CIRCUIT DESCRIPTION

CD-66902-01
ISSUE 2D
APPENDIX 5D
DWG ISSUE 10D

PBX SYSTEMS
NO. 756A
DIAL CONFERENCE TRUNK CIRCUIT
STATION CONTROLLED

CHANGES

D. Description of Changes

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

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3224-WVS-RVL

PBX SYSTEMS
NO. 756A
DIAL CONFERENCE TRUNK CIRCUIT
STATION CONTROLLED

CHANGES

B. Changes in Apparatus

B.1 Superseded	Superseded by
S1, 2 and S3, 4 resistors, 19LC, App Fig. 1, option K	S1, 2 and S3, 4 resistors, 19LG, App Fig. 1, option J
S5 resistor, 18BW, option K	S5 resistor, 18EB, option J

D. Description of Changes

D.1 Option J is added and rated Standard to recode resistors S1 through S5 from 100 (option K) to 84 ohms. The 84-ohm resistor provides the proper voltage level on the sleeve to prevent a link test failure when conference equipment is used.

D.2 Option F is added and rated Standard to improve the transmission between the control station and the attendant (dial 0) or a called station (second to fifth conferee).

D.3 These changes are reflected in the Sheet Index, Option Index, FS3, FS4, App Fig. 1, and Circuit Note 104.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3224-TEH-RVL

PBX SYSTEMS
NO. 756A
DIAL CONFERENCE TRUNK CIRCUIT
STATION CONTROLLED

CHANGES

D. Description of Changes

D.1 The code of resistors R0 through R5, R8, and RD is shown as 145A or 221A types.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3221-WVS-RGP

CIRCUIT DESCRIPTION

CD-66902-01
ISSUE 2D
APPENDIX 2A
DWG. ISSUE 7A

PBX SYSTEMS
NO. 756A
DIAL CONFERENCE TRUNK CIRCUIT
STATION CONTROLLED

CHANGES

D. Description of Changes

D.1 A break contact of relay RT is added in the operate path of relay D1 when private consultation is provided. This change prevents the possibility of a false bid for the marker when the controller flashes to include the controller and the called party in the conference, SC 24.

BELL TELEPHONE LABORATORIES, INCORPORATED

(WECo 2120-HW-RRS-WHK)
DEPT 5337-LAH

PBX SYSTEMS
NO. 756A
DIAL CONFERENCE TRUNK CIRCUIT
STATION CONTROLLED

CHANGES

D. Description of Changes

D.1 On sheets B3B and C2, contact 5B is substituted for contact 6B of relay CO.

D.2 On sheet B1, terminals of relay DOA coil are corrected.

D.3 On sheet B2, contact 8M of relay S5 is designated option V and contact 10M is added and designated option 3 to agree with App. Fig. 1.

D.4 On sheet G1, S lead from cord switchboard is relocated from pin 8 to pin 9 of connector C1.

BELL TELEPHONE LABORATORIES, INCORPORATED

(WECo 2120HW-RHB-WHK)
DEPT 5337-LAH

PBX SYSTEMS
NO. 756A
DIAL CONFERENCE
TRUNK CIRCUIT
STATION CONTROLLED

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit provides control arrangements which permit any station to set up a conference connection with any five other stations or with any four other stations and a central office trunk. The private consultation feature permits the originating station to confer privately with each new conferee prior to both joining the conference.

2. GENERAL DESCRIPTION OF OPERATION

A. Definitions

2.01 Table A defines terms used in this description and in the operation charts of drawing information notes which outline the station and switching actions involved in setting up and controlling a conference.

B. Assignment of Switch Verticals

2.02 The six conference ports may be assigned to any six tie trunk verticals of the link. The number of the vertical assigned to conference port 0 is the calling code for originating a conference. For descriptive purposes, it is assumed the verticals 80-85 are assigned to ports 0-5, respectively. It should be noted, however, that a consecutive sequence of numbers is not required.

C. Originating a Conference

2.03 When any station calls 80, normal switching action of the PBX terminates the calling station on conference port 0.

2.04 When a call is first terminated on the conference calling code, the conference circuit performs the following functions:

(a) Makes verticals 80 and 81 busy.

(b) Calls for the attachment of a dial pulse register at vertical 81.

(c) Returns dial tone to the conference originator.

(d) Prepares to repeat the dialing of the originating station into the dial pulse register. The conference originator may now dial the code of the first conferee station.

2.05 The conferee station, when called, is terminated on port 1 of the conference circuit via vertical 81 and conference circuit port 1 is connected to conference bridge port 1.

TABLE A

Term	Definition
CONFERENCE ORIGINATOR	Station which dials conference code and seizes the conference control circuit.
CONFERENCE CONTROLLER	Conference originator or a conferee station which has assumed control after originator has gone on-hook.
CONFEREE	Station which has been called into a conference by the originator or controller.
CONFERENCE POPT	One of six interfaces between tie trunk switch verticals and the conference control circuit. The first vertical is the conference calling code used by the originator. Other verticals are occupied by conferees on a first-idle basis.
CALLING PORT	A conference port in group 1-5 through which a conferee station is being called.
CONFERENCE VERTICAL	A switch vertical in the tie trunk group which is cross-connected to a conference port.
CONFERENCE BRIDGE	A six-port conference bridge which provides multiway communication between all conferees (including originator).
CONFERENCE BRIDGE PORT	One of six interfaces between the conference control circuit and the conference bridge circuit.
PRIVATE CONSULTATION	Feature which allows the conference originator or controller to privately confer with a new station before both parties join the multiway voice communication conference.
SWITCHHOOK FLASH	Operation of switchhook and release in not fewer than 75 ms nor more than 1.5 seconds.

2.06 When the switching and control circuit actions are completed, the conference originator is connected to conference bridge port 0 and may communicate with the conferee station just added.

2.07 The originating station prepares for calling the second station by a momentary operation of the switchhook. This action disconnects the originator from the conference bridge and transfers the originating line to vertical 82 for calling the next conferee. By normal switching action the dial pulse register is connected to vertical 82 and dial tone is returned to the conference originator.

Without Private Consultation Feature

2.08 The conference originator dials the number of the second desired conferee station and, by normal switching action, the station is rung. When the called station answers, it is terminated on the conference bridge. At this time, the originator is reconnected to the conference bridge and multiway voice communication may take place between the originating station and both conferee stations.

With Private Consultation Feature

2.09 The conference originator dials the number of the second desired conferee station and, by normal switching action, the station is rung. At this point, the private consultation circuits are operated. When the called station answers, it is connected to the conference originator for private consultation via a repeat coil.

2.10 After private consultation, the originator switchhook flashes and both he and the called station are transferred to the conference buss. At this time, the originator is reconnected to the conference bridge and multiway voice communications may take place between the originating station and all conferee stations.

2.11 Assuming that all desired conference stations are idle and answer when rung, setup of the conference proceeds until five stations have been connected to the conference

bridge circuit. If the originator attempts to add a sixth station, busy tone rather than dial tone is returned to the originator as an indication that the conference is "full".

2.12 If at any time during the process of buildup of a conference the called station is busy or does not answer when rung, the conference originator cancels the call to this station by a switchhook operation. This dismisses the PBX switching circuits and returns the originator to the conference bridge for communication with the stations already connected.

2.13 The action of canceling by operation of the switchhook, including canceling after partial dialing, may be taken at any time prior to answer by the called station.

D. Disconnections

2.14 If a station leaves the conference by going on-hook, it is dismissed from the conference circuit and may make or receive other calls in a normal manner. The conference port vacated by the disconnected station is available for calling in any other station or for recall of any station which previously has left the conference.

2.15 If the station which originated the conference goes on-hook, it is disconnected from the conference and may make or receive other calls in a normal manner. In this case, however, the originating station cannot be replaced by another station since the master conference number must remain busy to the marker.

E. Transfer of Control

2.16 If the conference originator has left the conference by going on-hook and there is at least one other vacant port, any one of the remaining conferee stations may become conference controller by a momentary operation of the station switchhook.. This signal transfers control of the conference to the station at which the switchhook was operated and calls for attachment of a dial pulse register at the lowest numbered unused conference port other than port 0. The station which has assumed control may now connect stations to vacant conference ports by the same procedure used in originating the conference.

2.17 If a station which has assumed control goes on-hook, any remaining station may assume control by a switchhook operation and may proceed with the connection of other conference stations to unused conference ports.

2.18 Throughout the conference, the station which is in control may call for connection of stations to conference ports (except port 0) which becomes available as stations leave the conference.

F. Connection of Central Office Trunk

2.19 A central office trunk may be connected to the conference by the PBX attendant if such a connection is requested by the conference controller.

Without Private Consultation Feature

2.20 When the conference controller dials 0 to request a trunk connection, port 5 is automatically reserved for the trunk and is no longer available for a station connection.

2.21 After dialing 0 and passing information to the attendant, the conference controller may proceed with the addition of stations at conference ports other than port 5. The switch vertical used in the process of reaching the attendant becomes vacant so that the conference may include the originator and four stations in addition to the central office trunk.

2.22 When the trunk call is completed to the desired distant station, the PBX attendant connects the trunk to the conference via port 5, using normal dial-back procedures if a console is used for attendant position. If a cord switchboard is used, the attendant connects to port 5 by plugging into the jack appearance of port 5.

With Private Consultation Feature

2.23 To add a central office party, the controller dials 0 to reach the attendant. After requesting a CO party, the controller waits on the attendant trunk until the attendant completes the connection. If the controller dials 0 with only the last port idle, busy tone will be returned as an indication that a central office party cannot be added. The controller flashes his switchhook to dispose of the busy tone and returns to the conference. If a central office party must be added, the controller must request a station to disconnect. The central office party may then be added and the disconnected station can then be reconnected in the normal manner.

2.24 When the trunk call is completed to the desired distant station, the PBX attendant connects the trunk into the conference circuit by:

(a) Normal dial-back procedure if a console is used for the attendant position, or by

(b) Plugging into the switchboard jack appearance if a cord switchboard is used for the attendant position.

2.25 When the attendant makes the above connection, the controller will automatically be disconnected from the attendant trunk and connected to the central office trunk. After the attendant releases, the controller and the central office party will be connected via a repeat coil unless the central office

party is the first added to the conference in which case the controller and central office party will be connected via the conference bridge.

2.26 After the controller and the central office party are connected for private consultation, a switchhook flash by the controller will connect both parties into the conference bus.

SECTION II - DETAILED DESCRIPTION

1. GENERAL

1.01 Any six tie trunk switch verticals may be used as entry ports to the conference control circuit. In the following description, use of the group 80-85 is assumed but a consecutive sequence is not a requirement.

1.02 It is also assumed that vertical 80 is given a ringdown tie trunk (RTT) class of service and that verticals 81-85 are given a central office trunk (COT) class of service by suitable strapping at PBX terminal strips. Verticals 81-85 are on a "service denied" basis with the exception that code 85 may be used for a "dial-back" connection by the attendant if the controller has called the attendant for connection of a central office trunk.

2. ORIGINATING A CONFERENCE - SC1

A. Control Circuit Seized

2.01 Any station may seize the conference control circuit by dialing the conference control code (for descriptive purposes assumed to be 80). The marker functions in its normal manner for handling a tie trunk code and connects the calling station to vertical 80. Operation of the crosspoints closes the tip and ring of conference port 0 through the link to the calling line circuit. The tip and ring closure operates relay L.

2.02 Relay L operated operates relay SRC which operates off-normal relays ON and ONA and prepares a holding path for relays CR1-5.

2.03 Relay ONA operated provides a holding ground for the calling party hold magnet and prepares a locking ground for relays BC1-5.

2.04 Relay ON operated:

(a) Prepares a holding path for relays CR1-5.

(b) Prepares operating paths for relays D1 and RRL and a locking path for relay RS.

(c) Provides a holding path for relay ONA.

(d) Operates relay CRDK via break contacts on relays Z and CR1-5.

(e) Prepares a locking path for relay PM.

(f) Locks under control of relay ONRL.

(g) Provides off-normal ground to the private consultation circuitry.

B. Dial Tone Returned

2.05 Relay CRDK operated operates relay CR1 through thermistor A. The thermistor delays the operation of relay CR1 approximately 400 ms.

2.06 Relay CR1 operated:

(a) Releases relay CRDK which in turn operates relay RR1 after 1 second.

(b) Disconnects thermistor A from its winding and locks to ground under control of relays S1, D1, PM, RR1, and SRC.

(c) Prepares an operating path for relay BC1.

(d) Places a short circuit (if option V is used), through the 5-6 and 1-2 windings of repeat coil T1 and the polarized operating circuit of relay P, on the tip and ring of tie trunk vertical 81.

(e) If option 3 is used, applies approximately 2000 ohms across the tie trunk vertical 81. This 2000 ohms is the sum of resistance of the 5-6 and 1-2 windings of repeat coil T1, the 1920-ohm P resistor, and the forward resistance of the B diode.

(f) Connects a 100-ohm holding ground to the sleeve of vertical 81.

C. Register Attached

2.07 The bridged tip and ring of vertical 81 signals the marker to connect vertical 81 to a register and return dial tone.

3. ORIGINATOR ADDS FIRST CONFEREE STATION - SC2 OR SC22

A. Calling Conferee Station

3.01 After receiving dial tone from the register, the control station dials the code of the first conferee station. Relay L follows the dial pulses; make contacts on relay L are in series with the bridge across tip and ring and pulse the register.

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) Operates relay PM.

(c) Closes a path from the marker, operating relay RS.

(d) Opens its operating path and locks under control of marker relay RLAA.

3.04 Relay PM operated opens one of the locking paths for relays CR1-5 and prepares a path for operating relay D1 when relay L is released.

3.05 Relay RS operated:

(a) Locks to ground at relay ON under control of relays RT and D1.

(b) Releases relay P by opening the bridge across tip and ring via coil T1.

(c) Prepares a path for applying ringing supply to tip and ring of vertical 81.

(d) Opens the termination via coil T1 across tip and ring of vertical 80.

(e) Prepares a path via capacitor H for audible ringing feedback from vertical 81 to vertical 80.

(f) Operates relay RS1 (option 3).

3.06 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 ringing supply through the primary winding of relay RT to the ring side of vertical 81 and connects ringing ground to the tip side. This rings the called station; audible ringing feedback is transmitted through capacitor H to port 0 (vertical 80).

B. Called Station Answers

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

(a) Locks through its secondary winding to ground at relay ON under control of relay CRDK.

(b) Operates relay BC1.

(c) Releases relay RS which in turn releases relay RS1 with option 3.

3.08 Relay BC1 operated:

(a) Operates relay S1 by closing the tip and ring of vertical 81 to the primary and secondary windings; relay S1 remains operated under control of the called party.

(b) Removes the idle port terminating network from port 1 of the conference bridge and connects tip and ring of the called station to this port.

(c) Supplements the path via relay CR1 for holding 100-ohm ground on the sleeve of vertical 81.

(d) Prepares a holding path which is completed when relay BCH1 operates.

(e) Operates relay RV which in turn operates relay TPDK.

3.09 Relay S1 operated:

(a) Releases relay CR1.

(b) Prepares an operating path for relay CR2.

(c) Operates relay BCH1 to provide a holding path for relay BC1.

3.10 Relay CR1 released opens one path to 100-ohm holding ground from the sleeve of vertical 81 and operates relay CRDK. Sleeve ground is maintained by operated relay BC1.

3.11 Relay CRDK operated:

(a) Releases relays RT, PM, and RRL.

(b) Disconnects the idle port terminating network from port 0 of the conference bridge and connects tip and ring of the conference originator to this port.

3.12 The conference originator and the conferee station are now connected via the conference bridge and may communicate.

4. ORIGINATOR ADDS SECOND CONFEREE STATION

A. Originator Resumes Control Function - SC3

4.01 To add another station to the conference, the originator flashes his switchhook. This transfers the originating station from the conference bus to a dial pulse register.

4.02 Depressing the switchhook at the originating station opens the tip and ring loop connected to vertical 80 and thus releases relay L.

4.03 Relay L released operates relay D1 which in turn operates relay CR2. Relay SRC may release if the switchhook is held operated more than about 100 ms but performs no functions of interest in this sequence.

4.04 Relay CR2 operated:

(a) Releases relay CRDK.

(b) Prepares an operating path for relay BC2.

(c) Prepares to bridge the tip and ring of the trunk vertical 82 via windings of repeat coil T1, resistor P, and diode B.

(d) Supplies a 100-ohm holding ground for the sleeve of vertical 82.

4.05 Relay CRDK released:

(a) Operates relay RRL through thermistor C (which delays its operation approximately 1 second) if relay SRC has not released or prepares the operating path for doing so if relay SRC has released.

(b) Disconnects tip and ring of vertical 80 from the conference bridge with idle port termination.

(c) Prepares a holding path for relay PM and a locking path for relay RT.

(d) Releases relay D1.

4.06 When the switchhook is released at the originating station, relay L operates and performs the following functions:

(a) Operates relay SRC if it has released.

(b) Places a bridge on tip and ring of vertical 82 through the windings of repeat coil T1 and the operating circuit for relay P. This calls for attachment of a register at vertical 82.

4.07 Relay SRC operated (if released during switchhook flash):

(a) Operates relay RRL through thermistor C which delays its operation approximately 1 second. If relay SRC does not release during switchhook flash, operation of relay RRL starts when relay CRDK is released.

(b) Re-establishes the operating path for relay ON. Relay ON is held operated by its locking path via relay ONRL unless the switchhook is depressed longer than the disconnect time of 1.5 seconds.

B. Register Attached

4.08 Register seizure is the same as in adding the first conferee station except that vertical 82 is used instead of 81. At this point, dial tone is returned to the originating station.

5. ORIGINATOR ADDS ADDITIONAL STATIONS

A. Calling Conferee Station - No Private Consultation (Option V)

5.01 Dial tone is returned to the originating station and circuit functions during subsequent dialing and called party answering are the same as in adding the first station except that relays BCH2, BC2, and S2 are operated instead of relays BCH1, BC1, and S1.

B. Calling Conferee Station - Private Consultation (Option 3) - SC23

5.02 After receiving dial tone from the register, the control station dials the code of the desired conferee station. Relay L follows the dial pulses; make contacts on relay L are in series with the bridge across tip and ring and pulse the register.

5.03 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.

5.04 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) Operates relay PM.

(c) Closes a path from the marker operating relay RS.

(d) Opens its operating path and locks under control of marker relay RLAA.

5.05 Relay PM operated opens one of the locking paths for relays CR1-5 and prepares a path for operating relay D1 when relay L is released.

5.06 Relay RS operated:

(a) Locks to ground at relay ON under control of relays RT and D1.

(b) Releases relay P by opening the bridge across tip and ring via coil T1.

(c) Prepares a path for applying ringing to tip and ring of the called vertical.

(d) Opens the termination via coil T1 across tip and ring of vertical 80.

(e) Prepares a path via capacitor H for audible ringing feedback from vertical 80 to the called vertical.

(f) Operates relay RS1.

5.07 Relay RS1 operated:

(a) Operates relays BR1 and BR2 which lock under control of relay CF.

(b) Prepares the connection to talking battery for private consultation when the called station answers.

(c) Operates relay PMR which causes relay PM to release and provides a holding ground for relays CR1-5.

5.08 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 ringing supply through the primary winding of relay RT to the ring side of vertical 82 and connects ringing ground to the tip side. This rings the called station; audible ringing feedback is transmitted through capacitor H to port 0 (vertical 80).

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

(a) Locks through its secondary winding to ground at relay ON under control of relay CRDK.

(b) Releases relays RS and PMR.

5.10 Relay RS released releases relay RS1 which provides talking battery for private consultation.

5.11 The control station and called station are now in private consultation. All previously connected conferees are on the multiway conference bridge and are free to talk to each other at all times.

6. ORIGINATOR OR CONTROLLER SWITCHHOOK FLASHES WITH ALL PORTS BUSY - SC17

6.01 When all conference ports are occupied by stations, a busy tone is returned to the controller as an indication that all conference ports have been used.

6.02 When all conference ports are occupied by stations or dial repeating tie trunks, relays BC1-5 are operated and relay DOM is released. Under this condition, operation of relay D1 resulting from depression of the switchhook at the control station operates relay D9W. This connects busy tone via capacitor G and coil T1 to the control station line. When the switchhook is released, relay D1 is released and relay Z operates. Operation of relay Z releases relay CRDK so that busy tone is heard only by the conference controller.

6.03 After receiving the all-ports-busy signal, the controller returns to the conference bridge by a second flash of the switchhook. This releases relays D9W and Z. Release of relay D9W removes busy tone and release of relay Z operates relay CRDK to return the control station to the conference bridge.

7. CONTROLLER AND CALLED STATION ENTER CONFERENCE (OPTION 3) - SC24

7.01 After private consultation with a called station and both parties wish to join the multiway conference, the control station flashes his switchhook.

7.02 Depressing the switchhook at the originating station opens the tip and ring loop connected to vertical 80 which releases relay L.

7.03 Relay L released operates relay CF.

7.04 Relay CF operated releases relays BR1 and BR2. Relay BR1 released allows relay BC- of the called station to operate.

7.05 Relay BC- operated:

(a) Operates relay S- by closing the tip and ring of vertical 8- to the primary and secondary windings; relay S- remains operated under control of the called party.

(b) Removes the idle port terminating network from the port of the conference bridge and connects tip and ring of the called station to this port.

(c) Supplements the path via relay CR- for holding 100-ohm ground on the sleeve of vertical 8-.

(d) Prepares a holding path which is completed when relay BCH- operates.

(e) Operates relay RV which in turn operates relay TPDK.

7.06 Relay S- operated:

(a) Releases relay CR-.

(b) Prepares an operating path for the succeeding relay CR-.

(c) Operates relay BCH- to provide a holding path for relay BC-.

7.07 Relay CR- released opens one path to 100-ohm holding ground from the sleeve of vertical 8- and operates relay CRDK. Sleeve ground is maintained by operated relay BC-.

7.08 Relay CRDK operated:

(a) Releases relays RT, PM, and RRL.

(b) Disconnects the idle port terminating network from port 0 of the conference bridge and connects tip and ring of the conference originator to this port.

7.09 Release of relay RT releases relay CF.

7.10 The conference originator and the conferee station are now connected via the conference bridge and may communicate. The private consultation circuits are restored to normal and are ready to operate on the next call.

8. ORIGINATOR DISPOSES OF LINE BUSY OR NO ANSWER - SC5

8.01 If the called station is busy or does not answer, the originator may return to the conference bus by flashing his switchhook.

8.02 When the originator depresses his switchhook, relay L releases and performs the following functions:

(a) Immediately removes the bridge from tip and ring of the conference port connected to the called station. This action is supplemented by the later release of the operated CR- relay.

(b) Operates relay D1.

(c) Provides a holding path for relay RRL.

(d) Starts the slow release of relay SRC.

(e) Operates relay CF which in turn releases relays BR1 and BR2 (option 3).

8.03 Relay D1 operated releases relay RS and relay CR- which has just been operated. Relay RS releases relay RS1 with option 3.

8.04 Relay CR- released:

(a) Operates relay CRDK.

(b) Opens tip and ring of the calling port so that subsequent operation of relay L will not place a bridge on the port.

(c) Removes 100-ohm holding ground from the calling port sleeve.

8.05 Relay CRDK operated returns the conference originator to the conference bus.

8.06 When the originator releases his switchhook relay L operates. Relay L operated operates relay SRC if it has released and releases relays D1, RRL, and with option 3, relay CF. Relay D1 in releasing releases relay PM.

8.07 At this time, the port last used is cleared and made available for adding the next conferee and the originator is on the conference bridge. The private consultation circuits are back to normal ready for the next operation (option 3).

9. ORIGINATOR DISPOSES OF DIAL TONE OR PARTIAL DIAL - SC4

9.01 If the conference originator has received dial tone or has partially dialed, he may cancel the call and return to the conference bus by flashing his switchhook. In this case the switchhook must be depressed long enough to release slow-release relay SRC.

9.02 When the originator depresses his switchhook, relay L releases and performs the following functions:

(a) Immediately removes the bridge from tip and ring of the port connected to the dial pulse register. This action is supplemented by the later release of operated relay CR-.

(b) Releases slow-release relay SRC which releases relay CR- just operated.

9.03 Relay CR- released:

(a) Operates relay CRDK.

(b) Opens tip and ring of the calling port so that subsequent operation of relay L will not place a bridge on the port.

(c) Removes the 100-ohm holding ground from the calling port sleeve.

9.04 Relay CRDK operated:

(a) Returns the conference originator to the conference bus.

(b) Operates relay D1. This serves no purpose at this time.

9.05 When the originator releases his switchhook, relay L is operated. Operation of relay L operates relay SRC and releases relays D1 and RRL.

9.06 At this time, the originator is connected to the conference bridge, the register is released, and the port used to call in the register is cleared and made available for adding the next conferee.

10. CENTRAL OFFICE TRUNK ADDED TO CONFERENCE

A. Without Private Consultation Feature (Option V)

Originator Dials 0 to Call Attendant - SC6

10.01 The conference circuit is so arranged that the conference controller may add one central office trunk with the assistance of the PBX attendant. The action of dialing 0 reserves port 5 for later addition of a central office trunk.

10.02 When the controller dials 0, the register and marker function to connect the calling port to an attendant trunk. Relay P operates operating relay MC. When relay TKO in the marker operates, relays D0 and PM are operated via contacts on relay MC. Relay D0 locks to off-normal ground under control of relay D0R.

10.03 Relay D0 operated:

(a) Prepares a path between the IT-1 (25) and HM-2 (25) punchings of terminal strip D so that the "service denied"

restriction will be removed (from vertical 85 only) when relay MC is released by the marker.

(b) Operates relay D0M.

(c) Prepares an operating path for relay BC5 and a locking path for relay S5.

(d) Opens the operating path of relay CR5 to reserve conference port 5 for the central office trunk.

(e) Prepares an operate path for relay C0 if option 2 is furnished.

10.04 Relay D0M operated prepares operating paths for relays D0R and D9W. Relay P releases due to relay operation in the register.

Attendant Connects Central Office Trunk to Conference - SC6 - Console Used as Attendant Position

10.05 When the conference originator or controller calls the attendant by dialing 0, the conference circuit is primed so that the attendant may later place a central office trunk on the conference bus by dialing code 85.

10.06 Relay P operates when the attendant answers. The attendant calls the distant station over the central office trunk, then operates the HOLD key and receives PBX dial tone. When the attendant dials 85, the marker functions in the normal manner for connecting a central office trunk to a tie trunk. When a relay OT 25 in the line, link, and marker circuit operates, relay BC5 is operated.

10.07 Relay BC5 operated:

(a) Operates relay S5 through the closed tip and ring loop of port 5. Relay S5 locks under control of relay D0R.

(b) Connects vertical 85 to the conference bridge.

(c) Supplies a 100-ohm holding ground to the sleeve of port 5.

10.08 Relay S5 operated operates relay BCH5 which performs the following functions:

(a) Operates relay D0R (in series with thermistor B) in approximately 400 ms. Relay D0R locks to off-normal ground via relay BCH5.

(b) Supplies an off-normal holding ground for relay D0M.

10.09 Relay D0R operated releases relay D0 which performs the following functions:

(a) Opens the lead between terminal strip punchings IT-1 (25) and HM-2 (25).

(b) Removes the temporary holding ground from relay S5.

10.10 After making a trunk connection, the attendant should release the holding condition by operating key RLS. After operating the release key, the attendant is released from the conference circuit and cannot re-enter. However, the attendant may be recalled by the conference controller as described in a following section.

Attendant Connects Central Office Trunk to Conference - SC6 - Cord Switchboard Used as Attendant Position - SC19

10.11 When the conference controller calls the attendant by dialing 0, the conference circuit is primed so that the attendant may later place a central office trunk on the conference by plugging into the conference circuit jack appearance.

10.12 Relay P operates when the attendant answers. The attendant calls the distant party over the central office trunk.

10.13 After informing the central office party that he is to be included in a conference, the attendant plugs into the conference circuit jack appearance with the other cord of the pair used in the central office trunk jack. Plugging in the cord grounds lead SL. Ground on lead SL operates relay C0 through a relay DC make contact, diode C0(0-4), and a normal break contact of relay MONA in the line, link, and marker circuit.

10.14 Relay C0 operated:

(a) Locks operated under control of the switchboard and relays S1-4 and ON.

(b) Operates relay S5; relay S5 operates relay BCH5.

(c) Operates relay BC5.

(d) Operates the line hold magnet in the marker associated with conference port 5.

(e) Provides dc path across tip and ring of port 5 switchboard jack through inductor L1 and the break contact of released relay F0.

(f) Grounds sleeve of port 5 jack.

(g) Sets up flash attendant circuitry for longer (750 ms) flash interval needed for recall at the 608A or D attendant position by bridging relay F0 break contact 7. Also, relay F0 is made fast release so that the timing variation is minimized.

10.15 The cord switchboard attendant releases from the conference by depressing either another talk key or the release key. The attendant may re-enter at any time.

Controller Releases From Attendant Trunk - All Ports Not Busy - SC5

10.16 When the conference controller has reached the attendant via a conference port other than number 5, he may return to the conference bridge by a single switchhook flash. The circuit functions in this case are similar to those involved when a called station is busy or does not answer.

Controller Releases From Attendant Trunk - All Ports Busy - SC7

10.17 When conference ports 1-4 are in use, dialing 0 to reach the attendant sets up an all-ports-busy condition by reserving port 5 for later connection of a central office trunk. In this case, a switchhook flash at the controlling station results in return of busy tone to the conference controller.

10.18 When the switchhook at the controlling station is depressed, relay L releases. Relay L released operates relay D1 and releases relay P.

10.19 Relay D1 operated:

(a) Releases relay CR5. Relay CR5 releasing operates relay CRDK.

(b) Operates relay D9W via a path through operated relays D0M and BC1-4.

10.20 Operation of relay D9W connects busy tone via coil T1 to the tip and ring of the control port.

10.21 When the switchhook at the controlling station is released, relay L operates and relay D1 releases. This opens the shunt path across relay Z which operates, releasing relay CRDK. Under this condition, busy tone is heard at the controlling station only.

10.22 To dispose of busy tone, the controller again flashes his switchhook.

10.23 When the switchhook is depressed, relay L releases and shunts relay D9W via operated relay Z. Release of relay L also operates relay D1 which supplements the shunt path across relay D9W via operated relay Z.

10.24 When the switchhook is released, relay L operates and releases relay D1. This removes operating ground from relay Z which releases. Release of relay Z operates relay CRDK which returns the conference controller to the conference bridge.

B. With Private Consultation Feature (Option 3)

Originator Dials 0 to Call Attendant - SC28 - Attendant Called on Port 5

10.25 When the controller dials 0, the register and marker function to connect the calling port to an attendant trunk. Relay P operates operating relay MC. When relay TK0 in the marker operates, relays D0, D0A, and PM are operated via contacts of relay MC. Relay D0 locks operated under control of relay BCH5 or a switchhook flash.

10.26 Relay D0 operated:

(a) Prepares a path between the IT-1 (25) and HM-2 (25) punchings of terminal strip D so that the "service-denied" restriction will be removed (from vertical 85 only) when relay MC is released by the marker.

(b) Operates relay D0M which prepares an operate path for relay D9W.

(c) Prepares an operate path for relays BR1, BR2, RT, and BC5.

(d) Transfers control of relay CR5 so that it may be operated by a ground on lead OTG via relay BR1 make contact.

10.27 If the call to the attendant was made on port 5, the transfer of control of relay CR5 will cause relay CR5 to release. This will remove the bridge from port 5 tip and ring and the call will be disconnected.

10.28 Ground via relay BC1,2,3,4 make contact, relay BC5S break contact, relay D0M make contact, and relay D9W break contact operates relay D9W which locks operated under control of relay ON and relay Z.

10.29 Relay D9W operated causes busy tone to be returned to the controller as an indication that a central office party cannot be added with only one part idle. To dispose of busy tone, the controller flashes his switchhook and returns to the conference.

Originator Dials 0 to Call Attendant - SC28 - Attendant Called on Port Other Than Port 5

10.30 When the controller dials 0, the register and marker function to connect the calling port to an attendant trunk. Relay P operates operating relay MC. When relay TK0 in the marker operates, relays D0, D0A, and PM are operated via contacts of relay MC. Relay D0 locks operated under control of relay BCH5 or a switchhook flash.

10.31 Relay D0 operated:

(a) Prepares a path between the IT-1 (25) and HM-2 (25) punchings of terminal strip D so that the "service-denied" restriction will be removed (from vertical 85 only) when relay MC is released by the marker.

(b) Operates relay D0M which prepares an operate path for relay D9W.

(c) Prepares an operate path for relays BR1, BR2, RT, and BC5.

(d) Transfers control of relay CR5 so that it may be operated by a ground on lead OTG via relay BR1 make contact.

10.32 When the attendant answers, relay P operates. The attendant calls the distant party via a central office trunk while the controller waits on the attendant trunk connection.

With Console Used as Attendant Position and No One Yet on Conference Bridge

10.33 After reaching the central office party, the attendant connects the central office trunk into the conference by operating the hold key and dialing 85. When the attendant dials 85, the marker functions in the normal manner for connecting a central office trunk to a tie trunk. When relay OT25 in the line, link, and marker circuit operates, relay BC5 operates through a normal break contact of relay BR1 which does not operate because no BCH- relay is operated. Relay RT also operates through diode RT.

10.34 Relay BC5 and its slave BC5S operated:

(a) Operates relay S5 through the closed tip and ring loop of port 5.

(b) Releases relay CR1, releasing the attendant trunk.

(c) Connects vertical 85 to the conference bridge and removes idle port termination from bridge port 5.

(d) Supplies a 100-ohm holding ground to the sleeve of conference circuit port 5.

10.35 Relay S5 operated operates relay BCH5 which performs the following functions:

(a) Supplies an off-normal holding ground for relay D0M.

(b) Shunts down relay D0 causing relay D0A to release.

10.36 Relay CRDK operates with relay D0 released and releases relays PM and RT. With relay CRDK operated, the controller is again connected to the conference bridge.

10.37 After the attendant releases, the controller and the central office party are alone on the conference bridge.

With Console Used as Attendant Position and at Least One Party Waiting on Conference Bridge

10.38 After reaching the central office party, the attendant connects the central office trunk into the conference circuit by operating the hold key and dialing 85. When the attendant dials 85, the marker functions in the normal manner for connecting a central office trunk to a tie trunk. When relay OT25 in the line, link, and marker circuit operates, fast-operate relay BR1 operates from ground on lead OTG through relay D0 make contact and diode BR1 and relay BCH- make contact and relay CF break contact. Relay BR2 operates over the same path as BR1. Relay RT also operates from the ground on lead OTG via relay D0 make contact and diode RT.

10.39 Relay BR1 operated:

(a) Opens the operate path of relay BC5 before it has a chance to operate.

(b) Operates relay CR5 via relay D0 make contact.

10.40 Relay BR2 operated:

(a) Releases the CR- relay which was used to establish connection to the attendant.

(b) Disconnects resistor P, relay P, and diodes A and B, and transfers connection of capacitors P so as to permit transmission through repeat coil T1 while direct current is blocked.

10.41 Relay CR- released opens the loop to the attendant and releases the attendant trunk.

10.42 Relay CR5 operated connects the controller to the central office trunk through repeat coil T1. After the attendant releases, the controller and central office party may consult privately via repeat coil T1.

Controller Flashes to Include Central Office Party and Self in Conference - SC31

10.43 A switchhook flash by the controller will release relay L.

10.44 Relay L released:

(a) Operates relay CF via relay BR1 make contact. Relay CF locks operated under control of relay RT.

(b) Starts the slow release of relay SRC.

10.45 Relay CF operated:

(a) Releases relays BR1 and BR2.

(b) Establishes a temporary path so that the loop to central office trunk circuit will not be opened during the transfer of the loop. This temporary path prevents the release of relay P in the central office trunk circuit.

(c) Maintains ground on lead S1 of conference circuit port 5 during the transfer of the loop.

10.46 Relay BR1 released:

(a) Operates relay BC5 from lead OTG via relay D0 make contact and diode BC5. Relay BC5 operates relay BC5S.

(b) Releases relay CR5.

(c) Operates relay D1 which performs no useful function at this time.

10.47 Relays BC5 and BC5S operated:

(a) Complete the loop to relay S5 which operates through relay P in the central office trunk circuit even though there exists a parallel path from inductor L2 via normal break contacts of relay RS1, relay CF make contacts, resistors T2R and T2T, and relay D0A make contacts.

(b) Connects port 5 to the conference bridge.

10.48 Relay S5 operated operates relay BCH5 which releases relay D0.

10.49 Relay D0 released:

(a) Releases relay D0A which opens the temporary holding path for central trunk circuit P relay.

(b) Supplies battery to relay CRDK operating it.

10.50 Relay D0A released:

(a) Opens the path which temporarily held central office trunk circuit P relay.

(b) Re-establishes direct current paths to the conference circuit P relay.

(c) Removes direct ground from lead S1 of port 5; 100-ohm ground remains on lead S1 via relay BC5 make contact.

10.51 Relay CRDK operated:

(a) Releases relay RT which releases relay CF.

(b) Releases relay PM.

(c) Returns the controller to the conference bridge.

(d) Removes idle port termination from bridge port 0.

With Cord Switchboard Used as Attendant Position and No One Yet on Conference Bridge

10.52 After reaching the central office party, the attendant connects the central office trunk into the conference by plugging into the conference circuit jack appearance. Plugging the cord into the port 5 jack appearance grounds lead SL. Ground on lead SL operates relay CO via diode CO (0-4), relay D0 make contact, and line, link, and marker circuit relay MONA break contact.

10.53 Relay CO operated:

(a) Locks operated under control of the switchboard and relays S1-4 and ON.

(b) Grounds the switchboard jack sleeve to give answer supervision to the switchboard.

(c) Closes a direct current path through inductor L1.

(d) Operates LHM 25 in the line, link, and marker circuit.

(e) Operates relays RS1 and RT which perform no useful function at this time.

(f) Operates relay BC5 via relay D0 make contact, diode BC5, and relay BR1 break contact.

10.54 Relay BC5 operated:

(a) Closes the transmission path to conference bridge port 5.

(b) Removes idle port terminations from bridge port 5.

(c) Operates relay BC5S.

10.55 Relay BC5S operated:

(a) Operates relay S5 by shorting terminal 1L to terminal 2U. Relay S5 operated operates relay BCH5.

(b) Releases relays RS1 and CR1.

10.56 Relay BCH5 operated shunts down relay D0.

10.57 Relay D0 released:

(a) Releases relay D0A.

(b) Supplies battery to relay CRDK operating it.

10.58 Relay CRDK operated:

(a) Releases relays PM and RT.

(b) Removes the idle port termination from bridge port 0 and connects the controller to the bridge.

10.59 After the attendant releases, the controller and the central office party are alone on the conference bridge.

With Cord Switchboard Used as Attendant Position and at Least One Party Waiting on Conference Bridge

10.60 After reaching the central office party, the attendant connects the central office trunk into the conference circuit by plugging into the conference circuit jack appearance. Plugging into the port 5 jack appearance grounds lead SL. Ground on lead

SL operates relay CO via diode CO (0-4), relay D0 make contact, and line, link, and marker circuit relay MONA break contact.

10.61 Relay CO operated:

(a) Locks operated under control of the switchboard and relays S1-4 and ON.

(b) Grounds the switchboard jack sleeve to give answer supervision to the switchboard.

(c) Closes a direct current path through inductor L1.

(d) Operates LHM 25 in the line, link, and marker circuit.

(e) Operates relay BR2 and fast-operate relay BR1 through relay D0 make contact and diode BR1 and relay BCH- make contact and relay CF break contact.

(f) Operates relay RT via relay D0 make contact and diode RT. Relay RT prepares a hold path for relay CF.

(g) Operates relay RS1 so that the consult bus operates dry.

10.62 Relay BR1 operated:

(a) Opens the operate path of relay BC5 before it has a chance to operate.

(b) Operates relay CR5 from lead OTG via relay D0 make contact and relay S5 break contact.

10.63 Relay BR2 operated:

(a) Releases the CR- relay used to establish the connection to the attendant, releasing the attendant trunk.

(b) Disconnects resistor P, relay P, and diodes A and B, and transfers connection of capacitor P so as to permit transmission via repeat coil T1 while direct current is blocked.

10.64 Relay CR5 operated connects the controller to the central office trunk through repeat coil T1. After the attendant releases, the controller and central office party may consult privately via repeat coil T1.

Controller Flashes to Include Central Office and Self in Conference - SC3

10.65 A switchhook flash by the controller will release relay L.

10.66 Relay L released:

(a) Operates relay CF via relay BR1 make contact.

(b) Starts the slow release of relay SRC.

10.67 Relay CF operated:

(a) Locks operated under control of RT.

(b) Releases relays BR1 and BR2.

(c) Opens the operate path of relay D9W so that busy tone is not returned if the added party is the sixth party to the conference.

(d) Opens the operate path of relay FOM so that relay FOM does not operate when the sixth party is added to the conference.

(e) Shorts out relay D1 break contact in the hold path of relay D0 to prevent release of D0 when relay D1 operates.

10.68 Relay BR1 released:

(a) Operates relay BC5 through diode BC5 and relay D0 make contact and relay C0 make contact.

(b) Operates relay D1 which performs no useful function at this time.

10.69 Relay BC5 operated:

(a) Cuts a transmission path through to conference bridge port 5.

(b) Removes the idle port termination from bridge port 5.

(c) Operates relay S5 by shorting terminal 1L to terminal 2L. Relay S5 operated operates relay BCH5.

(d) Operates relay BC5S.

10.70 Relay BC5S operated releases relay RS1.

10.71 Relay BCH5 operated:

(a) Provides a hold path for relays D0M and BC5.

(b) Shunts relay D0, releasing it.

10.72 Relay D0 released:

(a) Releases relay D0A, re-establishing direct current paths to the conference circuit P relay.

(b) Supplies battery to relay CRDK, operating it.

10.73 Relay CRDK operated:

(a) Releases relay RT which releases relay CF.

(b) Releases relay PM.

(c) Returns the controller to the conference bridge.

(d) Removes the idle port termination from bridge port 0.

Attendant Recall After CO Trunk Has Been Added - All Ports Not Busy

10.74 When a CO trunk is connected at port 5 but one or more ports in group 1-4 are unoccupied, a switchhook flash at the controlling station results in dial tone instead of operator recall to the CO trunk. Under this condition, the controller dials 0 to reach the attendant via an attendant trunk.

10.75 After giving the attendant instructions via the attendant trunk, the controller returns to the conference by another switchhook flash. The attendant takes appropriate action to release the attendant trunk and disconnects the CO trunk if this is required.

Attendant Recall After CO Trunk Has Been Added - All Ports Busy; Console Used as Attendant Position - SC8

10.76 When all conference ports are busy and a CO trunk has been connected at port 5, a switchhook flash at the conference control station results in a flashing recall signal on the CO trunk of the attendant console.

10.77 Depressing the switchhook at the controlling station releases relay L which starts the slow release of relay SRC. Relay D1 is operated by the release of relay L but performs no functions of interest in this sequence.

10.78 When relay SRC has released, relay FOM operates and prepares a path for operating relay FO. Release of relay SRC also starts disconnect timing action which will end in operation of relay ONRL if the switchhook is held operated longer than about 1.5 seconds.

10.79 If the switchhook is released within 1.5 seconds, disconnect timing action is stopped and relay SRC is reoperated. This operates relay FO via the path prepared by operation of relay ROM.

10.80 Relay FO operated starts the slow release of relay FOM and also reverses battery and ground on the tip and ring toward the CO trunk. This locks in a flashing recall signal associated with the CO trunk at the attendant console.

10.81 Release of relay FOM starts the slow release of relay FO. The combined slow release of relays FO and FOM allows sufficient time to lock in the recall condition at the attendant position circuit.

10.82 The recall signal is an indication to the attendant that the CO trunk should be released.

10.83 Disconnection of the CO trunk releases relays S5, BCH5, BC5, BC5S, and DOM if option 3 is used or relays S5, BCH5, BC5, DOM, and DOR if option V is used. This clears conference port 5 for use in adding a conferee station or another CO trunk connection.

10.84 If another CO trunk connection is desired, the conference controller dials 0 and reaches the attendant via an attendant trunk. The dial 0 conditions mark port 5 for addition of a trunk after the controller and attendant have released the connection via the attendant trunk.

Attendant Recall After CO Trunk Has Been Added - All Ports Busy; Cord Switchboard Used as Attendant Position

10.85 When all conference ports are busy and port 5 is connected through the switchboard, a switchhook flash by the controller results in a flashing recall signal at the attendant position on the cord lamp associated with the cord plugged into the conference circuit jack appearance.

10.86 Depressing the switchhook at the controlling station releases relay L which starts the slow release of relay SRC. Relay D1 is operated by the release of relay L but performs no functions of interest in this sequence.

10.87 When relay SRC has released, relay FOM operates through varistors FO1 and FO2 and resistor FO; relay FOM prepares a path for operating relay FO. Release of relay SRC also starts disconnect timing action which will end in operation of relay ONRL if the switchhook is held operated longer than about 1.5 seconds.

10.88 If the switchhook is released within 1.5 seconds, disconnect timing action is stopped and relay SRC is reoperated. This operates relay FO via the path prepared by operation of relay FOM; reoperation of SRC also initiates timing of timer FO.

10.89 Relay FO operated opens the DC path to the switchboard. Relay FO also places an idle port termination across bridge port 5 to prevent howling.

10.90 After about 750 ms, timer FO completes timing; timer FO1 (option V) or FO7 (option M) lead is effectively connected to timer FO4 (option V) or FO5 (option M) lead and relay FOM is shunted down. Relay FOM released releases relay FO. Release of relay FO restores the dc path to switchboard. This 750-ms open of the dc path locks in a 120-ipm flashing recall signal at the switchboard.

10.91 The recall signal is an indication to the attendant that the conference should be re-entered. The attendant re-enters and receives instructions on the action desired.

10.92 If the attendant is instructed to disconnect the party on port 5, the cord is pulled down from the jack appearance of port 5. Disconnection results in release of

relays CO, BC5, BCH5, D0M, and D0R if option V is used or relays CO, BC5, BC5S, BCH5, and D0M if option 3 is used. This clears conference circuit port 5 for addition of another party.

10.93 If another connection via the switchboard is desired, the conference controller dials 0 and reaches the attendant via an attendant trunk. This will set up the conference circuit so that a party may again be added via the switchboard jack appearance.

11. DIAL 9 TRUNK ACCESS DENIED - SC9

11.01 The conference circuit is arranged to deny access to central office trunks and to return busy tone if trunk access code 9 is dialed by the conference controller.

11.02 When the conference originator dials 9, the register and marker function in a normal manner for connecting a dial 9 call. Relay P operates which operates relay MC. Relay MC in turn operates relay PM. When the marker relay TKB9 operates, it operates relays D9W and Z via operated relay MC.

11.03 Relay D9W operated:

(a) Locks to off-normal ground and, independently, to ground via operated relay PM.

(b) Removes the bridge from the tip and ring of the calling port.

(c) Through capacitor G, connects busy tone to a winding of repeat coil T1. Tone is induced on the tip and ring of the port which is controlling the conference.

11.04 Relay Z operated prepares a path for shunt-down release of relay D9W when relay L is released by a switchhook flash.

11.05 The controller disposes of the busy tone and returns to the conference bus by a switchhook flash.

11.06 When the switchhook is depressed, relay L releases. This operates relay D1 which removes locking ground from the CR1-5 relays and releases the one just operated.

11.07 Relay CR- released:

(a) Removes 100-ohm holding ground from the sleeve of the calling port.

(b) Opens a possible tip and ring bridge on the calling port when relay D9W releases.

11.08 Release of relay L completes a shunt path across the winding of relay D9W via operated relay Z. This releases relay D9W but relay Z remains operated as long as the switchhook is depressed. Release of relay D9W removes busy tone from the tip and ring of the control station.

11.09 When the switchhook is released, relay L operates and relays D1 and PRL release. This opens both paths for holding relay Z operated so that it releases.

11.10 Release of relay Z operates relay CRDK. This reconnects tip and ring of the control port to bridge port 0 and also releases relay PM.

11.11 At this time, the conference connection is restored to the condition which existed before the controller attempted to add a central office trunk by dialing the trunk access code.

12. DIAL REPEATING TIE TRUNK ADDED TO CONFERENCE - SC18, SC26

12.01 Dial repeating tie trunks with reverse battery supervision may be added to the conference without help from the PBX attendant. With option 3, the originator may also have a private consultation with the tie trunk party.

12.02 When a tie trunk (say 86) has been dialed by the conference controller, the register calls the marker and reverses battery toward the calling port. This operates relay P which in turn operates relay MC.

12.03 Relay MC operated:

(a) Prepares a path for operation of relay D8 via the marker.

(b) Grounds marker lead CCC to cancel the camp-on function.

(c) Operates relay PM.

12.04 The marker when connected operates relay D8, connects the called port to the tie line, and then releases.

12.05 With private consultation (option 3) provided, relay D8 operates relay RS1 which in turn operates relays BR1 and BR2. When the called station answers with relay BR1 operated, the control station and called station will be in private consultation.

12.06 Relay BR1 operated operates relay PMR which releases relay PM to keep holding ground on relays CR1-5 (option 3).

12.07 Release of the marker releases relay MC and connection of the tie line releases relay P. The controller may now dial the number of the station at the distant PBX.

12.08 If a supervisory signal received from the distant PBX indicates the called station is busy or does not answer, the controller may cancel the call and return to the conference by a switchhook flash (SC27).

12.09 If the distant station answers, reverse battery supervision provided by the trunk operates relay P. This operates relay RT on its secondary winding via operated relay D8 and released relay MC.

12.10 With private consultation (option 3), operation of relay RT releases relays PMR and RS1. Relay RS1 released releases relay P by removing battery previously available through inductor L2. Relay P released releases relay D8.

12.11 Without private consultation (option V), the operation of relay RT operates relay BC- and releases relay D8. Relay BC- operated completes a path via the switch vertical by operating relay S-. This releases relay CR- and operates relay BCH-. Release of relay CR- operates relay CRDK which releases relays RT, PM, and RRL. Relay CRDK operated also returns the conference controller to the conference bridge.

13. TRANSFER OF CONTROL

A. Conference Originator Disconnects

13.01 When the conference originator depresses his switchhook longer than 1.5 seconds, he is disconnected from the conference and cannot re-enter unless he is recalled by a conference station which has assumed control of the conference as described in a following section. Circuit action involved in disconnecting an originating station is described in a following section.

Note: The originating station, if recalled, will be connected at a port in group 1-5 and not at port 0.

B. Conferee Station Assumes Control - SC15

13.02 After the conference originator hangs up and is disconnected, a conferee station may gain control of the conference and add additional stations. The conferee station gains control by flashing his switchhook.

13.03 Assume that a conference port (other than port 0) is available, the originator has been disconnected, and the station on port 3 wishes to assume control of the conference.

13.04 When the conferee on port 3 depresses his switchhook, relay S3 releases. Relays BC3 and BCH3 are slow to release and hold up over a switchhook flash to maintain the sleeve ground at port 3.

13.05 Relay S3 released operates relay TP3 which locks to ground via operated relay BY.

13.06 Relay TP3 operated releases relay TPDK and prepares operating paths for relays L, TE, and TEA which temporarily lock under control of released relay TPDK and operated relay RV.

13.07 Relays TE and TEA operated:

(a) Open the operate paths for relays TP1-5.

(b) Close the loop of port 3 across the windings of relay L operating it.

(c) Supply a holding ground for relay S3.

(d) Prepare a locking ground for relay TPDK.

(e) Prepare an operating path for relay D1.

13.08 Relay L operated:

(a) Operates relay SRC.

(b) Opens one operating path for relay D1.

13.09 Relay SRC operated operates relays ON and ONA.

13.10 Relay ON operated:

(a) Provides a holding ground for relays ONA, TE, and TEA.

(b) Prepares a holding ground for relays Z, D9W, CR1-5, RRL, RS, and D0.

(c) Indirectly prepares an operating path for relays DOR, BC1-5, and CR1-5.

(d) Operates relay CRDK.

(e) Prepares an operating path for relay D1.

13.11 Relay ONA operated:

(a) Opens the operating path for relays TE and TEA.

(b) Supplies a locking path for relays TP1-5.

(c) Releases relay BY.

(d) Provides a make-busy ground for the sleeve of vertical 80.

13.12 Relay CRDK operated:

(a) Operates relay D1.

(b) Removes off-normal ground from the operating path of relay RRL.

13.13 Relay D1 operated operates relay CR- (for the lowest numbered available port) which performs the following functions:

(a) Releases relay CRDK.

(b) Prepares an operating path for relay BC-.

(c) Places a bridge, through the windings of repeat coil T1 and the operating circuit for relay P, on the tip and ring of the switch vertical connected to the lowest numbered available port.

13.14 A bridge on tip and ring of the switch vertical is a bid for connection of a dial pulse register.

13.15 Relay CRDK released:

(a) Operates relay RRL (via thermistor C) after a delay of approximately 1 second.

(b) Provides an off-normal holding ground for relays PM and RT.

(c) Releases relay D1.

13.16 Relay RRL operated:

(a) Operates relay TPDK which locks under control of relay TE.

(b) Transfers holding ground for relays CR1-5 from relay ON to relay SRC.

13.17 At this point in the control sequence, the following conditions exist:

(a) The station line connected via vertical 83 is transferred from its normal line relay S3 to the controlling line relay L.

(b) Connection between conference bridge port 3 and switch vertical 83 is open.

(c) Line relay S3 is held operated.

(d) A register is connected to the lowest numbered available port and is returning dial tone to port 3 via coil T1 and a bridging connection at the tip and ring of vertical 80.

(e) Switch linkage to vertical 80 has been dropped by the previous disconnect of the originator, but the conference control circuit number is held busy by ground on the sleeve of vertical 80.

13.18 Under these conditions, the station at port 3 may control the conference circuit in the same manner as the originator. The necessary action at this time is dialing the number of a station to be added or disposing of the dial tone and releasing the register by a switchhook flash.

14. DISCONNECT

A. An Added Station Disconnects - SC12

Originator Still in Control - Three or More Stations in Conference

14.01 When a called conferee station hangs up, the S- relay associated with his conference port is released. This starts the slow release of relay BCH-. Release of relay BCH- starts the slow release of relay BC- which when released removes the holding ground from the sleeve of the switch vertical to release the corresponding holding magnet.

14.02 When a conferee port is cleared by disconnection of the called station, it becomes available for a new call by the conference controller. A new call is directed to the lowest number conference port having a released S- relay.

Added Station, Not in Control, Disconnects With Originator Disconnected - Three or More Stations in Conference - SC13

14.03 If the conference originator has been disconnected before an added station hangs up, the added station releases relays S-, BCH-, BC-, and the link hold magnet in the sequence which occurs when the originator is still in control. With the originator disconnected, however, there is an additional circuit action of operating and releasing relay TP- and releasing and reoperating relay TPDK during the disconnect sequence.

Originator Disconnects First - Only Two Stations Left in Conference - SC14

14.04 If the conference originator has been disconnected and only two stations are left in the conference, a hangup at either station releases the conference control circuit. For discussion purposes, assume that the stations on conference ports 2 and 3 remain in the conference and that the station on port 2 hangs up.

14.05 A hangup at the station connected to port 2 releases, in sequence, relays S2, BCH2, BC2, and link hold magnet 82. Also during this sequence relay TP2 is operated and released and relay TPDK is released and reoperated.

14.06 Since the originator is disconnected, relay ONA is released so that the holding path for relay BC3 is opened when relay BC2 releases. Release of relay BC2 thus releases relay BC3.

14.07 Relay BC3 released:

(a) Releases holding magnet 83.

(b) Releases relay S3.

(c) Releases relay RV.

14.08 Release of relay S3 releases relay BCH3 and release of relay RV releases relay BY.

14.09 Release of relay BY releases relay TPDK and removes ground from the sleeve of the switch vertical used by the originator. This restores the conference control circuit to a normal idle condition and thus makes it available for a new conference originator.

Called Station Disconnects During Private Consultation With Originator (Option 3) - SC25

14.10 The called station disconnects during private consultation by hanging up. The control station switchhook flashes to reconnect to the multiway conference as described in 7., except the disconnected station does not go to the conference and is free to make and receive other calls.

B. Originator Disconnects

With Register Attached - SC10

14.11 When the conference originator hangs up, relay L is released and starts the slow release of SRC. Release of relay SRC releases relay CR- associated with the conference port at which the register is attached. This removes the bridge from the tip and ring of the switch vertical and thus dismisses the register. Release of relay CR- operates relay CRDK which in turn operates relay D1.

14.12 Release of relay SRC also activates the disconnect timing circuit by grounding the start terminal. After the disconnect interval of about 1.5 seconds, relay ONRL operates. This opens the locking path for relay ON, releasing it.

14.13 Release of relay ON releases relays ONA, CRDK, D1, and RRL. Release of relay ONA releases relay TPDK and hold magnet 80 and stops disconnect timing. Relay ONRL releases.

14.14 Release of relay TPDK operates relay BY which reconnects ground to the sleeve of vertical 80 to hold the conference number busy. Operation of relay BY also operates relay TPDK via a series of break contacts on relays TP1-5.

While Connected to Conference Bridge - SC11

14.15 If the conference originator hangs up while connected to the conference bridge, the main disconnect sequence is the same as for disconnection when attached to a register. However, there is additional circuit action which depends on the busy condition of the conference ports.

14.16 If all ports are busy with stations, operation of relay D1 operates D9W in preparation for applying an all-ports-busy tone. The all-ports-busy tone is not applied to the conference, however, since repeat coil winding 4-3, 7-8 is open at break contacts of relay L. Relays D9W and D1 are released when relay ON releases.

14.17 An additional circuit action in the all-ports-busy case is the operation of relay FOM when relay SRC releases. This is preparatory to flashing the trunk recall lamp at the attendant console if a central office trunk is connected at port 5.

While on Consultation Bus With Another Station - SC34

14.18 If the originator disconnects while on the consultation bus, the circuit operation is as described in 7. and in 14.15 through 14.17.

C. Station in Control Disconnects - SC16

14.19 When a station which is in control of the conference (say the station on port 3) hangs up, relay L is released. This operates relay D1 and starts the slow release of relay SRC. If a conference port is idle, operation of relay D1 operates relay CR- in preparation for adding a station. Operation of relay CR- releases relay CRDK which in turn releases relay D1. However, the on-hook condition at the controlling station allows the disconnect sequence to continue through the operation of relay ONRL, release of relays ON and ONA, and release of relay ONR1.

14.20 Release of relay ON in addition to releasing relay ONA releases the operated relay CR- and relays TE and TEA.

14.21 Release of relay TE opens the locking path for relay TPDK which releases since relay TP3 was operated when the station assumed control. Release of relay TEA removes holding ground from relay S3 releasing it.

14.22 Release of relay ONA, in addition to recycling the timer, releases relay TP3 and operates relay BY via released relay TPDK. With relay PT3 released, operation of relay BY applies ground via break contacts on relay TP1-5 for operating relay TPDK.

14.23 If at least one port is idle, operation of relay BY completes a path via relay TPDK operated and relays TEA and BCH- released for reoperating TP3. This is a momentary operation since relay TP3 is released when relay BC3 is released following release of relay BCH3.

14.24 At the end of a disconnect sequence for a station which has assumed control, the conference circuit is in the same condition as that following disconnection of the original controller. Any station still connected to the conference may assume control by flashing his switchhook.

D. Disconnects When Port 5 is Connected Through Cord Switchboard - SC21

14.25 The following describes the action resulting when all stations except a station (or trunk) connected through a cord switchboard appearance hang up. Assume that port 2

is the next-to-last port to be disconnected; assume further that port 2 is associated with directory number 82 and port 5 is associated with directory number 85.

14.26 A hangup at the station connected to port 2 releases S2 which releases relay CO, operates relay TP2 releasing relay TPDK, and, in sequence, releases relays BCH2, BC2, and TP2. Release of BC2 also releases line hold magnet 82.

14.27 Relay CO released releases line hold magnet 85 and relay S5. Relay CO released removes ground from the sleeve of the switchboard jack causing the back cord lamp to light.

14.28 Relay S5 released releases relays TP5 and BCH5. BCH5 released releases relays BC5 and DOM and in conjunction with released BC2 releases relay RV. Release of relay RV releases relay BY making the conference circuit available for another conference. Relay BC5 released releases relays TP5 and BC5S.

14.29 If a central office party connected through a cord switchboard disconnects while the conference is in progress, central office timeout will result in a momentary open of the trunk loop which will lock in a flashing recall at the switchboard. A moment later, dial tone will be returned from the central office into the conference. This dial tone will persist until the attendant takes the appropriate action.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

Lines and Trunks

1.01 Maximum external loop resistance is 1500 ohms. Minimum insulation resistance is 16,000 ohms.

Voltage Limits

1.02

Minimum	Maximum
-45	-52

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

Designation	Meaning
BC1-5	Bus Connect
BC5S	Bus Connect 5 Slave
BCH1-5	BC Hold
BR1	Block Relay 1
BR2	Block Relay 2
BY	Busy
CF	Conference Return
CO	Cut Over
CR1-5	Connect Register
CRDK	CR Down Check
D0	Dial 0
D0A	Dial 0 Auxiliary
D0M	Dial 0 Memory
D0R	D0 Release
D1	Dial 1
D8	Dial 8
D9W	Dial 9 and All-Ports-Busy Sequence W
FO	Flash Attendant
FOM	Flash Attendant Memory
L	Line Relay
MC	Marker Connect
ON	Off Normal
ONA	Off-Normal Auxiliary
ONRL	Off-Normal Release
P	Polarized
PM	P Relay Memory
PMR	PM Release
RRL	Register Release
RS	Ring Start
RS1	Ring Start Slave
RT	Ring Trip
RV	Reverse
S1-5	Supervisory - Station Line
SRC	Slow Release
TE	Transfer Control Execute
TEA	TE Auxiliary
TP1-5	Transfer Control Prepare
TPDK	TP Down Check
Z	All-Ports-Busy Sequence Z

3. FUNCTIONS

3.01 To provide means for initiating and controlling, from any PBX station, a conference connection of PBX stations and dial repeating tie trunks.

3.02 To disconnect any conference station which goes on-hook and make the station available for incoming or outgoing nonconference calls.

3.03 To make a conference port from which a station has disconnected available to the conference controller for adding another station.

3.04 To return busy tone if the controller attempts to add a station when all ports are in use.

3.05 To return busy tone if the controller attempts to add a central office trunk by dial 9 procedure.

3.06 To transfer conference control to any conferee station which flashes a switchhook after the conference originator is disconnected.

3.07 To release the conference controller from a partially completed call if the switchhook is flashed at any time prior to answer by the called station.

3.08 To provide for addition, by the PBX attendant, of a central office trunk to the conference.

3.09 To recall the attendant to a central office trunk if the switchhook is flashed by

the controller when all conference ports are in use.

3.10 To provide private consultation between the control station and newly added conferee. The private consultation is canceled by a switchhook flash by the controller, and both the control station and the called station are connected into the multiway conference.

3.11 To return busy tone if the controller dials 0 over conference port 5.

4. CONNECTING CIRCUITS

PBX Circuits

4.01 The station controlled conference circuit is connected to the following circuits.

(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.

(d) 552A, 552B, 552D, 552E, 605A, 607A, 607B, or 608A Jack Circuit - SD-65778-01.

(e) 608D Jack and Lamp Circuit - SD-65997-01.

Plug-In Units

4.02 The station controlled conference circuit includes timing circuit SD-66793-01 or SD-99361-01 (CP5) or SD-99361-01 (CP4). The station controlled conference circuit also includes six-port conference bridge circuit SD-96595-01, Fig. 1.

5. ALARM INFORMATION

5.01 Operation of a fuse supplying power to the station controlled conference circuit results in a visual and audible alarm at the attendant position and at the alarm, transfer, and test circuit. If alarm sending is provided, a fuse alarm results in a major alarm at the plant service center.

6. MANUFACTURING TESTING REQUIREMENTS

6.01 The station controlled conference 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.

7. TAKING EQUIPMENT OUT OF SERVICE

7.01 The station controlled conference circuit may be taken out of service by the following procedures:

(a) Determine that the circuit is not in use by observing that all relays are released.

(b) Block relay BY operated.

(c) Remove all battery supply fuses.

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 To provide a private consultation between the controller and newly added conferee. The private consultation is canceled with a switchhook flash by the controller and both the controller and the called station are connected into the multiway conference.

A.2 To return busy tone if the controller dials 0 over conference port 5.

B. Changes in Apparatus

B.1 Added

Relay	BC5S	1/2AK4	App	Fig. 3
Relay	BR1	AF88	App	Fig. 3
Relay	CF	AJ15	App	Fig. 3
Relay	D0A	1/2AK4	App	Fig. 3
Relay	RS1	1/2AK4	App	Fig. 3
Relay	PMR	1/2AK4	App	Fig. 3
Inductor	L2	274L	App	Fig. 3
Capacitor	P	437A	App	Fig. 3
Diode	BC5	446F	App	Fig. 3
Diode	BR1	446F	App	Fig. 3
Diode	D8	446F	App	Fig. 3
Diode	RT	446F	App	Fig. 3
Resistor	D0	18U	App	Fig. 3
Resistor	MC	KS-13492,L1, 200 Ohms	App	Fig. 3
Resistor	P	18JU	App	Fig. 3
Resistor	T2R	144A, 1500 Ohms	App	Fig. 3
Resistor	T2T	144A, 1500 Ohms	App	Fig. 3

B.2 Superseded / Superseded By

Superseded	Superseded By
A Capacitor, 542F, T Option	A Capacitor, 705G, S Option
B Capacitor, 542F, T Option	B Capacitor, 705G, S Option
C Capacitor, 542F, T Option	C Capacitor, 705G, S Option
D Capacitor, 542F, T Option	D Capacitor, 705G, T Option
E Capacitor, 542F, T Option	E Capacitor, 705G, T Option
F Capacitor, 542F, T Option	F Capacitor, 705G, T Option
L Capacitor, 437QA, V Option	Wiring, M Option
RD Connector, KS-19198,L1, App Fig. 1, V Option	RD Connector, 910A, M Option
RD Plug-In Unit, ED-66715, App Fig. 1, V Option	RD Plug-In Unit, ED-99556, App Fig. 1, Q Option or
FO Plug-In Unit, ED-99541, App Fig. 2, V Option	RD-FO Plug-In Unit, ED-99555, App Fig. 1, R Option
D0R Relay, 1/2AK4, App Fig. 1, V Option	BR2 Relay, 1/2AK4, App Fig. 1, M Option
L Relay, AJ52, App Fig. 1, V Option	L Relay, AJ138, App Fig. 1, M Option
R0-5 Resistors, 145A, 900 Ohms, App Fig. 1, T Option	R0-5 Resistors, 145A, 600 Ohms, App Fig. 1, S Option

B.3 Removed

B Thermistor, 1F, App Fig. 1, V Option

D. Description of Changes

D.1 Option T is designated and rated Mfr Disc. and option S is added to change the idle bridge-port termination to improve balance on partially loaded conferences.

D.2 Option V is designated and rated Mfr Disc. and options 3, N, Q, R, and M are added to provide private consultation and to permit the use of one double relay time delay circuit in place of the previous two single relay time delay circuits.

D.3 On sheet C1, use of contacts of relays BCH1-4, L, ON, RS, RT, D8, and S are shown for use with option 3. Options M and V are also shown.

D.4 On sheet C2, App Fig. 3 is added.

D.5 On sheet D1:

(a) Options 3, N, Q, R, and M are included in Note 102.

(b) Options 3, N, Q, R, S, T, M, and V are included in Note 104.

(c) Notes 107 and 303 are added.

(d) Minimum insulation resistance is

raised from 10,000 ohms to 16,000 ohms to insure release of relays S- on disconnects.

D.6 Sheets D2 and D3 are added; Information Note 302 is added on sheets D1, D2, and D3.

D.7 Sheets E1 through E8 and SC1 through SC21 are modified and sheets SC22 through SC34 are added.

D.8 On sheet F1, circuit requirement information for relays BC5S, BR1, BR2, CF, D0A, RS1, and PMR is added. Information on relays D0 and L is also made to agree with changes in this issue.

BELL TELEPHONE LABORATORIES, INCORPORATED

(WECo 7120HW-RRS-JGW)

DEPT 5337-LAH