PBX SYSTEMS
NO. 701B
TWO-WAY TRUNK CIRCUIT
ARRANGED TO TRANSFER INCOMING
STATION CALLS AND ROUTE DIRECTORY NUMBER
CALLS TO THE ATTENDANT
FOR USE WITH DIRECT DIALING TO
AND FROM A CROSSBAR CENTRAL
OFFICE ARRANGED FOR
LINE LINK PULSING WITH
E & M LEAD SIGNALING

CHANGES

A. Changed and Added Functions

A.1 To provide optional incoming call source identification for use with the 1 and 2 type telephone console.

B. Changes in Apparatus

B.1 Added

ID Relay, 1/2AK22, Fig. 1, Option ZW

D. Description of Changes

D.1 Option ZW is added as a feature standard to provide necessary wiring and apparatus for Incoming Call Source Identification.

D.2 Option ZV is designated as a feature standard to be used when Incoming Call Source Identification is not provided.

D.3 Circuit Note 109 is added and Notes 102 and 104 are modified.

D.4 CAD 1 is updated to include options ZV and ZW.

D.5 CAD 9 is added.

F. Changes in Description of Operation

F.1 In SECTION II, add the following:

15. INCOMING CALL SOURCE IDENTIFICATION - (OPTION ZW)

A. Listed Number Identification

15.01 This circuit functions as described in paragraph 2. INCOMING CALL TO THE ATTENDANT with the following exceptions.

15.02 Relay SW operated conditions lead T to send an identification mark to the Incoming Call Source Identification Circuit upon the operation of relay ID.

15.03 Relay GT operated, operates relay ID.

15.04 Relay ID operated:

(a) Opens leads T, R, and R1 and applies the identification marks to the Incoming Call Source Identification Circuit.

(b) Locks operated to lead TR.

(c) Grounds lead PC1 to the peg count register.

15.05 After the Incoming Call Source Identification Circuit functions, ground is removed from lead TR releasing relay ID.

15.06 Relay ID released, restores the original configuration for leads T, R, and R1.

15.07 The trunk now functions as normal.

B. Attendant Recall

15.08 When the attendant is signalled either by attendant recall or station dial transfer, this circuit functions as described in paragraph 1. C. Flash to Call Attendant Station Dial Transfer Not Provided or paragraph 1. D. Flash to Transfer an Incoming Call-Station Dial Transfer Provided respectively with the following exceptions.

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15.09 With relays PA and PA1 operated (attendant recall) or relays PA, PA1 and SW operated (station dial transfer) lead T is conditioned to send an identification mark to the Incoming Call Source Identification Circuit upon the operation of relay ID.

15.10 Relay GT operated, operates relay ID.

15.11 Relay ID operated:

(a) Locks operated to lead TR.

(b) Prevents the operation of relay TR.

(c) Opens leads T, R, and R1 and applies the identification mark to the Incoming Call Source Identification Circuit.

(d) Grounds lead PC1 to the peg count register.

15.12 After the Incoming Call Source Identification Circuit functions, ground is removed from lead TR releasing relay ID.

15.13 Relay ID released:

(a) Operates relay TR.

(b) Restores the original configuration for leads T, R, and R1.

15.14 The trunk now functions as normal.

C. Busy Line Transfer

15.15 Relay BT operated conditions lead R to send an identification mark to the Incoming Call Source Identification Circuit upon the operation of relay ID.

15.16 Identification is completed as described above in paragraphs 15.03 through 15.07.

D. Don't Answer Transfer

15.17 Relay DA1 operated conditions lead T and optionally lead R to send an identification mark to the Incoming Call Source Identification Circuit upon the operation of relay ID.

15.18 Identification is completed as described above in paragraphs 15.03 through 15.07.

F.2 In SECTION III, paragraph 2. FUNCTIONAL DESIGNATIONS, add the following?

Relay	Meaning	Primary Function
ID	Identification	To open leads T, R, and R1 so identification marks can be passed to the Incoming Call Source Identification Circuit.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5152HW-JLF-WEA

DEPT 5337-RVT

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit provides for two-way direct dialing service between the PBX and a crossbar central office arranged for line link pulsing with E & M lead signaling. In addition, directory number calls and incoming calls to be transferred can be routed to the attendant on a switched loop basis.

2. GENERAL DESCRIPTION OF OPERATION

A. Incoming Call

2.01 This circuit is connected between the signaling equipment and the incoming first selector or if station dial transfer is provided between the transmission facilities and the station dial transfer circuit.

2.02 All supervisory and dial pulse signals are transmitted over the E & M leads. Signals from the central office are received on the E lead and signals to the central office are transmitted on the M lead. Dial pulses are transferred from the E lead to the incoming first selector by a relay which follows the dial pulses and places a bridge across the tip and ring to operate the selector relay.

2.03 When the called station answers, reverse battery supervision is returned from the connector on a direct inward dialed call or from the attendant loop circuit on directory number calls. Answer supervision to this circuit operates a polar relay which causes the transfer of lead M from ground to resistance battery to signal the central office of the off-hook condition.

2.04 If the central office disconnects first, this circuit returns to normal immediately and is ready to accept the next call. If the called party disconnects first, there is a 1.2 second delay before a disconnect signal is sent to the central office so that this circuit can distinguish between a transfer request and a disconnect.

2.05 Direct inward dialed calls are transferred to the attendant under the following conditions:

(a) When the called station flashes the switchhook if station dial transfer is not provided.

(b) When the called station dials the attendant if station dial transfer is provided.

(c) If busy line transfer is provided, when the called station is busy.

(d) If don't answer transfer is provided, when the called station does not answer after approximately 25 seconds.

2.06 Connection to the attendant is via a trunk and position finder or trunk finder and an attendant loop circuit.

2.07 When the attendant answers, a bridged impedance transmission circuit is established in the attendant loop circuit. The calling and called parties remain bridges for conversation to the attendant.

2.08 In order for the attendant to complete the transfer, the called party must be disconnected and the attendant then completes over the original switchtrain.

2.09 If the attendant does not complete the transferred call but disconnects, the attendant loop release and the original talking path is re-established. Should the called party again require attendant assistance, flashing the switchhook or dialing the attendant if station dial transfer is provided will condition the circuit as before.

2.10 If the called party disconnects while the attendant is still connected, the attendant will remain connected to the central office.

2.11 If the central office disconnects while the attendant is still connected, the attendant will be released and this circuit will return to normal.

2.12 With single position single cord operate of the 608B or 608D PBX, this circuit may be connected directly to the attendant loop circuit. All types of calls to the attendant are routed as described previously except, with this condition, the call distributor and trunk finder or trunk and position finder are not required. Also, the peg count registration of all types of calls to the attendant is not provided.

B. Outgoing Call

2.13 For outgoing service, this trunk appears on a selector bank level and a station or the attendant gains access by dialing the proper digit.

2.14 Dialing and supervisory signals are passed to the central office on the M lead by a relay which follows dial pulses from the station or sender.

2.15 Immediate answer supervision is returned to connecting circuits via the attendant selector upon seizure of this trunk or if a register sender is used, upon release of the sender. Delayed answer supervision under control of the central office may be provided on an optional basis.

2.16 If the central office disconnects first, this circuit is held busy until the PBX station disconnects. If the PBX station disconnects first, the central office trunk will release and send a disconnect to the PBX releasing the trunk.

SECTION II - DETAILED DESCRIPTION

1. INCOMING CALL TO A STATION (SC1)

A. Seizure and Dialing

1.01 This circuit signals the central office that it is idle by connecting direct ground on lead M. The central office may seize this trunk any time it is in this condition.

1.02 Seizure takes place when ground is connected to lead E operating relay E.

1.03 Relay E operated:

(a) Operates relay INC.

(b) Grounds lead S to the local selector banks to make this circuit busy to outgoing calls.

(c) Prepares an operate path for polarized relay P and relay Z.

(d) Opens its low resistance operate path.

(e) Prepares a lock path for relay BY.

(f) Connects the winding of relay SK to lead SC.

(g) Prepares a path for grounding leads FL on ON if station dial transfer is provided so that this circuit cannot be held busy by the station dial transfer circuit when the central office disconnects.

(h) Prepares an operate path for relay ST if attendant transfer is provided.

(i) Prevents relay C from operating upon operation of relay INC.

(j) Connects relay BT to lead F is busy line transfer is provided.

1.04 Relay INC operated:

(a) Locks via lead S under control of relay BY upon seizure of incoming selector.

(b) Prepares a path to operate relay C on the first break of relay E.

(c) Prevents ground from being applied to leads A and B to the PBX ANI circuit.

(d) Maintains a ground on lead S to the local selector banks while relay E follows dial pulses.

(e) Removes the idle circuit termination consisting of capacitor IL and resistor IL.

(f) Operates relay TR1.

1.05 Relay TR1 operated:

(a) Transfers a portion of the bridge across the tip and ring from relays A and L to the polarized relay P in series with inductor A and a pulsing contact of relay E.

(b) Transfers the tip and ring from the local selector banks to the incoming selector jacks.

(c) Prepares a lock path for relay T.

(d) Prevents the operation relay RV if provided.

(e) Prevents the start of outgoing answer supervision guard timing if provided.

1.06 With relay TR1 operated, the bridge across the tip and ring consisting of inductor A, diode B, a break contact of relay T, and the pulsing contact of relay E, seizes the incoming selector. Relay P does not operate at this time since the incoming selector furnishes ground on the tip and battery on the ring causing current to bypass diode A and relay P through diode B.

1.07 Dial pulses are transmitted from the central office by opening and grounding lead E Relay E follows the dial pulses and remains operated after dialing until central office disconnects. A network consisting of capacitor E, resistor E, and a break contact of relay E prevents relay E from distorting the dial pulses.

1.08 Relay C operates on the first break of relay E to prevent dial pulse transients from interfering with the signaling equipment.

1.09 Relay C operated:

(a) Connects capacitor C across leads T and F or with option E, across leads T and B.

(b) Connects capacitor C1 across leads B and G or with option E, across leads G and R.

(c) Provides a low resistance shunt across inductor A.

(d) Operates relay DA1 if provided whose functions are described in Part 4.

DON'T ANSWER TRANSFER.

1.10 Relay C is slow releasing and holds over dial pulses releasing and re-operating between digits. When the central office stops pulsing, relay E remains operated releasing relay C which in turn operates relay DA if provided.

B. Called Party Answers

1.11 When the called party answers, reverse battery is returned from the connector and relay P operates from battery on the tip and ground on the ring. Relay P operated operates relay PA and opens the lock path of relay T.

1.12 Relay PA operated:

(a) Prevents the start of disconnect timing.

(b) Prevents the operation of relay ST when relay PA1 operates (S option).

(c) Prevents grounding lead FL to dial transfer circuit when relay PA1 operates (R option).

(d) Operates relay PA1.

1.13 Relay PA1 operated:

(a) Operates relay A which sends answer supervision to the central office.

(b) Operates relay L which operates relay B.

(c) Stops don't answer transfer timing and also releases relay DA if provided.

(d) Connects ground to lead ON if station dial transfer is provided.

(e) Locks via lead S to the incoming selector.

(f) Prepares a path to start disconnect timing under control of relay PA.

(g) Prevents grounding of lead PC2.

(h) Opens the operate path of relay BT if provided.

(i) Prepares an operate path for relay ST if provided.

(j) Prepares an operate path for relay TR under control of relay SK.

1.14 Relay B operated:

(a) Connects ground to lead PC3 for registration of all calls.

(b) Removes ground from lead K to the traffic register circuit.

(c) Operates relay BY.

(d) Places a ground on lead S to local selector banks.

(e) Opens original operate path of relay INC.

1.15 Relay BY operated:

(a) Places another ground on lead S to the local selector banks.

(b) Locks under control of relay E.

(c) Removes ground from lead PC3 for registration of all calls.

(d) Transfers lock path of relay INC.

1.16 This circuit is now conditioned for possible transfer.

C. Flash to Call Attendant - Station Dial Transfer Not Provided - Option S (SC6)

Station Flashes Switchhook

1.17 When the called station depresses the switchhook, relay P releases which releases relay PA.

1.18 Relay PA released:

(a) Starts disconnect timing.

(b) Operates relay ST.

(c) Opens an operate path of relay Z.

(d) Opens the original operate path of relay PA1.

1.19 Relay ST operated locks under control of relays PA1 and E operated and relays OA and SW released and partially closes the operate path of relay Z.

1.20 If the called party releases the switchhook in less than 1.2 seconds, relay P reoperates operating relay PA.

1.21 Relay PA reoperating operates relay Z and stops disconnect timing.

1.22 Relay Z operated:

(a) Closes the operate path of relay GT to the call distribution circuit over lead GC(M option) or leads GC and GT (K option). Relay GT operates when a position is available and the call distribution circuit gate is open.

(b) Connects 10,000-ohm ground through resistor CW to lead CW and direct ground to lead L to the calls waiting circuit.

(c) Connects 2108-ohm battery through resistor SF to lead F to the trunk and position finder or trunk finder circuit.

(d) Connects audible ringing to the trunk through capacitor R.

(e) Locks operated under control of relays OA and E.

1.23 Relay GT operated:

(a) Locks operated under control of relays SK and Z.

(b) Opens lead GC and grounds lead G to the call distribution circuit.

(c) Grounds lead PC1 for registration of all calls to the attendant.

(d) Connects 691-ohm battery through resistor SF to lead S to the trunk and position finder or trunk finder circuit.

1.24 The trunk and position finders or trunk finders operate from the call distribution circuit. The trunk finder hunts for 691-ohm battery on lead S. The position finder selects an idle attendant loop circuit. The 2108-ohm battery on lead F causes the attendant loop circuit to operate. The loop circuit in operating receives a ground mark on lead TR through a normal contact of relay SK to indicate that this is a DID trunk (option ZP) and extends ground over lead SC to operate relay SK and extends ground on lead S to hold relay SK. This is an indication that the trunk has been found and a position selected.

1.25 Relay SK operated:

(a) Removes the 691-ohm battery from lead S and locks operated under control of lead S from the trunk and position finder or trunk finder circuit.

(b) Releases relay GT.

(c) Prepares an operate path for relay OA.

(d) Removes ground from lead TR6 (option ZP).

(e) Operates relay TR.

1.26 Relay TR operated splits the T and R leads of the central office from the T and R leads of the incoming selector and connects the central office to the T and R leads and the incoming selector to the T1 and R1 leads of the trunk and position finder or trunk finder circuit. The attendand loop circuit functions to flash the source lamp at 120 ipm and light the destination lamp steady.

1.27 With relay TR operated, a holding bridge is supplied on leads T1 and R1 by the attendant loop circuit to hold the switchtrain and proper polarity is supplied on leads T and R by the attendant loop circuit to hold relay P operated.

1.28 When the attendant answers, the loop circuit removes ground from lead SC and grounds lead TR operating relay OA.

1.29 Relay OA operated:

(a) Provides a holding path for relay TR under control of relay SK.

(b) Removes 2108-ohm battery from lead F and connects leads F and SC of the trunk and position finder or trunk finder circuit to leads F and S respectively of the incoming selector.

(c) Removes ground from lead OA of the incoming selector to provide for absorption of the first digit only when the attendant completes.

(d) Opens lead OL between the incoming selector and night closing circuit.

(e) Releases relays ST and Z.

(f) Opens lead PC from the peg count register to the incoming selector.

(g) Opens the locking path of relay T.

(h) Opens the locking path of relay PA1 so that the attendant may flash the toll operator if necessary.

1.30 Relay Z released removes audible ringing from the trunk and removes 10,000-ohm ground from lead CW and ground from lead L to the calls waiting circuit.

1.31 The attendant may talk to either the calling or the called party and may connect the central office to another extention over the original switchtrain when the called party disconnects.

Attendant Completes

1.32 The attendant completes by keying the required digits and then releasing. Lead F is provided to indicate ringing, busy, or all-paths-busy.

1.33 When the called party answers, the attendant loop circuit releases. Ground is removed from leads TR and S by the attendant loop circuit releasing relays OA and SK and the trunk and position finder or trunk finder.

1.34 With relay SK released, relay TR releases. Relay TR released transfers the incoming selector leads back to the central office. The circuit is now in the

same state as it was before transfer and it is conditioned for any further transfers.

D. Flash to Transfer an Incoming Call - Station Dial Transfer Provided - Option R (SC9 & 10)

Called Station Transfers to Another Station

1.36 When station dial transfer is provided, operation of relay PA1 when the called station answers connects ground on lead ON to the station dial transfer circuit. Since relay PA is operated prior to relay PA1, ground is not connected to lead FL until the called station flashes the switchhook.

1.36 When the called station depresses the switchhook, relay P releases releasing relay PA.

1.37 Relay PA released:

(a) Connects ground to lead FL to station dial transfer circuit.

(b) Opens the original operate path of relay PA1.

(c) Starts disconnect timing.

1.38 If the called station releases the switchhook in less than 1.2 seconds, relay P reoperates operating relay PA.

1.39 Relay PA operated removes ground from lead FL to the station dial transfer circuit and stops disconnect timing.

1.40 When ground was placed on lead FL, relay FL in the station dial transfer circuit operated. When ground was removed, relay DB in the station dial transfer circuit operated. Operation of relay DB opens the tip and ring to this trunk releasing relays P and PA. The station dial transfer circuit functions to ground lead AS reoperating relay PA to hold the trunk and prevent it from releasing. The calling party is not brought into the connection until either the called or the transferred station flashes the switchhook.

1.41 When either of the two PBX stations flash the switchhook, relay DB in the station dial transfer circuit releases closing through a three-way talking path and relay P operates.

1.42 On disconnect by either the called or transferred station, the OB and OB1 leads are used to open the holding bridge supplied by diode B and release the switchtrain of the station disconnecting. If this bridge is not opened, the DC path through diode B and resistor B will hold up the switchtrain after the disconnecting station is on hook. Relay P in series with diode A provides a holding bridge for the transferred station.

Called Station Dials the Attendant

1.43 After the called station has flashed for transfer and has received dial tone, he may dial the attendant. If the attendant level is dialed, ground is returned on lead O by the incoming selector. Ground on lead O will operate relay SW.

1.44 Relay SW operated:

(a) Operates relay Z.

(b) Removes ground from lead ON.

(c) Provides a lock path for relay Z of the incoming selector.

(d) Opens lead OL between the incoming selector and night closing circuit.

1.45 Relay Z operated performs the same functions as described in Part 1, Section C. Flash to Call Attendant - Station Dial Transfer Not Provided - Option S except relay ST is not operated.

1.46 When ground is removed from lead ON, relays FL and DB in the station dial transfer circuit release. Relay DB released connects the central office back to the called party and releases the selector used for dialing. Release of the selector releases relay SW.

2. INCOMING CALL TO THE ATTENDANT (SC2)

A. Seizure and Dialing

2.01 Seizure and dialing occurs as discussed in Part 1.

2.02 When a directory number is dialed from the central office, the first effective digit will step the incoming selector to the attendant level.

B. Transfer to Attendant

2.03 When the attendant level is reached, ground is connected to lead O by the incoming selector. Ground on lead O operates relay SW.

2.04 Relay SW operated:

(a) Operates relay Z (ZB option).

(b) Stops don't answer transfer timing and releases relay DA1 if provided.

(c) Prepares a path to ground lead PC2 to peg count register circuit for registration of all directory calls under control of relay GT.

(d) Provides a lock path for relay Z of the incoming selector.

(e) Opens lead OL between the incoming selector and night closing circuit.

(f) Connects battery to the RD1 timer to delay the routing to the attendant until all digits have been received at the PBX (ZB option).

2.05 After approximately 5 seconds, the RD1 timer times out connecting ground through diode D to lead C operating relay Z (ZA option)

2.06 The attendant is signaled in the same manner as described in Part 1, Section C. Station Flashes Switchhook, except that relays ST and TR will not operate.

C. Attendant Answers

2.07 When the attendant answers, the circuit functions as described in Part 1, Section C. Attendant Answers, except the operation of relay OA operates relay TR.

2.08 With relay TR operated, leads T and R to the incoming selector are connected to leads T1 and R1 from the attendant loop circuit. Leads T1 and R1 are open in the attendant loop circuit and the incoming selector releases. Release of the incoming selector removes ground from lead O and relay SW releases.

2.09 Reverse battery supervision is returned on leads T and R from the attendant loop circuit operating relay P through diode A. Relay P operated operates relay PA which operates relay PA1.

2.10 Relay PA1 operated operates relays A and L. Relay A connects battery through resistance lamp M to lead M to signal the central office of the answer condition. Relay L operates relay B which operates relay BY. Relay BY operated locks under control of relay E to hold this circuit busy to outgoing traffic.

2.11 The attendant is now connected to the central office party and may complete the call to the desired extension.

D. Attendant Flashes Toll Operator (SC5)

2.12 The attendant may flash the toll operator by depressing the signal source key releasing relay P which releases relay PA and in turn releases relay PA1. Relay PA1 will release since its lock path is opened with relay OA operated.

2.13 Release of relay PA1 releases relays A and L. Release of relay A sends an on-hook signal to the central office. Release of relay L releases relay B. When the attendant releases the signal source key, relay P reoperates reoperating relay PA which in turn reoperates relay PA1.

2.14 Relay PA1 operated reoperates relay A and L. Reoperation of relay A sends an off-hook signal to the central office and reoperation of relay L reoperates relay B. This on-hook signal followed by an off-hook signal will alert the toll operator.

E. Attendant Completes

2.15 The attendant completes in the same manner as described in Part 1, Section C. Attendant Completes.

3. BUSY LINE TRANSFER - OPTION W (SC7)

3.01 On a DID call to a busy station, the connector returns 60-ipm ground on lead F. When busy line transfer is provided, this ground will operate relay BT.

3.02 Relay BT operated:

(a) Operates relay Z from ground supplied on lead OL from the night closing circuit.

(b) Locks operated under control of relay PA1 released and relay E operated.

(c) Partially opens holding bridge across the tip and ring.

(d) Connects a short across leads T and R to the trunk and position finder or trunk finder circuit if option V is provided to signal the attendant with 120-ipm flashing lamp. If option V is not provided, the attendant is signaled with 60 ipm flashing lamp. The attendant is signaled from the attendant loop circuit, and the change from 60 ipm to 120 ipm is accomplished by operating a relay in the loop circuit.

3.03 Relay Z operated starts a sequence of relay operations as described in Part 1, Section C. Station Flashes Switchhook, except relay ST is not operated at this time. Also relay Z operated opens the bridge across the tip and ring releasing the switchtrain.

3.04 The release of the switchtrain removes ground from lead S releasing relay DA if provided to stop don't answer transfer timing.

3.05 When the attendant answers, reverse battery supervision from the attendant loop circuit operates relays P, PA and PA1 in sequence. Relay PA1 operated operates relays A and L and releases relay BT. Relay A sends answer supervision to the central office and relay L operates relay B which operates relay BY. The attendant may now complete to another station.

4. DON'T ANSWER TRANSFER - OPTION Y (SC8)

4.01 This feature provides for a DID call to be transferred to the attendant if the called station does not answer after approximately 25 seconds.

4.02 With the seizure of the incoming selector, ground is returned on lead S which operates relay DA1 upon the first operation of relay C.

4.03 Relay DA1 operated:

(a) Locks operated to lead S.

(b) Prepares an operate path for relay DA.

4.04 Relay DA operates after the first digit is pulsed (upon the release of relay C) and follows the operation of relay C recycling don't answer transfer timing to prevent the start of timing until the last digit is received.

4.05 Relay DA operated:

(a) Changes the timing of the relay time delay circuit from 1.2 seconds to approximately 25 seconds.

(b) Starts don't answer transfer timing.

(c) Shunts a contact of relay T preventing the bridge across tip and ring from being opened.

(d) Prepares an operate path of relay Z.

(e) Connects a short across leads T and R to the trunk and position finder or trunk finder circuit if option T is provided to signal the attendant with 120-ipm flashing lamp. If option T is not provided, the attendant is signaled with 60-ipm flashing lamp.

4.06 Approximately 25 seconds after the operation of relay DA, the time delay circuit functions to operate relay T. Relay T and relay DA operated operates relay Z which opens the operate path of relay PA1.

4.07 Relay Z operated will start a sequence of relay operations as described in Part 1, Section C. Station Flashes Switchhook, except that relay ST is not operated at this time.

Attendant Answers First

4.08 When the attendant answers, relays OA and TR operate. Relay OA operated releases relay Z. Relay TR operated releases the incoming selector and extends reverse battery supervision from the attendant loop circuit operating relays P and PA. Relay PA operated releases relay T.

4.09 With relay Z released, relay PA1 operates operating relays A and L and releasing relay DA1 which releases relay DA. Relay A sends answer supervision to the central office and relay L operates relay B which operates relay BY.

Called Station Answers First

4.10 If the called station answers first, reverse battery supervision from the connector operates relay P which operates relay PA and releases relay T. With relays PA and DA operated, relay Z releases resulting in the release of the attendant loop.

4.11 With relay PA operated, the release of relay Z operates relay PA1 which releases relays DA and DA1. This sequence of operation prevents the loop from being opened and releasing the incoming switchtrain when the called station answers.

4.12 Relay PA1 operated operates relays A and L. Relay A sends answer supervision to the central office and relay L operates relay B which operates relay BY.

5. DISCONNECT ON A DID CALL (SC3)

A. Central Office Disconnects First

5.01 When the central office disconnects, ground is removed from lead E by the central office and relay E releases.

5.02 Relay E released:

(a) Opens the bridge across the tip and ring releasing connector relay A and relay P in turn releasing relay PA.

(b) Starts the operation of relay C which has no function at this time.

(c) Opens lock path of relay BY.

(d) Opens original operate path of relay INC.

5.03 Connector relay A released releases connector relay B. Release of connector relay B removes ground from lead S releasing relay PA1 which releases relays A and L.

5.04 Relay A released connects ground through a break contact of the TST & MB jack to lead M to signal the central office of the disconnect.

5.05 Relay L released releases slow release relay B which releases relay BY. Relay BY released releases relay INC.

5.06 Relay INC released:

(a) Releases slow release relay C and relay TR1.

(b) Removes ground from lead S to local selector banks.

(c) Completes idle circuit termination.

5.07 Relay TR1 released transfers trunk from incoming to outgoing mode of operation.

5.08 At this time the circuit is normal

and ready for the next incoming or outgoing call.

B. Called Party Disconnects First

5.09 When the called party disconnects, reverse battery supervision is returned from the connector releasing relay P. Relay P released releases relay PA.

5.10 Relay PA released:

(a) Opens the original path of relay PA1.

(b) Operates relay ST (S option).

(c) Starts disconnect timing.

5.11 After approximately 1.2 seconds, the time delay circuit functions to operate relay T.

5.12 Relay T operated locks under control of relay TR1 operated and relays P and OA released, and opens the bridge across the tip and ring releasing the switchtrain. Release of the connector removes ground from lead S releasing relay PA1.

5.13 Relay PA1 released releases relays A and L and relay ST if provided. Relay A released sends a disconnect signal to central office. Relay L released releases slow release relay B which opens the original operate path of relay BY.

5.14 When central office disconnects or times out, ground is removed from lead E releasing relay E. Relay E released releases relay BY. Relay BY released releases relay INC.

5.15 Relay INC released:

(a) Releases relay TR1.

(b) Removes ground from lead S to local selector banks.

(c) Replaces idle circuit termination.

5.16 Relay TR1 released transfers trunk from incoming to outgoing mode of operation and releases relay T.

5.17 At this time, all relays are released in the circuit and ready for the next incoming or outgoing call.

6. DISCONNECT ON AN INCOMING CALL TO THE ATTENDANT (SC4)

A. Attendant had not Completed to a Station

Central Office Disconnects First (Option ZO and ZP)

6.01 When central office disconnects, relay E releases.

6.02 Relay E released:

(a) Opens bridge across tip and ring resulting in the release of P, PA, and PA1.

(b) Operates relay C which has no function at this time.

6.03 Disconnect supervision is repeated to the attendant loop circuit which releases relay L in the loop circuit. This causes the loop circuit to remove ground from from leads S and TR releasing relays SK and OA.

6.04 Relays SK and OA released releases relay TR.

6.05 Relay PA1 released releases relays A and L. Relay A released sends a disconnect signal to the central office. Relay L released releases relay B which releases relay BY. Relay BY released releases relay INC.

6.06 Relay INC released:

(a) Releases relay TR1 and slow release relay C.

(b) Removes ground from lead S to local selector banks.

(c) Completes idle circuit termination.

6.07 Relay TR1 released transfers trunk from incoming to outgoing mode of operation.

6.08 At this time the circuit is normal and ready for the next incoming or outgoing call.

Central Office Disconnects First

6.09 When central office disconnects, relay E releases.

6.10 Relay E released:

(a) Opens bridge across tip and ring resulting in the release of P, PA, and PA1.

(b) Releases relay SK.

(c) Operates relay C which has no function at this time.

6.11 Relay SK released releases relays OA and TR.

6.12 Relay PA1 released releases relays A and L. Relay A released sends a disconnect signal to the central office. Relay L released releases relay B which releases relay BY. Relay BY released releases relay INC.

6.13 Relay INC released:

(a) Releases relay TR1 and slow release relay C.

(b) Removes ground from lead S to local selector banks.

(c) Completes idle circuit termination.

6.14 Relay TR1 released transfers trunk from incoming to outgoing mode of operation.

6.15 At this time the circuit is normal and ready for the next incoming or outgoing call.

Attendant Disconnects First

6.16 When the attendant operates the release key and has not completed to a station, the attendant loop circuit returns reverse battery supervision to this circuit releasing relay P which releases relay PA starting a series of relay operations as described in Part 5, Section B. Called Party Disconnects First, except that opening the bridge across the tip and ring will release relay L in the attendant loop circuit. Relay L released releases relay L1 in the attendant loop circuit which removes ground from leads TR and S. This will release relays SK, OA and TR.

B. Attendant has Completed to a Station

Central Office Disconnects First

6.17 This circuit releases in the same manner as described in Part 5, Section A. Central Office Disconnects First, except that when relay TR releases, the loop is opened and the switchtrain releases.

Called Party Disconnects First

6.18 When the called party disconnects, the switchtrain releases but there is no affect on this circuit. The attendant remains connected to the central office.

Attendant Disconnects First

6.19 When the attendant operates the release key after having completed to a station, ground is removed from leads TR and S releasing relays OA, SK and TR. Since the contacts of relay TR are transfer contacts, relay P does not release and this circuit is in the same condition as a DID call to a station. The calling and called parties are connected for a possible transfer.

7. NIGHT OPERATION

A. Incoming Call to the Attendant

7.01 At night, ground is not returned on lead O from the incoming selector and the trunk treats directory number calls the same as DID calls.

B. Flash to Call Attendant

7.02 Lead OL from the night closing circuit is not grounded on night operation. Therefore, operation of relays PA and ST will not operate relay Z and the attendant cannot be signaled.

C. Busy Transfer

7.03 When a busy station is dialed, 60-ipm ground is connected to lead F to operate relay BT. During night operation, relay BT will operate when a busy station is dialed, but operation of relay BT will not operate relay Z since there is no ground on lead OL from the night closing circuit. Hence, the attendant will not be signaled.

D. Don't Answer Transfer

7.04 At night, relays DA and T will operate the same as during day operation. However, operation of relays DA and T will not operate relay Z since there is no ground on lead OL from the night closing circuit. There is also a contact of relay DA across the break contact of relay T to prevent operation of relay T from releasing the switchtrain on don't answer transfer.

8. OUTGOING CALL (SC11)

A. Seizure and Dialing

8.01 This circuit is idle to outgoing traffic from the PBX when there is no ground on the sleeve to the local selector banks or attendant selector banks. A station or the attendant may seize this trunk any time it is in the idle condition.

8.02 When the proper code is dialed for access to this trunk, a bridge is placed across the tip and ring by the calling station. This bridge operates relays A and L.

8.03 Relay A operated sends an immediate seizure signal to the central office to prevent an incoming call from reaching this trunk. Relay L operated operates relay B.

8.04 Relay B operated:

(a) Operates relay BY.

(b) Grounds lead S to the local selector banks to hold the outgoing switchtrain.

(c) Prepares a path to operate relay C on the dirst break of relay L.

(d) Removes the idle circuit termination consisting of resistor IL and capacitor IL.

(e) Connects ground to lead A to the automatic number identification circuit is provided.

(f) Grounds lead PC3 to register for registration of all calls.

(g) Removes ground from lead K to the traffic register circuit.

8.05 Relay BY operated:

(a) Connects another ground on lead S to the local selector banks. Since relay BY is the last relay to release, it holds the circuit busy to outgoing traffic until all relays have released.

(b) Removes ground from lead PC3 for registration of all calls.

(c) Prevents the operation of relay INC on disconnect.

(d) Connects ground to lead B to the automatic number identification circuit if provided.

(e) Starts answer supervision guard timing (option G).

8.06 When the central office is ready to receive dial pulses, it returns dial tone to the PBX station. The PBX station dials the desired number with relays A and L following dial pulses. Relay A transmits the dial pulses to the central office over lead M.

8.07 On the first break of relay L, relay C operates. Relay C operating connects capacitor C across the tip and lead A and capacitor C1 across the ring and lead B shunting the transmittion facilities to prevent dial pulse transients from interferring with the signaling equipment.

8.08 Relay C is slow releasing and holds over dial pulses releasing and reoperating between digits. Relay B is a slow release relay and holds over intradigital time. At the end of dialing, relays A and L remain operated and relay C releases.

B. Answer

8.09 When the central office establishes a connection to an outgoing trunk, it operates relay E which provides a lock path for relay BY. This off-hook serves as answer supervision since the LLP circuit is not equipped for end-to-end supervision.

8.10 If the call is routed through a dial repeating CENTREX tie trunk, the first off hook is changed to on hook when the next office is ready to receive the additional dial pulses. Subsequent reversals may be received by the PBX as the call progresses through other intermediate switching points.

F Option

8.11 Answer supervision from the central office has no effect in this circuit. Reversal of the wiring of the tip and ring to the attendant selector bank results in immediate answer supervision to the connecting circuit upon seizure of this circuit or, if a register sender is used, upon release of the sender.

G Option

8.12 Relay T operates 1.2 seconds after this trunk is seized outgoing and prepares an operate path for relay RV. Relay E in operating operates relay RV which returns reverse battery supervision toward the calling station and operates relay RVA. The operation of relay RV is placed under control of relay T to prevent its premature operation on simultaneous seizure of this trunk. Relay RVA operated provides a holding path for relay RV and releases relay T.

8.13 Relay RV provides answer supervision at distant PBX's under control of the central office.

C. Simultaneous Seizure

8.14 If a simultaneous seizure occurs, this circuit will give preference to outgoing calls. If relays A and L operate by a bridge from the PBX station at the same time as relay E operates from the central office, relay INC will not operate since its operate path is opened by relay L operated. Relay A operated sends a seizure signal to the central office which immediately releases from the outgoing mode and proceeds to receive the incoming call from the PBX. When the central office is ready to receive pulses, it sends dial tone to the PBX and the PBX dials as discussed previously.

9. DISCONNECT ON AN OUTGOING CALL (SC12)

A. Central Office Disconnects First

9.01 When the called party disconnects, the central office outgoing trunk circuit times out (13-32 sec.) causing the LLP circuit to function and send on-hook supervision to the PBX. On-hook supervision releases relay E which removes lock path for relay BY.

9.02 When the calling party disconnects, the bridge across the tip and ring is opened releasing relays A and L. Relay A released transfers lead M from resistance battery to ground as on-hook supervision to central office. Relay L released operates relay C which has no function at this time and releases the slow-release relay B.

9.03 Relay B released:

(a) Releases relay BY and slow-release

relay C.

(b) Replaces idle circuit termination.

(c) Removes ground from lead A to PBX ANI.

9.04 Relay BY released:

(a) Replaces ground on lead K to the traffic register circuit.

(b) Removes ground from lead S to the local selector banks and from lead B to PBX ANI.

(c) Releases relay RV which releases relay RVA (G option).

9.05 At this time, this circuit is idle and ready for the next incoming or outgoing call.

B. Calling Party Disconnects First

9.06 When the calling party disconnects, the bridge across the tip and ring is opened releasing relays A and L. Relay A released sends on-hook supervision to central office. Relay L released operates relay C and releases relay B.

9.07 Relay B released:

(a) Releases slow release relay C.

(b) Replaces idle circuit termination.

(c) Opens original operate path of relay BY.

(d) Removes ground from lead A to PBX ANI.

9.08 With receipt of the on-hook supervision from the PBX trunk, the central office line circuit functions and returns on-hook supervision to the PBX releasing relay E. Relay E released releases relay BY.

9.09 Relay BY released:

(a) Removes ground from lead S to the local selector banks.

(b) Replaces ground on lead K to the traffic register circuit.

(c) Removes ground from lead B to PBX ANI.

(d) Releases relay RV which releases relay RVA (G option).

9.10 At this time, this circuit is idle and ready for the next incoming or outgoing call.

10. AUTOMATIC NUMBER IDENTIFICATION - OPTION J

A. Seizure

10.01 The automatic number identification circuit determines the direction of a call through a trunk by detecting the sequence in which ground is applied to control leads A and B by the trunk. The seizure of the trunk by a station or attendant making a dial "9" call results in the operation of relay B. Relay B operated grounds lead A and operates relay BY. Relay BY operates in approximately 50 milliseconds grounding lead B.

10.02 This order of seizure (A before B) turns on a pnpn transistor in the trunk sensing circuit causing a capacitor to discharge which sets the trunk location core associated with the seized trunk and starts the identification cycle.

B. Identification

10.03 The automatic number identification equipment functions to open the sleeve via leads S1 and S2 and provides a metallic path from the outpulser to the sleeve via the trunk connector.

10.04 The outpulser sends a positive 150 to 200 volt, 30 microsecond pulse (Write, WRP1) over this path and the sleeve of the switchtrain to the station line circuit to set the proper station number or directory number cores. The outpulser provides a holding ground on the sleeve during periods that the trunk connector is operated.

11. TIMING

A. Disconnect Timing -Option Z

11.01 With relay PA1 operated and relay PA released, battery is applied to an RC timing circuit consisting of resistor T1 and a relay time delay circuit capacitor. In approximately 1.2 seconds, the capacitor is sufficiently charged to turn on a transistor in the relay time delay circuit and causes the operation of relay T which results in the release of the trunk circuit.

B. Disconnect Timing - Figure 2 and Option Y

11.02 Disconnect timing is the same as described above except that the RC timing circuit consists of resistor T3 and a relay time delay capacitor in parallel with capacitors T2 and T3.

C. Don't Answer Transfer Timing - Figure 2 and Option Y

11.03 With relay PA1 released and relay DA operated, battery is applied to the RC timing circuit. Relay DA operated transfers the timing resistor from resistor T3 to resistor T2 to provide the don't answer transfer timing interval.

11.04 In approximately 25 seconds, the relay time delay circuit functions as described above except that the operation of relay T with relay DA operated will route the call to the attendant.

11.05 Relay T operated opens lead M "C" to prevent audible ringing tone from being applied at the trunk and interferring with the audible ringing tone supplied by the connector when relay Z operates.

D. Answer Supervision Guard Timing - Figure 3 and Option G

11.06 With relay BY operated and relays RVA and TR1 released, battery is applied to a RC timing circuit to operate relay T as described in Part 10, Section A. Disconnect Timing, except the operation of relay T does not result in the release of the trunk circuit.

11.07 With relay T operated, relay RV operates when off-hook supervision is received from central office. Relay RV operated operates relay RVA which releases relay T. This sequence of operations prevents premature operation of relay RV in the event of a simultaneous seizure.

12. TRANSMISSION PAD CONTROL (App. Fig. 7)

A. Incoming Call

12.01 When a direct inward dialed or attendant assisted call requires the removal of the transmission pad, a normal post spring of the incoming selector will operate. The operated normal post spring applies resistance ground to lead PO, operation relay PO which removes the transmission pad.

B. Outgoing Call

12.02 An additional selector bank multiple is provided for accessing this circuit on outgoing calls requiring removal of the transmission pad. Seizure of the trunk via this access causes relay PC to operate in series with relays A and L. Relay PC operated operates relay PO.

12.03 Relay PO operated removes the transmission pad and locks operated upon the operation of relay B.

12.04 Relay L operated operates relay B which operates relay BY. Relay BY operated removes relay PC from the tip side of the line.

13. REGISTERS

13.01 This circuit provides for the connection of five registers. Lead PC is connected to a register which will register all DID calls. lead PC1 is connected to a register which will register all calls to the attendant, lead PC2 is connected to a register which will register all directory number calls, lead PC3 is connected to a register which will register all outgoing calls, and lead K is connected to a traffic register which provides an all trunks busy indication.

14. TESTING

A. Outgoing Test

14.01 When this circuit is idle, the PBX craftsman must first turn the TEST and BUSY key to the OG position to busy the trunk to the local selector banks. Connection of a phone to the TST jack now allows outgoing test calls.

B. Incoming Test

14.02 For incoming test this circuit must be made busy at the central office first. Turning the TEST and BUSY key to the INC position and connecting a phone to the TST jack operates relay TST which transfers the trunk to the incoming test mode and makes this circuit busy at the selector banks which allows incoming test calls.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Voltage Limits 44-52 vdc.

1.02 Station pulsing and supervision maximum conductor loop resistance, 1,500 ohms. Minimum insulation resistance, 15,000 ohms.

2. FUNCTIONAL DESIGNATIONS

2.01

Relay	Meaning	Primary Functions
A	Pulse Transmit	Transmits dial pulses and supervision to the central office.
B	Traditional	Slow release relay which holds over interdigital times.
BY	Busy Relay	To provide a ground on lead S to the local selector banks to make this circuit busy.
BT	Busy Transfer	Transfers a DID call to a busy station to the attendant.
C	Traditional	Holds over dial pulses to prevent transients from interferring the signaling equipment.
DA	Don't Answer	Transfers a DID call to the attendant if it is not answered in approx. 25 seconds.

Relay	Meaning	Primary Functions
DA1	Don't Answer Auxiliary	Prevents the start of don't answer transfer until the first digit is pulsed.
E	Traditional	To receive seizure and disconnect signals and follow dial pulses from the central office.
GT	Gate	Grounds lead G to the call distrubution circuit to start trunk and position finders.
INC	Incoming	Prepares trunk for incoming mode of operation.
L	Pulse	Follows dial pulses.
OA	Operate	Operates when attendant answers call. Transfers functional and control leads to the attendant loop circuit.
P	Polar	To operate whenever answer supervision is connected to the T and R leads from the connector or attendant loop circuit.
PA	Polar Auxiliary	A slave of relay P.
PA1	Polar Auxiliary 1	A slave of relay PA.
SK	Sleeve Closure	Operates when both trunk finder and position finder have found their respective circuits and there is continuity on the sleeve.
RV	Reverse	To provide answer supervision for outgoing calls.
ST	Start Transfer	To start transfer to the attendant if station dial transfer is not provided.
SW	Switchboard	Operates on directory number or calls to be routed to the attendant.
T	Timing	To provide timing for switchhook flash and don't answer transfer.
TR	Transfer	Transfers leads T and R, T1 and R1 to the attendant loop circuit.
TR1	Transfer	Transfers trunk from outgoing to incoming mode of operation
TST	Test	Converts circuit from outgoing to incoming test mode.
Z	Start Signal	Operates every time attendant is signaled to send start signal to the call distribution circuit.

3. FUNCTIONS

3.01 To receive supervisory and dial pulse signals from the central office over the E lead and transfer them to the incoming selector.

3.02 To transmit supervisory signals to the central office on the M lead.

3.03 To provide immediate off-hook supervision to the central office when the station or attendant answers.

3.04 To delay called station disconnect for 1.2 seconds and then release the switchtrain.

3.05 To return to normal immediately when the central office disconnects.

3.06 To release the attendant if the attendant is in the connection and the central office disconnects.

3.07 On receipt of a flash (on hook less than 1.2 seconds) from the called station to send a start signal to the call distribution circuit and to provide ringing tone as an audible signal indicating that the attendant is being called.

3.08 To provide a calls-waiting signal.

3.09 To retire audible ringing tone and calls-waiting signal when the attendant answers.

3.10 To permit the attendant to connect to both the calling and called party at the same time.

3.11 To transfer a DID call to the attendant if the called station is busy.

3.12 To transfer a DID call to the attendant if the called station does not answer after approximately 25 seconds.

3.13 To provide the necessary signals to the station dial transfer circuit.

3.14 To provide for peg count registration of all direct inward dialed calls.

3.15 To provide for peg count registration of directory numbered calls.

3.16 To provide for peg count registration of all calls to the attendant.

3.17 To provide a test and make busy jack for testing purposes and to remove the incoming trunk from service.

3.18 To provide idle line termination.

3.19 To provide means of changing the indication to the attendant from 60-ipm flashing to 120-ipm flashing if desired with busy line transfer or don't answer transfer.

3.20 To provide outgoing mode precedance in case of simultaneous seizure.

3.21 To provide for registration of outgoing calls.

3.22 To provide for all trunks busy registration.

3.23 To provide for the PBX automatic number identification.

3.24 To provide a test jack for the outgoing mode of operation.

3.25 To provide answer supervision for outgoing calls.

3.26 To provide for two or four wire termination.

3.27 To provide for a transmission pad and pad control.

3.28 To provide a five second timing interval on a directory number call when the central office is not equipped with single digit operation.

4. CONNECTING CIRCUITS

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

(a) Incoming Selector - SD-65950-01.*

(b) Trunk and Position Finder - SD-65954-01.

(c) Trunk Finder - SD-65955-01.

(d) Call Distribution Circuit - SD-65811-01.

(e) Call Distribution Circuit - SD-65829-01.

(f) Night Closing Circuit - SD-65898-01.

(g) Calls-Waiting Signal Circuit - SD-65845-01.

(h) Auxiliary Signal Fuse Alarm, Battery Cut Off and Miscellaneous Circuit, 608A or 608B PBX - SD-66722-01.

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

(j) Dial Transfer Circuit - SD-65896-01.

(k) Ringing Circuit - SD-65771-01.

(l) Transmission Facilities - See Common Systems - SD-99421-01.

(m) Traffic Register Circuit - SD-65774-01.*

(n) Relay Time Delay Circuit - SD-99361-01.

(o) Automatic Number Identification Circuit - SD-1E007-01.

(p) Attendant Loop Circuit, 608B or 608D PBX - SD-65830-01.

(q) Rotary Out Trunk Switch Circuit - SD-30868-01.

(r) Rotary Out trunk Switch Circuit - SD-30891-01.

*Typical

5. MANUFACTURING TEST REQUIREMENTS

5.01 This circuit shall be capable of perfo ming all of the functions given in this description; the relays with which it is equipped shall meet the requirements given in the Circuit Requirements Table.

6. TAKING EQUIPMENT OUT OF SERVICE

6.01 This trunk may be taken out of service by turning the TEST and BUSY key to the OG position to make this trunk busy at the local selector banks preventing outgoing calls.

6.02 To prevent incoming calls, this trunk must be made busy at the central office.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus

B.1

SUPERSEDED	SUPERSEDED BY
DA Relay ½ AK30, Fig.2	DA Relay ½ A 30, Fig.8
BT Relay ½ AK30, Fig.2	BT Relay AF 100, Fig.9

SUPERSEDED	SUPERSEDED BY
SW Relay ½ AK 4, Fig.1 Option ZD	SW Relay AJ75, Fig.1 Option ZE
A Lamp 14A, Fig. 1 Option ZT	A Lamp 14B, Fig. 1 Option ZU
OG TST Jack 241C, Fig. 1 Option ZF	TST Jack 241C, Fig. 1 Option ZG

B.2 ADDED

DA1 Relay
½ AK30, Fig. 8

TEST and BUSY Key
552E, Fig. 1, Option ZG

TST Relay
½ AK4, Fig. 1, Option ZG

D. Description of Changes

D.1 Option ZD is designated and rated Mfr. Disc. and option ZE is added and rated Std. to change the code of relay SW from ½ AK4 to AJ75 to provide additional contacts.

D.2 Option ZF is designated and rated Mfr. Disc. and option ZG is added and rated Std. to provide necessary wiring and apparatus to change the operational test procedures of this circuit to conform with No. 5 Crossbar Central Office procedures.

D.3 Option ZH is designated and rated Mfr. Disc. and option ZI is added and rated Std. to prevent the start of don't answer transfer timing until this circuit receives pulses. This prevents transfer to the attendant if this circuit receives a steady seizure from the central office for test purposes.

D.4 Options ZJ and ZK are added as feature standards. Option ZJ is functional with only don't answer transfer provided. Option ZK functions to release relay DA1 upon the operation of relay BT when both don't answer transfer and busy-line transfer are provided.

D.5 Option ZL is designated and rated Mfr. Disc. and option ZM is added and rated Std. to insure the release of relay Z before the operation of relay DA1. This insures that the attendant will not receive audible and visual indications if the station answers first on a don't answer transfer.

D.6 Option ZN is designated and options ZO and ZP are added as feature standards based upon the attendant facility at the PBX. Option ZN is necessary for use with a 608B or 608D PBX or with telephone consoles with the Attendant Loop Circuit of issue 11B or prior. Options ZO and ZP are necessary for use with telephone consoles with the Attendant Loop Circuit of issue 12B or later. These options change the disconnect supervision such that if the calling party disconnects first with the attendant on the line or on hold, the loop circuit is released first which in turn releases the trunk finder or trunk and position finder and this circuit.

D.7 Option ZT is designated and rated Mfr. Disc. and option ZU is added and rated Std. to change code of Lamp A from 14A to 14B. This is to limit the current to the PBX station loop to protect the handset transmitter.

D.8 App. Fig. 2 is rated Mfr. Disc. and App. Fig. 8 and 9 are added and rated standard to change code of relays DA and ET and add relay DA1. This also aids ordering of busy-line transfer and don't answer transfer features in that providing one feature without the other does not incur the cost of an additional unused relay.

D.9 Contact 7 of relay TR1 is changed to read contact 6 on FS1 on a no record basis to bring this drawing into agreement with manufacturing information.

D.10 Option K is rated Mfr. Disc. and option M is rated Std. to discontinue the use of lead GT to Call Distribution Circuit SD-65811-01.

D.11 Option ZR is designated and rated Mfr. Disc and option ZS is added and rated Standard to change contact 1 of relay SK to contact 2 to facilitate the changes described in D.6

D.12 CAD 1 is updated to include options added on this drawing issue.