone.

17.09 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.

B. Station at the Distant PBX Answers

17.10 When the distant station answers, reverse battery supervision provided by the trunk operates relay P in the central office trunk which in turn operates relay RT in the central office trunk.

17.11 Relay RT operated in the central office trunk operates relay PA through thermistor PA performing the following:

(a) Prevents relay RLDT from operating when relay TTA operates.

(b) Provides a parallel holding path for relay P in the central office trunk.

17.12 Station C can call in party A by flashing the switchhook. Switchhook flashes at the distant PBX station will have no effect unless station C has hung up.

17.13 The distant PBX party may recall the attendant by flashing the switchhook. This type of recall must be handled by the attendant.

18. TRANSFER TRUNKS BUSY

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

18.02 Relay GP operated in the controller circuit operates controller relay ATB which in turn operates relay AR, performing the following functions:

(a) Locks to ground under control of the central office trunk.

(b) Flashes the red central office trunk lamp in 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 also in the controller.

19. DISCONNECTS

A. After Dialing Zero Station B Disconnects Before Attendant Answers

19.01 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 (SC26)

19.02 Station C releases from the connection when hung up. This also releases the transfer trunk and makes it available for subsequent requests for transfer. When station C hangs up, relay C releases which in turn releases relay CA. Relay CA releasing operates relay DLC via the timer.

19.03 Relay DLC operated:

(a) Locks to ground under control of relay BB.

(b) Supplies an alternate holding path for the relays in the central office trunk.

(c) Prevents marker relay TR1 from operating when relay HM releases.

(d) Releases relay CB.

19.04 Relay CB releasing releases relays STC and STB. When relay STB releases, it releases relay MDB. This releases the transfer trunk circuit and releases controller relays TOA and TRO.

C. Station B Hangs Up After Station C has Answered (SC27)

19.05 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 making it available for subsequent transfers.

19.06 When station B hangs up, relay B is released which in turn releases relay BA. Relay BA released operates relay DLB via the timer.

19.07 Relay DLB operated releases relays BB and MCB and operates slow-release relay DLBA.

19.08 Relay DLBA operated:

(a) Releases relays DC9A and RLBY.

(b) Releases relays HM, RT, and TLA in the central office trunk circuit and THM-- in the marker circuit, restoring the central office trunk to normal as it was after the attendant answered the incoming call from party A.

D. After Dialing Zero Station C Disconnects Before Attendant Answers (SC28)

19.09 If station C hangs up before the attendant answers, relay CA is released which in turn operates relay DLC via the timer. This causes the transfer trunk to release and makes it available for subsequent requests for transfer.

19.10 Relay DLC operated locks to ground under control of relay BB and releases relay CB.

19.11 Relay CB releasing releases relays STC and STB. When relay STB releases, it releases relay MCB. This releases the transfer trunk circuit and releases relays TOA and TRO in the controller circuit.

20. FUNCTION OF MAKE BUSY AND BUSY DISPLAY CIRCUIT

A. Dial Transfer Trunk Key Normal

20.01 With the dial transfer key (DLTR key) normal in the make busy and busy display circuit, the station dial transfer trunk and controller circuits will function as described previously. However, the ground placed on lead HM by the marker to operate both relay HM in the transfer trunk and trunk hold magnet THM9- in the controller will also light the dial transfer trunk busy lamp (DLTR lamp) in the make busy and busy display circuit. The lighting of lamp DLTR indicates that the transfer trunk has been made busy through normal operations.

B. Dial Transfer Trunk Made Busy

20.02 If it is desired to make a dial transfer trunk busy, the associated DLTR key in the make busy and busy display circuit is operated. Key DLTR operated will operate the associated MBT relay in the station dial transfer trunk circuit. Relay MBT operated:

(a) Opens lead HMPA in the transfer trunk circuit if transfer trunk 0 is being made busy or HMPB if transfer trunk 1 is being made busy.

(b) Connects lead GP or ATB through contacts of relays MBT and HM to lead TC in the transfer trunk circuit.

(c) Opens lead HM from the make busy and busy display circuit to the dial transfer trunk circuit.

(d) Grounds lead HM toward the make busy and busy display circuit to light lamp DLTR.

20.03 The lighting of lamp DLTR indicates that the dial transfer trunk has been made busy. The opening of lead HMPA or HMPB prevents the use of the associated transfer trunk circuit. The connecting of lead GP or ATB to lead TC directs subsequent requests for transfer to the other transfer trunk circuit.

20.04 If both transfer trunk circuits are made busy, any subsequent request for transfer by a PBX station will be routed to the attendant.

21. OPTIONS

21.01 Option N opens leads FFA and FFB toward the attendant trunks to prevent the false flashing of the SL lamp in the attendant console associated with an attendant trunk when a station dials 0 to call the attendant.

21.02 Option R relocates relay P from the ring side of the circuit to prevent an unbalanced condition that might result in hum or other unwanted noise.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

LINES AND TRUNKS

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

VOLTAGE LIMITS

1.02

Minimum	Maximum
-45 volts	-52 volts

2. FUNCTIONAL DESIGNATIONS

Designation	Meaning
B, BA, BB	Supervisory Relays (Station B)
BY	Busy
C, CA, CB	Supervisory Relays (Station C)
CTD	Cut-Through Destination
CTZ	Sequence Circuit
DB0	Station B Dials Zero
DB9	Station B Dials Nine
DB9A	Station B Dials Nine Auxiliary
DC0	Station C Dials Zero
DC9	Station C Dials Nine
DC9A	Station C Dials Nine Auxiliary
DLB	Delay Station B
DLBA	Delay Station B Auxiliary
DLC	Delay Station C
HM	Hold Magnet
LCO	Lamp Cutoff
MBT	Make Busy Trunk
MC	Marker Connect
MCA	Marker Connect Auxiliary
MCB	Marker Connect to B
P	Polarized
PA	Polarized Auxiliary
RLBY	Release Busy Condition
RLDT	Release Dial Tone
RLS	Release Transfer Trunk
RS	Ring Start
RT	Ring Trip
SL	Sleeve
STB	Station Transfer B
STC	Station Transfer C
TT	Tie Trunk
TTA	Tie Trunk Auxiliary
TTF	Tie Trunk Flashing
TTR	Tie Trunk Release
W	Sequence Circuit

3. FUNCTIONS

3.01 To provide means which permit a PBX station, originally connected to an outside party through a central office trunk, to transfer the outside party to another PBX station without the assistance of the attendant.

3.02 To disconnect any station from the transfer trunk after the transfer has taken place.

3.03 To return a transfer station to the attendant through the central office trunk without going through an attendant trunk.

3.04 To return 120-ipm tone if any station involved in a transfer attempts to add a central office trunk by dial 9 procedure.

3.05 To release the transfer trunk or part of the transfer trunk and part of the central office trunk from a partially completed call if the switchhook is flashed at any time prior to answer by the called station.

3.06 To provide for operation of the trunk with the traffic measurement system No. 1A remote scanner.

3.07 To provide for a dial transfer trunk busy indication to the make busy and busy display circuit.

3.08 To provide for being made busy by the make busy and busy display circuit.

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) Ringing Circuit SD-81288-01 and Power Supply Circuit SD-81326-01, or Power Supply Circuit SD-81577-01 alone, or Power Supply Circuit SD-81600-01 alone.

(c) Tie Trunk Circuit - SD-65535-01 (by switching action).

(d) Controller Circuit, Dial Transfer Station Controlled - SD-66909-01.

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

(f) Relay Time Delay Circuit - SD-99361-01 (Option W).

(g) Relay Time Delay Circuit - SD-66793-01 (Option X).

(h) Traffic Measurement System No. 1A Remote Scanner and Encoder Circuit, Portable Type - SD-3B200-01.

4.03 This circuit also includes two plug-in timing circuits, SD-66793-01.

5. ALARM INFORMATION

5.01 An operated fuse supplying the station dial transfer trunk circuit with add-on conference results in visual and audible signals at the attendant position and in the alarm, transfer, and test circuit. Also, if alarm sending is provided, a major alarm is transmitted to the plant service center.

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

6. MANUFACTURING TESTING REQUIREMENTS

6.01 The dial transfer trunk circuit, station controlled, 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.

7. TAKING EQUIPMENT OUT OF SERVICE

7.01 When the make busy and busy display circuit is not provided, the station dial transfer trunk circuit, with add-on conference, 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) Block relay STB released.

(c) Remove all battery supply fuses.

(d) Block relay HM operated.

7.02 When the make busy and busy display circuit is provided, the station dial transfer trunk circuit may be taken out of service by the following procedure in sequence:

(a) Determine that the circuit is not in use by observing that the dial transfer trunk busy lamp (DLTR lamp) in the make busy and busy display circuit is not lighted.

(b) Operate key DLTR in the make busy and busy display circuit.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus

B.1 Added

LCO Relay, 1/2AK4,
Spare with Option W,
App Fig. 1, Option N

C Diode, 446F, App Fig. 1,
Option R

D. Description of Changes

D.1 Relay LCO is added to the Apparatus Index.

D.2 Leads FFA and FFB are added to the Lead Index for the attendant trunk.

D.3 Options N, R, and S are added to the Option Index.

D.4 Option N is added as Standard to open leads FFA and FFB to prevent flashing the attendant trunk SL lamp falsely when a station dials 0 to call the attendant.

D.5 Option S is designated and rated Mfr Disc.

D.6 Option R is added as Standard.

D.7 Circuit Note 104 is revised to reflect Issue 9D.

D.8 Circuit Note 105 and Information Note 305 are added.

D.9 Sequence Charts SC9 and SC21 are revised to show options to relay LCO.

D.10 CAD Fig. 1 is revised to add leads FF, FFA, and FFB.

D.11 The Diode Index is corrected to add diode C.

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