

32

PBX SYSTEMS
NO. 701, 711, OR 740
PBX ACCESS LINE CKT, DIAL REPEATING, E & M
LEAD SIGNALING ARRANGED FOR PRE-EMPTION

CHANGES

C. Changes in Circuit Requirements Other Than Those Caused by Changes in Apparatus

C.1 Timing requirements for the T1, T2, and T3 timers are added to the F2 sheet.

D. Description of Changes

D.1 On sheet B1, in dialing path contact 3B of relay PT is added in series with contact 11 of relay E.

D.2 On sheet B2, in holding path of relay PT, contact 3 of relay PT is changed to contact 8 of relay PT.

D.3 On sheet B2, in timer T1 timing circuit wire from contact 2M of relay PE is removed from terminal 7 of connector T1 and connected to terminal 10 of connector T1.

D.4 On sheet B2, in timer T1 timing circuit contact 3B of relay PR is removed and replaced with contact 11B of relay P4.

D.5 On sheet B4, in relay WK operate path contact 11 of relay P4 is replaced

with contact 12M of relay P4.

D.6 On sheet B4, in operate path of sequence count relay P1 contact 12M of relay P4 is replaced with contact 10M of relay P4 and the positions of the contacts of contact 10M of relay P4 and contact 3B of relay P3 are interchanged.

D.7 On sheet B5, in the ringing machine and interrupter circuit contact 7M of relay B2 is replaced with the parallel combination of contact 8M of relay AR, contact 8M of relay AT, and contact 6M of relay OP. The ringing machine and interrupter circuit control is separated into two leads.

D.8 On sheet G1, the control lead to the interrupter circuit is brought out on previously vacant terminal No. 41 of terminal strip B.

D.9 On sheet G1, the lead from contact 3B of relay PR to terminal 7 of terminal strip C is removed. The S option straps between terminals 6 and 7 of terminal strip (C) and also between terminal 8 of terminal strip (C) and terminal 28 of terminal strip (B) are removed.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

(WECO 7120HW-WPF/PDS-JGW)
DEPT 5337-RAV

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SECTION I - GENERAL DESCRIPTION1. PURPOSE OF CIRCUIT

1.01 This circuit provides two-way service between a dial or large manual PBX and a distant switch center. The access line is dial repeating with E and M lead signaling and is arranged for pre-emption by the PBX attendant or the switch center.

1.02 The circuit is arranged to be used with a 24 V4 repeater. A 2-db pad is switched out automatically for tandem or through connections and may be switched out manually by the switchboard attendant.

2. GENERAL METHOD OF OPERATIONA. Incoming Routine Call

2.01 A routine call will be completed using regular Network-In-Dialing (NID) to the station. When the access line is seized at the switch center, the routine and precedence busy lamps will light at the switchboard. Dial pulses will step the incoming selector and other switches, including the connector, to the correct terminals. Pad control status may be indicated to the access line by the selector level. Various standard PBX call progress tones, busy tone, audible ringing, etc. will be returned from the switch train. When the station answers, an off-hook signal will be sent to the switch center and the precedence busy lamp will be extinguished.

2.02 A routine call for the PBX listed number will be indicated to the attendant by means of a steady routine line lamp. The incoming selector will absorb digits preceding the attendant code (0). The access line will absorb the digits succeeding the attendant code. The calling party will receive routine audible ringing until the attendant answers.

B. Incoming Precedence Call

2.03 With the switch center and access line not arranged for Precedence Network-In-Dialing (Non-PNID), all incoming precedence calls will be routed to the attendant. The seizure sequence causes the precedence line lamp to light steadily to alert the attendant.

2.04 With the switch center and access line arranged for PNID, a precedence level digit will precede the station line number on all calls. This digit will mark the access line busy state at the attendant switchboard after the station answers. In this case since a precedence digit has been

pulsed, the precedence busy lamp will be lit for the duration of the call, the transmission path will be split in the access line and precedence audible ringing will be supplied to the calling party from the access line until the station answers.

2.05 With PNID, if the called PBX station is busy or does not answer within 12 seconds, the call will be transferred to the switchboard attendant. The precedence line lamp will flash at 60 ipm to alert the attendant.

C. Transfer to Attendant

2.06 If the access line has been wired for the attendant transfer option, a routine or precedence call completed to a station by NID means may be transferred to the attendant by flashing the switchhook at the station set. The routine or precedence line lamp will flash at 120 ipm to alert the attendant. Audible ringing is provided to the distant end until the attendant answers.

D. Outgoing Calls

2.07 Only routine calls may be Network-Out-Dialed (NOD) from PBX stations. An attendant with only a rotary dial may originate a routine call by plugging into a talk jack with a dark busy lamp using either cord end of one cord circuit and then inserting the trunk or calling cord end of another cord circuit into the dial jack for dialing. This latter cord plug is withdrawn after dialing is completed.

2.08 Precedence calls must be placed via a switchboard attendant having a 16 button TOUCH-TONE set. The attendant answers the calling party with the station or answer cord of a cord circuit and extends the call by placing the plug of the trunk or calling cord into the precedence jack. The attendant will TOUCH-TONE the precedence, route and address digits as required.

2.09 If a call received from the public message network is to be completed over AUTOVON, the attendant will have answered the central office trunk with a station or answer cord. The attendant will then seize the access line by inserting the plug of the trunk or calling cord into the precedence or routine jack as appropriate. Routine and precedence calls may be completed by TOUCH-TONE over the connections established. For routine call completion using a rotary dial it will be necessary for the attendant to use the trunk or calling cord of another cord circuit inserted in the precedence jack to dial pulse the AUTOVON address.

E. Pre-emption by Switch Center

2.10 The access line may be pre-empted at any time by the switch center for a call having higher precedence. To initiate pre-emption the switch center will send a pre-empt wink signal to the access line followed by the audible pre-emption notification tone. The precedence busy lamp will light, if not already lighted, and the access line will time for 3 seconds. In all cases except that of an attendant-placed precedence call, calls are automatically dropped after 3 seconds and an on-hook signal is sent to the switch center. If the access line pre-empted is serving an attendant-placed precedence call the attendant must remove the cord plug from the precedence jack before the on-hook signal is sent to the switch center. The on-hook signal from

the PBX to the switch center must be received before the new call can proceed.

F. Pre-emption by PBX Attendant

2.11 If all access lines are busy, a PBX attendant having pre-emption capability may pre-empt a routine call to place a precedence call. The attendant will insert the trunk or calling cord into a precedence jack associated with a dark precedence busy lamp. The access line will send pre-empt tone to the pre-empted PBX station and the switch center for 3 seconds. If the parties have not disconnected by then, the connection will be opened in the access line and an on-hook signal sent to the switch center. After the switch center disconnects toward the PBX, an off-hook signal is given to the switch center for the new call and the attendant hears dial tone. The new call will be completed in the usual manner.

SECTION II - DETAILED DESCRIPTION

1. INCOMING CALL

A. Seizure

- 1.01 The access line is seized at the distant end by grounding lead E. Lead E grounded operates relay E.
- 1.02 Relay E operated:
- (a) Lights the busy lamps.
 - (b) Operates relay EA.
 - (c) Completes part of the dialing loop to the incoming switchtrain.
 - (d) Opens the operate path of relay PTL.
 - (e) Opens the operate path of relay E. The relay E break contact, resistors RE1 and RE2, and capacitor CE prevent distortion of lead E pulses.
 - (f) Opens the operate path of the sequence count relays P1, P2, P3, and P4.
 - (g) Opens the operate path of relay C.
 - (h) Prepares a locking path for itself.
- 1.03 Relay EA operated:
- (a) Locks operated under control of relay PT.
 - (b) Operates relay B1.
 - (c) Prepares the operate path for relay WK.
- 1.04 Relay B1 operated:
- (a) Closes the dialing loop to the incoming switchtrain.
 - (b) Grounds lead S to the local selector bank to mark access line busy to outgoing dial-selected calls.
 - (c) With V option operates relay OP to start timed operation of relay AT.
 - (d) Prepares the operate path for relay C.
 - (e) Operates relay WK.
- 1.05 Relay WK operated:
- (a) Operates relay P4 to prepare for the sequence count.
 - (b) Operates relay B2.
- 1.06 Relay B2 operated:
- (a) Locks operated via its own contact and the operated relay B1.

- (b) Removes the idle line termination (Resistor IL).
- (c) Connects the contact protection network D1 across the pulsing contact of relay E.
- (d) Grounds lead S to access line and jack circuit for restoring air ground and data trunks.
- (e) Releases relay WK. The operation and release of relay WK connects battery on lead M momentarily to signal the switch center that the access line is ready to receive the incoming digits. (Option S is not provided.)
- (f) Provides holding paths for relays PT and PO when operated.

B. Manual PBX (Routine Call - V Option)

- 1.07 Relay P4 operated:
- (a) Locks operated via relay B1.
 - (b) Operates relay DB (digit begin).
- 1.08 Relay DB operated:
- (a) Locks operated via its own contact and the operated relay B1.
 - (b) Operates relay DE (digit end).
 - (c) Grounds lead IN to the traffic usage registers indicating an incoming call.
- 1.09 Relay AT operates in about 3 seconds to extinguish the busy lamps and light the routine line lamp.

C. Manual PBX (Precedence Call - S Option)

- 1.10 On an incoming precedence call, the access line is seized by a repeated 1650 ms off-hook and a 345 ms on-hook signal on lead E. The off-hook portion of the priority alert signal seizes the access line in the normal manner.
- 1.11 Circuit action proceeds same as for a routine call until relay E releases due to the on-hook portion of the priority alert signal.
- 1.12 Relay E released:
- (a) Operates relay C.
 - (b) Opens the loop to the incoming selector releasing the switchtrain. The release of relay E steps the selector one level but the selector loop is opened longer than for a dial pulse forcing release.
 - (c) Starts timed operation of relay PTL. Relay PTL does not operate on pulse breaks of the incoming digits.

1.13 Relay PTL operates in about 250 ms after the release of relay E. Relay PTL operated operates relay PT.

1.14 Relay PT operated:

- (a) Starts the slow release of relay EA.
- (b) Starts the slow release of relay B1.
- (c) Prepares a path for operating relay PR.
- (d) Releases relay PTL.
- (e) Provides a locking path for relay E.

1.15 Relay PTL released starts another timed operation when relay EA releases. Its reoperation is prevented by the reoperation of relay E on the next off-hook portion of the repeated priority alert signal. Relay E reoperated operates relay EA.

1.16 Relay B1 released:

- (a) Releases relay DB.
- (b) Releases relay P4.
- (c) Releases relay OP.
- (d) Releases relay B2.

1.17 Relay DB released releases relay DE.

1.18 With relay B2 released and relays PT and EA operated, relay PR operates.

1.19 Relay PR operated:

- (a) Releases relay PT.
- (b) Prepares an operating path for relay AR.
- (c) Applies ground on lead PY to the access line and jack circuit for restoring air ground and data trunks to indicate a precedence busy condition.

1.20 With relay PT released and relay EA operated, relay B1 operates.

1.21 Relay B1 operated:

- (a) Operates relay WK (no function).
- (b) Operates relay AR.

1.22 Relay AR operated:

- (a) Provides a holding ground for relay PR.

- (b) Opens the path to the precedence busy lamp extinguishing it and closes a path to light the precedence line lamp to alert the attendant.

- (c) Grounds leads to start the ringing machine and the interrupter.

- (d) Provides precedence audible ringing to the switch center.

- (e) Switches in resistor RT6 to increase the operate time of relay PTL to approximately 550 ms to prevent its operation on the next on-hook part of the priority alert signal.

D. Dial PBX Not Arranged for FNID
(Routine Call)

1.23 Relay P4 operated:

- (a) Locks operated via relay B1.
- (b) Prepares a path to operate relay DB.

1.24 As dialing begins, an on-hook signal from the switch center will release relay E. Relay E released:

- (a) Steps the incoming selector.
- (b) Operates relay C.
- (c) Starts the timed operation of relay PTL. Relay PTL does not operate due to the pulse breaks of the incoming digits.

1.25 Relay C, being slow release, remains operated over the pulsing breaks of each digit. Relay C operated:

- (a) Operates relay DB.
- (b) Removes relay D and inductor A from the pulsing path.
- (c) Removes capacitor A and resistor AA from the hybrid coil of the terminating set used.
- (d) Inserts capacitors C and C1 across the hybrid coils to prevent pulse transient interference.
- (e) Stops the timed operation of relay AT. The timed operation of relay AT which will be completed does not start until the release of relay C after the last digit.

1.26 Relay DB operated:

- (a) Operates relay DE at end of the first digit (Relay C released).
- (b) Locks operated via relay B1.
- (c) Grounds lead IN to traffic usage register.

1.27 The digits are repeated from lead E by relay E to step the selectors or connectors through the released relay AR contact.

1.28 Routine ringing audible or busy tone is returned to the switch center directly from the switchtrain.

E. Dial PBX Not Arranged for PNID (Precedence Call)

1.29 On an incoming precedence call, the access line is seized by a repeated 1650 ms off-hook and a 345 ms on-hook signal on lead E. The off-hook portion of the priority alert signal seizes the access line in the normal manner.

1.30 The on-hook portion of the priority alert signal releases relay E as a normal on-hook pulse signal.

1.31 Relay E released:

- (a) Operates relay C.
- (b) Opens the loop to the selector releasing the switchtrain. The release of relay E steps the selector one level, but the selector loop is opened longer than for a dial pulse forcing release.
- (c) Starts the timed operation of relay PTL. Relay PTL does not operate on pulse breaks of the incoming digits.

1.32 Relay PTL operates in about 250 ms after the release of relay E. Relay PTL operated operates relay PT.

1.33 Relay PT operated:

- (a) Starts the slow release of relay EA.
- (b) Starts the slow release of relay Bl.
- (c) Prepares a path for operating relay PR.
- (d) Releases relay PTL.
- (e) Provides a locking path for relay E.

1.34 Relay PTL released starts another timed operation when the slow release relay EA releases. Its reoperation is prevented by the reoperation of relay E on the next off-hook portion of the priority alert signal. Relay E reoperated operates relay EA.

1.35 Relay Bl released:

- (a) Releases relay DB.
- (b) Releases relay P4.
- (c) Releases relay B2.

1.36 Relay DB released releases relay DE.

1.37 With relay B2 released and relays PT and EA operated, relay PR operates.

1.38 Relay PR operated:

- (a) Releases relay PT.
- (b) Prepares an operating path for relay AR.
- (c) Applies ground on lead PY to the access line and jack circuit for restoring air ground and data trunks to indicate a precedence busy condition.

1.39 With relay PT released and relay EA operated, relay Bl operates.

1.40 Relay Bl operated:

- (a) Operates relay WK (no function).
- (b) Operates relay AR.

1.41 Relay AR operated:

- (a) Provides a holding ground for relay PR.
- (b) Opens the path to the precedence busy lamp extinguishing it and closes a path to light the precedence line lamp to alert the attendant.
- (c) Grounds leads to start the ringing machine and the interrupter.
- (d) Provides precedence audible ringing to the switch center.
- (e) Switches in resistor RT6 to increase the operate time of relay PTL to approximately 550 ms to prevent its reoperation on the next on-hook part of the priority alert signal from the switch center.

F. Dial PBX Arranged for PNID (Routine or Precedence Call)

1.42 Relay P4 operated:

- (a) Locks operated via relay Bl.
- (b) Prepares a path to operate relay DB.

1.43 As dialing begins, an on-hook signal from the switch center will release relay E. Relay E released:

- (a) Steps the incoming selector.
- (b) Operates relay C.
- (b) Starts the timed operation of relay PTL. Relay PTL does not operate due to the pulse breaks of the incoming digits.

1.44 Relay C being slow release remains operated over the pulsing breaks of each digit. Relay C operated:

- (a) Operates relay DB.
- (b) Removes relay D and inductor A from the pulsing path.

(c) Removes capacitor A and resistor AA and inserts capacitor C and C1 to improve pulsing.

1.45 Relay P1 operates on the first release of relay E. Relay P4 releases when relay E reoperates. The sequence count of relays P1, P2, P3 and P4 indicates the precedence of the incoming call. The sequence recycles as pulses of the precedence digit are received.

1.46 Relay C releases at the end of the precedence digit. Relay C released:

- (a) Operates relay DE (digit end).
- (b) Restores the pulsing path to normal.

1.47 Relay DE (digit end) operated:

- (a) Locks operated via its own contact and the operated relay DB.
- (b) Closes the dialing loop to the incoming switchtrain. The incoming selector is seized to operate when the E relay pulses on the next digit.
- (c) Removes the operating ground for the sequence count relays. The sequence count relays remain in the same state until disconnect.

1.48 If the sequence count relay P4 is operated after the precedence digit, the call is routine class. Relay E pulses the switchtrain in the normal manner.

1.49 If the sequence count relay P1, P2 or P3 is operated after the precedence digit, the call is precedence class. Relay PR operates via contacts of relays DE and P1, P2 or P3.

1.50 Relay PR operated:

- (a) Operates relay AR.
- (b) Applies ground on lead PY to the access line and jack circuit for restoring air ground and data trunks to indicate a precedence busy condition.

1.51 Relay AR operated:

- (a) Provides a holding path for relay PR.
- (b) Grounds leads to start the ringing machine and interrupter.
- (c) Provides precedence audible ringing to the calling party at the distant end.
- (d) Transfers the pulsing path to the incoming selectors from the terminating set to a path through relay AR contacts.

1.52 The digits following the precedence digit pulse relay E and the switchtrain in the normal manner.

G. Calls Routed to Attendant (Precedence Call to a Busy Station or Precedence Call Unanswered by Station)

1.53 The first release of relay E at the beginning of each digit operates relay C. Relay C releases when relay E remains operated between digits. The operation of relay C prevents the timed operation of relay AT. If relay C is released and the called station is busy or does not answer, relay AT operates in about 12 seconds.

1.54 Relay AT operated:

- (a) Opens the path to the precedence busy lamp extinguishing it.
- (b) Closes a path to flash the precedence line lamp at 60 ipm to alert the attendant.

H. Listed Number Call

1.55 The access line routes listed number calls to the attendant. The incoming selector is seized and operated to apply direct ground on lead O to the access line when the call is to be completed to the attendant.

1.56 Direct ground on lead O operates relays DVT and TFC. Relay TFC operated operates relay PO and relay DVT operated operates relay OP.

1.57 Relay PO operated:

- (a) Locks operated via its own contact and the operated relay B2.
- (b) Switches out the 2db transmission pad by removing resistor A and capacitor A from across the tip and ring and shunting resistor AA.

1.58 Relay OP operated:

- (a) Locks operated via its own contact and relay B1 operated.
- (b) Opens the loop to the incoming selector.
- (c) Prepares the lamp circuit to alert the attendant.
- (d) Prepares the timed operation of relay AT for a 3-second interval.
- (e) Grounds leads to start the ringing machine and the interrupter.
- (f) Provides routine audible ringing to the switch center.

1.59 The incoming selector releases when the loop is opened by relay OP. Lead O ground is removed when the selector releases releasing relays DVT and TFC.

1.60 Relay AT operates three seconds after the last digit is received (release of relay C). The operation of relay AT is delayed to prevent the attendant from answering a listed number call before the switch center has completed pulsing the entire number. The access line absorbs all digits after relay OP has operated.

1.61 Relay AT operated opens the paths to the busy lamps and closes a path to light the proper line lamp steadily to alert the attendant.

I. Answer by Station or Tie Trunk

1.62 A station or tie trunk upon answer reverses battery and ground on leads T and R. Relay D operates over the station or trunk loop indicating answer.

1.63 Relay D operated operates relay Fl. Relay Fl operated operates relay Dl.

1.64 Relay Dl operated:

- (a) Connects battery to lead M to indicate answer to the switch center.
- (b) Starts the 1.1 second timed operation of relay CC (call complete).
- (c) Opens the operate path of relay AT.
- (d) Provides a holding path for relay Bl. Relay Bl is held operated by both the originating and terminating ends.
- (e) Prepares a parallel path in the pulsing loop across the relay E contact. The path is used to prevent immediate disconnect on calls pre-empted.
- (f) Releases relay AR if operated to disconnect precedence audible ringing.
- (g) Extinguishes the precedence busy lamp if the call was routine class.

1.65 Relay CC operated:

- (a) Locks operated via relay EA. Relay CC remains operated until disconnect.
- (b) Completes the parallel path in the pulsing loop across the relay E contact.
- (c) Opens the operate path of relays AR and OP to prevent false lamp indications on disconnect.

J. Answer by Attendant (Routine Call)

1.66 The attendant inserts either cord plug into the routine jack having a lighted or flashing line lamp. For option W, X, Y or Z direct ground is provided on the jack sleeve or for option K low

resistance battery is provided. These conditions present a station appearance to the cord circuit indicating it is to supply talking battery for the connection.

1.67 Relay S operates from -48 volt battery on the ring lead from the cord circuit and either ground on lead SL for option W, X, Y or Z or +6 volt resistance battery on lead S from the cord circuit for option K. Relay S operated:

- (a) Locks operated via its own contact and lead S or SL.
- (b) Connects resistor R across leads T and R for option K, X or Y to trip ringing if present.
- (c) Closes the operate path for relay J. For option K, X or Y, the operation of relay J is delayed by thermistor J to allow sufficient time to trip ringing if present.

1.68 Relay J operated:

- (a) Operates relay Jl.
- (b) Completes part of the loop between the access line and the cord circuit.
- (c) Prepares an operate path for relay JPl upon answer.
- (d) Shunts out thermistor J for option K, X or Y.
- (e) Removes resistor R from across leads T and R for option K, X or Y.

1.69 Relay Jl operated:

- (a) Operates relay Dl.
- (b) Completes the talking path to the attendant cord circuit.
- (c) Releases relay OP.
- (d) Reopens the loop to the incoming selector which closed when relay OP released.

1.70 Relay Dl operated:

- (a) Connects battery to lead M to indicate answer to the switch center.
- (b) Starts the 1.1 second timed operation of relay CC (call complete).
- (c) Releases relay AT.
- (d) Provides a holding path for relay Bl.
- (e) Prepares a parallel path around relay E pulsing contact. The path is used to prevent immediate disconnect on calls pre-empted.

1.71 Relay CC operated opens the operate path for relays OP and AR to prevent false lamp signals on disconnect and operates relay JPl.

K. Answer by Attendant (Precedence Call)

1.72 The attendant inserts either cord plug into the precedence jack having a lighted or flashing line lamp. For option W, X, Y or Z direct ground is provided on the jack sleeve or for option K low resistance battery is provided. These conditions present a station appearance to the cord circuit indicating it is to supply talking battery for the connection.

1.73 Relay SP operates from -48 volt battery on the ring lead from the cord circuit and either ground on lead SL through resistor SCl for option W, X, Y or Z or +6 volt resistance battery on lead S through resistor SCl for option K. Relay SP operated:

- (a) Locks operated via its own contact and lead S or SL.
- (b) Connects resistor P across leads T and R for option K, X or Y to trip ringing if present.
- (c) Closes the operate path for relay JP. For option K, X or Y, the operation of relay JP is delayed by thermistor JP to allow sufficient time to trip ringing if present.

1.74 Relay JP operated:

- (a) Operates relay JPl.
- (b) Completes part of the loop between the access line and the cord circuit.
- (c) Opens the operate path for relay J1.
- (d) Opens the path to the precedence line lamp extinguishing it when option R is provided and closes the path to light the precedence busy lamp.
- (e) Shunts out thermistor JP for option K, X or Y.
- (f) Removes resistor P from across leads T and R for option K, X or Y.

1.75 Relay JPl operated:

- (a) Operates relay D1.
- (b) Completes the talking path to the attendant cord circuit.
- (c) Releases relay OP if operated.
- (d) Opens the loop to the incoming selector.
- (e) Locks operated via its own contact and the operated JP relay.

1.76 Relay D1 operated:

- (a) Connects battery to lead M to indicate answer to the switch center.
- (b) Releases relay AR.
- (c) Releases relay AT if operated.
- (d) Provides a holding path for relay B1.
- (e) Prepares a parallel path around relay E pulsing contact. This path is used to prevent immediate disconnect on calls pre-empted.
- (f) Starts the 1.1 second timed operation of relay CC (call complete).

1.77 Relay AR released:

- (a) Removes ground from start leads to ringing machine and interrupter.
- (b) Discontinues precedence audible ringing to switch center.
- (c) Completes talking path between switch center and cord circuit.
- (d) Opens the path to the precedence line lamp extinguishing it when option S is provided.

1.78 Relay CC operated opens the operate path for relays OP and AR to prevent false lamp signals on disconnect.

2. DISCONNECT ON INCOMING CALLS

A. Disconnect - Called Party First

2.01 Relay D releases when station or tie trunk goes on hook. Relay D released operates relay F2.

2.02 Relay F2 operated:

- (a) Locks operated under control of relays F1 and OP.
- (b) Sets the timed operation of relay AT at about 1.2 seconds.
- (c) Starts the timed operation of relay AT.

2.03 Relay AT operates in about 1.2 seconds. Relay AT operated:

- (a) Releases relay F1.
- (b) Releases relay CC.

2.04 Relay F1 released:

- (a) Releases relay F2.
- (b) Releases relay D1.

- (c) Releases relay AT.
 - 2.05 Relay D1 released:
 - (a) Switches lead M from battery to ground to indicate disconnect to the switch center.
 - (b) Closes path for operation of the proper busy lamp.
 - (c) Opens the parallel path across the relay E pulsing contact.
 - (d) Opens a holding ground path for relay B1.
 - (e) Operates relay AR (no function).
 - 2.06 When the switch center disconnects, relay E releases. Relay E released:
 - (a) Opens the loop to the incoming selector to release the switchtrain.
 - (b) Starts the timed operation of relay PTL.
 - (c) Removes the operate path for relay EA. Relay EA is held operated by relay PT released.
 - (d) Operates relay C (no function).
 - 2.07 Relay PTL operates in about 250 ms. Relay PTL operated operates relay PT.
 - 2.08 Relay PT operated:
 - (a) Releases relay B1.
 - (b) Releases relay PTL.
 - (c) Releases relay EA.
 - (d) Starts the timed operation of relay AT (no function).
 - 2.09 Relay B1 released:
 - (a) Removes ground from lead S to the local selector bank.
 - (b) Releases relays DB and the operated sequence count relay P1,2,3 or 4.
 - (c) Releases relay B2.
 - (d) Releases relay AR.
 - 2.10 Relay B2 released:
 - (a) Inserts the idle line termination (resistor IL).
 - (b) Removes network D1 from across the pulsing contact of relay E.
 - (c) Opens the paths to the busy lamps extinguishing them.
 - (d) Removes the busy indication to the access line and jack circuit for restoring air ground and data trunks.
 - 2.11 Relay EA released starts the timed operation of relay PTL. Relay PTL operates in about 250 ms. Relay PTL operated releases relay PT.
 - 2.12 Relay PT released releases relay PTL and opens its operate path for relay AT.
 - 2.13 Relay DB released releases relay DE.
 - 2.14 On precedence class calls relays P1, 2 or 3 released release relay PR.
- B. Disconnect - Calling Party First
- 2.15 Relay E releases when the switch center disconnects. Relay E released:
 - (a) Removes the operating path of relay EA. Relay EA is held operated by relay PT released.
 - (b) Starts the timed operation of relay PTL to determine if lead E on hook is a pre-empt signal.
 - (c) Opens one of the parallel paths holding the incoming selectors.
 - 2.16 Relay PTL operates in about 250 ms. Relay PTL operated operates relay PT.
 - 2.17 Relay PT operated:
 - (a) Releases relay PTL.
 - (b) Releases relay EA.
 - (c) Removes a holding path for relay B1.
 - (d) Starts the timed operation of relay AT (no function).
 - 2.18 Relay EA released starts the timed operation of relay PTL. Relay PTL operates in about 250 ms. Relay PTL operated releases relays PT and CC.
 - 2.19 Relay PT released releases relay PTL and opens the operate path for relay AT.
 - 2.20 If the called party has not disconnected before relay CC releases, relay CC released:
 - (a) Opens the loop to the incoming selector to release the switchtrain.
 - (b) Releases relay D which releases relay F1.
 - 2.21 If not already released, relay D releases when the called station goes on hook. Relay D released operates relay F2.

- 2.22 Relay F2 operated:
- (a) Locks operated under control of relays F1 and OP.
 - (b) Starts the timed operation of relay AT.
 - (c) Switches resistor RT4 in operating path of relay AT in parallel with resistors RT2 and RT3.
- 2.23 Relay AT operates in about 1.2 seconds. Relay AT operated releases relay F1.
- 2.24 If relay CC has released before the called party disconnects, the holding path for relay F1 is opened and relay F1 releases as soon as the D relay releases rather than after the 1.2 second timed operation of relay AT.
- 2.25 Relay F1 released:
- (a) Releases relays AT and F2.
 - (b) Releases relay D1.
- 2.26 Relay D1 released:
- (a) Switches lead M from battery to ground to indicate disconnect to the switch center.
 - (b) Releases relay B1.
 - (c) Operates relay C (no function).
 - (d) Closes path for operation of the proper busy lamp.
 - (e) Operates relay AR on precedence calls (no function).
- 2.27 Relay B1 released:
- (a) Removes ground from lead S to the local selector bank.
 - (b) Releases relays DB and the operated sequence count relay P1,2,3 or 4.
 - (c) Releases relay B2.
 - (d) Releases relay AR.
- 2.28 Relay B2 released:
- (a) Inserts the idle line termination (resistor IL).
 - (b) Removes network D1 from across the pulsing contact of relay E.
 - (c) Opens the paths to the busy lamps extinguishing them.
 - (d) Removes the busy indication to the access line and jack circuit for restoring air ground and data trunks.
- 2.29 Relay DB released releases relay DE.
- 2.30 On precedence class calls relays P1, 2 or 3 released release relay PR.
- C. Disconnect of Attendant Handled Calls - Attendant Disconnects First
- 2.31 The attendant disconnects from the access line by removing the cord plug from the jack used. Relay S or SP releases when the cord plug is removed.
- 2.32 Relay S or SP released releases relay J or JP respectively.
- 2.33 Relay J or JP released:
- (a) Releases relays J1 and JP1 or relay JP1 respectively.
 - (b) Opens the transmission path to the cord circuit.
 - (c) Releases relay D1.
- 2.34 Relay D1 released:
- (a) Switches lead M from battery to ground, to indicate disconnect to the switch center.
 - (b) Removes one of the holding paths for relay B1.
 - (c) Lights the precedence busy lamp if not lighted.
 - (d) Opens one of the parallel paths holding the switchtrain.
- 2.35 The switch center (distant end) releases the access circuit by an on-hook lead E which releases relay E. Relay E released:
- (a) Opens the loop to the incoming selector to release the switchtrain.
 - (b) Starts the timed operation of relay PTL.
 - (c) Removes the operate path for relay EA. Relay EA is held operated by relay PT released.
 - (d) Operates relay C (no function).
- 2.36 Relay PTL operates in about 250 ms. Relay PTL operated operates relay PT.
- 2.37 Relay PT operated:
- (a) Releases relay B1.
 - (b) Releases relay PTL.
 - (c) Releases relay EA.
 - (d) Starts the timed operation of relay AT (no function).

2.38 Relay B1 released:

- (a) Removes ground from lead S to the local selector bank.
- (b) Releases relays DB and the operated sequence count relays P1, 2, 3 or 4.
- (c) Releases relay B2.

2.39 Relay B2 released:

- (a) Inserts the idle line termination (resistor IL).
- (b) Opens the paths to the busy lamps extinguishing them.
- (c) Removes the busy indication to the access line and jack circuit for restoring air ground and data trunks.
- (d) Removes network D1 from across the pulsing contact of relay E.

2.40 Relay EA released:

- (a) Releases relay PR if operated.
- (b) Starts the timed operation of relay PTL.

2.41 Relay PTL operates in about 250 ms. Relay PTL operated releases relays PT and CC.

2.42 Relay PT released:

- (a) Releases relay PTL.
- (b) Opens the operate path for relay AT.

2.43 Relay DB released releases relay DE.

D. Disconnect of Attendant Handled Calls - Switch Center Disconnects First

2.44 The switch center releases the access line by an on-hook lead E which releases relay E. Relay E released:

- (a) Opens the pulsing path.
- (b) Starts the timed operation of relay PTL to determine if lead E on hook is a pre-empt signal.
- (c) Removes the operate path of relay EA. Relay EA is held operated by relay PT released.

2.45 Relay PTL operates in about 250 ms. Relay PTL operated operates relay PT.

2.46 Relay PT operated:

- (a) Releases relay PTL.
- (b) Releases relay EA.

- (c) Lights the precedence busy lamp if not lighted.
- (d) Starts the timed operation of relay AT (no function).

2.47 Relay EA released:

- (a) Starts the timed operation of relay PTL.
- (b) Releases relay JPI on routine calls.

2.48 Relay PTL operates in about 250 ms. Relay PTL operated releases relays PT and CC.

2.49 Relay PT released:

- (a) Releases relay PTL.
- (b) Opens the operate path for relay AT.

2.50 Relay CC released:

- (a) Opens the loop to the incoming selector to release the switchtrain.
- (b) Opens the cord circuit path to display cord lamp disconnect signals to the attendant.

2.51 When the attendant removes the cord plug from the jack used, relay S or SP releases releasing relay J or JP respectively.

2.52 Relay J or JP released releases relay JI or JPI respectively. Relay JI or JPI released:

- (a) Releases relay D1.
- (b) Opens the transmission path to the cord circuit.
- (c) Releases relay PR if operated.

2.53 Relay D1 released:

- (a) Switches lead M from battery to ground to indicate disconnect to the switch center.
- (b) Releases relay B1.
- (c) Operates relay C (no function).

2.54 Relay B1 released:

- (a) Removes ground from lead S to the local selector bank.
- (b) Releases relays DB and the operated sequence count relay P1, 2, 3 or 4.
- (c) Releases relay B2.

2.55 Relay B2 released:

- (a) Inserts the idle line termination (resistor IL).

- (b) Opens the paths to the busy lamps extinguishing them.
- (c) Removes the busy indication to the access line and jack circuit for restoring air ground and data trunks.
- (d) Removes network D1 from across the pulsing contact of relay E.

2.56 Relay DB released releases relay DE.

3. TRANSFER TO ATTENDANT (ZB OPTION)

3.01 Calls completed by the attendant can be transferred by the attendant entering the connection in the normal manner.

3.02 Calls completed direct to the station on a network-in-dial basis can be transferred to the attendant by the station depressing the switchhook and then releasing the switchhook within 1.2 seconds.

3.03 Relay D releases when the station switchhook is depressed. Relay D released operates relay F2.

3.04 Relay F2 operated:

- (a) Locks operated under control of relays OP and F1.
- (b) Starts the timed operation of relay AT.
- (c) Switches resistor RT4 in operating path of relay AT in parallel with resistors RT2 and RT3.

3.05 Relay OP operates if the station goes off hook within 1.2 seconds (relay D reoperated). Relay OP operated:

- (a) Locks operated via its own contact and relay B1 operated.
- (b) Closes a path to flash the appropriate line lamp at 120 ipm to alert the attendant and extinguish the associated busy lamp.
- (c) Grounds leads to start the ringing machine and the interrupter.
- (d) Provides routine or precedence audible ringing to the switch center depending on the precedence class of the call.
- (e) Releases relay F2 to stop the timed operation of relay AT.

3.06 The attendant answers the call in the same manner as an incoming call. Relay F1 operated holds the loop to the incoming selector closed.

3.07 The transmission path of the cord circuit and the incoming selector

loop are coupled by capacitors RF and TF. Inductor C is used to terminate the cord circuit. The dc path through inductor C provides answer supervision for the cord circuit used.

3.08 When the station requesting the transfer depresses the switchhook for disconnect, relay D releases.

3.09 Relay F2 operates when relay D releases.

3.10 Relay F2 starts the timed operation of relay AT. Relay AT operates in about 1.2 seconds to release relays F1 and CC.

3.11 Relay F1 released:

- (a) Transfers control of relay D1 to the jack relays.
- (b) Removes capacitors TF and RF and inductor C from the transmission path to the cord circuits. The cord circuit is thus connected directly to the access line.
- (c) Opens the loop to the incoming selector to release the switchtrain.
- (d) Releases relay F2.
- (e) Releases relay AT.

4. OUTGOING CALLS (DIAL SELECTED)

A. Seizure

4.01 Only the routine class calls can be dial selected. The access line is seized by a ground on lead S from the selector or selector -connector bank multiple. Ground on lead S operates relay TR through the contact of relay B1 released. Relay TR operated:

- (a) Transfers the leads T and R to the windings of relays A and L.
- (b) Prepares a path for operating relay RV upon answer.
- (c) Removes inductor A and relay D from the talking path.

4.02 Relays A and L operate over the loop from a station or tie trunk. Relay A operated places battery on lead M to seize the distant end. The switch center when ready to receive dial pulses returns dial tone.

4.03 Relay L operated operates relay B. Relay B operated:

- (a) Provides a ground on lead S to hold the switchtrain until relay B1 operates.
- (b) Operates relay B1.

- (c) Operates relay B2.
- (d) Prepares a path to operate relay CC on completion of call.
- (e) Opens the operate paths of relays AR, AT and OP.
- (f) Prepares the operate path of relay C.

4.04 Relay B1 operated:

- (a) Grounds lead S to the local selector bank to indicate the access line is busy to outgoing dial selected calls.
- (b) Lights the routine busy lamp.

4.05 Relay B2 operated:

- (a) Removes the idle line termination (resistor IL).
- (b) Grounds leads S and ALL to indicate busy conditions to connecting circuits.

4.06 Relays A and L follow and repeat the dial pulses from the station or tie trunk. The release of relay A changes lead M from battery to ground. The breaks of the dial pulses are transmitted to the switch center as lead M grounds.

4.07 The first release of relay L in each digit operates relay C. Relay C is slow release and remains operated over the dial pulses of each digit. Relay C operated:

- (a) Removes capacitor A and resistor AA from the transmission termination.
- (b) Adds capacitors C and C1 across the hybrid coils of the transmission termination.

4.08 Dial pulse transients are reduced by the operation of relay C. Diodes T and R are used to reduce the transient effect of the first break and make of each digit before relay C operates. Varistors B and B1 are used to prevent "ring-tap" of stations during dialing.

4.09 Stations equipped with TOUCH-TONE do not release relays A and L during dialing.

B. Answer by Switch Center

4.10 When the distant end answers, ground is applied to lead E of the access line operating relay E. Relay E operated operates relay EA.

4.11 Relay EA operated:

- (a) Starts the timed operation of relay CC (call complete).

- (b) Locks operated via its own contact and under control of relay PT.

4.12 Relay CC operates in about 1.1 secs. Relay CC operated operates relay RV.

4.13 Relay RV operated reverses the battery and ground from the windings of relays A and L towards the station or tie trunk to return answer supervision. Resistors RV1 and RV2 are inserted by relay RV when reversing the tip and ring to prevent a momentary open of the talking path and to discharge line capacitance of the incoming circuit. This is to prevent momentary release of relays in the access line.

5. DISCONNECT ON OUTGOING CALLS (DIAL SELECTED)

A. Disconnect - Calling Party Released First

5.01 When the calling party disconnects, the open loop causes relays A and L to release. Relay A released returns lead M to ground to signal disconnect to the switch center.

5.02 Relay L released:

- (a) Releases relay B.
- (b) Operates relay C (no function).

5.03 Relay B released:

- (a) Releases relay TR.
- (b) Opens the operate paths for relays B1 and B2 which remain operated via separate holding paths.

5.04 Relay TR released releases relay RV.

5.05 When the distant end disconnects, ground is removed from lead E. Relay E releases. Relay E released:

- (a) Starts the timed operation of relay PT1.
- (b) Opens the operate path of relay EA which remains operated.
- (c) Operates relay C (no function).

5.06 Relay PT1 operates in about 250 ms. Relay PT1 operated operates relay PT.

5.07 Relay PT operated:

- (a) Releases relay B1.
- (b) Releases relay PT1.
- (c) Releases relay EA.

- (d) Starts the timed operation of relay AT.

- 5.08 Relay B1 released:
- (a) Releases relay B2.
 - (b) Removes the busy indication (ground on lead S) to the local selector bank.
 - (c) Releases relay C.

5.09 Relay EA released starts timed operation of relay PTL.

5.10 Relay PTL operates in about 250 ms. Relay PTL operated releases relays PT and CC.

5.11 Relay PT released:

- (a) Releases relay PTL.
- (b) Opens the operate path for relay AT.

5.12 Relay B2 released:

- (a) Extinguishes the busy lamps.
- (b) Inserts the idle line termination (resistor IL).
- (c) Removes ground from the traffic register and busy indication leads.

B. Disconnect - Called Party Releases First

5.13 When the distant end disconnects, ground is removed from lead E. Relay E releases. Relay E released:

- (a) Starts the timed operation of relay PTL.
- (b) Opens the operate path of relay EA which remains operated.
- (c) Operates relay C (no function).

5.14 Relay PTL operates in about 250 ms. Relay PTL operated operates relay PT.

5.15 Relay PT operated:

- (a) Releases relay PTL.
- (b) Releases relay EA.
- (c) Starts the timed operation of relay AT.

5.16 Relay EA released starts the timed operation of relay PTL.

5.17 Relay PTL operates in about 250 ms. Relay PTL operated releases relays PT and CC.

5.18 Relay PT released releases relay PTL and opens the operate path for relay AT.

5.19 Relay CC released releases relay RV.

5.20 When the calling party disconnects, the open loop causes relays A and L to release. Relay A released returns lead M to ground to signal disconnect to the switch center.

5.21 Relay L released:

- (a) Releases relay B.
- (b) Operates relay C (no function).

5.22 Relay B released:

- (a) Releases relay B1.
- (b) Releases relay TR.

5.23 Relay B1 released releases relays B2 and C. Relay B2 released:

- (a) Opens the paths to the busy lamps extinguishing them.
- (b) Inserts the idle line termination (resistor IL).
- (c) Removes ground from the traffic register and busy indication leads.

6. ROUTINE OUTGOING CALLS - ATTENDANT COMPLETED

A. Seizure

6.01 To place a routine outgoing call, the attendant inserts either cord plug (station or answer, trunk or calling) into the routine jack of an idle access line. Ground or low resistance battery is connected to the sleeve of the cord plug to indicate a station appearance to the cord circuit.

6.02 Relay S operates from ground or +6 volt battery on the sleeve lead to -48 volt battery on the ring lead.

6.03 Relay S operated:

- (a) Locks operated via its own contact.
- (b) Operates relay J either directly for options W and Z or through thermistor J.
- (c) Switches resistor R across the T and R leads to trip ringing for options K, X or Y.

6.04 Relay F operated:

- (a) Operates relay J1.
- (b) Shunts out thermistor J.
- (c) Removes resistor R from across the T and R leads.
- (d) Completes part of the talking path.

- (e) Prevents operation of relay JPl when precedence jack is used as a dialing jack.
 - (f) Changes the sleeve of the precedence jack to a trunk condition.
- 6.05 Relay J1 operated:
- (a) Operates relay D1.
 - (b) Completes the talking path.
 - (c) Opens the loop to the incoming selector.
- 6.06 Relay D1 operated:
- (a) Operates relays B1 and B2.
 - (b) Connects battery to lead M to seize the distant end.
- 6.07 Relay B1 operated:
- (a) Lights both busy lamps.
 - (b) Provides a locking path for relay B2.
 - (c) Grounds lead S to the local selector bank to indicate busy to outgoing dial selected calls.
- 6.08 Relay B2 operated:
- (a) Removes the idle line termination.
 - (b) Grounds leads ALL and S to traffic register and connecting circuits to indicate busy.

B. Dialing

- 6.09 Insertion of a trunk or calling cord into the routine jack allows TOUCH-TONE calls to be completed using one cord.
- 6.10 If the switchboard is not arranged for TOUCH-TONE dialing or a station cord is inserted into the routine jack, the precedence jack is used as a dial jack. The trunk or calling cord of the cord circuit in use, if available, or of an idle pair is inserted into the precedence jack.
- 6.11 Relay SP operates from ground or +6 volt battery on the sleeve lead to -48 volt battery through contacts of relays CC and J.
- 6.12 Relay SP operated:
- (a) Locks operated via its own contact.
 - (b) Operates relay JP either directly for options W and Z or through themistor JP.
 - (c) Switches resistor P across the T and R leads to trip ringing.

- 6.13 Relay JP operated:
- (a) Operates relay TR.
 - (b) Shunts out thermistor JP.
 - (c) Removes resistor P from across the T and R leads.
 - (d) Completes part of the dialing path.
- 6.14 Relay TR operated transfers the access line to the dial jack and completes the cord circuit dialing loop via relays A and L.
- 6.15 Relays A and L operate over the cord circuit loop. Relay A operated places battery on lead M to hold the switch center connection when relay D1 releases.
- 6.16 Relay L operated operates relay B. Relay B operated releases relay D1 and provides a holding path for relay B1. Relay D1 released transfers control of lead M to relay A.
- 6.17 Relays A and L follow and repeat the dial pulses from the station or tie trunk. The release of relay A changes lead M from battery to ground. The breaks of the dial pulses are transmitted to the switch center as lead M grounds.
- 6.18 The first release of relay L in each digit operates relay C. Relay C is slow release and remains operated over the dial pulses of each digit. Relay C operated:
- (a) Removes capacitor A and resistor AA from the transmission termination.
 - (b) Adds capacitors C and C1 across the hybrid coils of the transmission termination.
- 6.19 Dial pulse transients are reduced by the operation of relay C. Diodes T and R are used to reduce the transient effect of the first break and make of each digit before relay C operates. Varistors B and B1 are used to prevent "ring-tap" of stations during dialing.
- 6.20 Stations equipped with TOUCH-TONE do not release relays A and L during dialing.
- C. Attendant Removes Dialing Cord Before Switch Center Answers
- 6.21 When the attendant removes the dialing cord plug from the precedence jack, relay SP releases and the cord circuit dialing loop is opened releasing relays A and L.
- 6.22 Relay SP released releases relay JP.
- 6.23 Relay JP released operates relay D1 to hold the switch center connection.

6.24 Relay L released:

- (a) Starts the slow release of relay B.
- (b) Operates relay C (no function).

6.25 Relay B released:

- (a) Releases relay TR.
- (b) Opens a holding path for relay Bl.
- (c) Releases relay C.

6.26 Relay TR released transfers the access line back to the routine jack.

6.27 When the distant end answers, ground is returned over lead E as answer supervision operating relay E.

6.28 Relay E operated operates relay EA.

6.29 Relay EA operated:

- (a) Starts the timed operation of relay CC.
- (b) Provides a holding path for relay Bl.

6.30 Relay CC operates in about 1.1 seconds. Relay CC operated:

- (a) Operates relay JPl.
- (b) Opens the path to the precedence busy lamp extinguishing it.

6.31 Relay JPl operated changes the precedence jack appearance to station class (ground or low resistance battery on the sleeve lead).

D. Switch Center Answers Before Attendant Removes Dialing Cord

6.32 When the distant end answers, ground is returned over lead E as answer supervision operating relay E.

6.33 Relay E operated operates relay EA.

6.34 Relay EA operated:

- (a) Starts the timed operation of relay CC.
- (b) Operates relay Dl to hold the switch center connection when relay A releases.

6.35 Relay CC operates in about 1.1 seconds.

6.36 When the attendant removes the dialing cord plug from the precedence jack, relay SP releases and the cord circuit dialing loop is opened releasing relays A and L.

6.37 Relay SP released releases relay JP.

6.38 Relay JP released:

(a) Operates relay JPl.

(b) Opens the path to the precedence busy lamp extinguishing it.

6.39 Relay L released:

- (a) Starts the slow release of relay B.
- (b) Operates relay C (no function).

6.40 Relay B released:

- (a) Releases relay TR.
- (b) Opens a holding path for relay Bl.
- (c) Releases relay C.

6.41 Relay JPl operated changes the precedence jack appearance to station class (ground or low resistance battery on the sleeve lead).

E. Disconnect - Calling Party Releases First

6.42 If the call has been extended to a PBX station, the cord circuit supervisory lamp lights when the station goes on hook. This signals the attendant to remove the cord plug from the routine jack starting the slow release of relay S.

6.43 Relay S released releases relay J.

6.44 Relay J released:

- (a) Releases relay Jl.
- (b) Releases relay JPl.
- (c) Opens the talking path for the cord circuit.

6.45 Relay Jl released releases relay Dl.

6.46 Relay Dl released:

- (a) Switches lead M from battery to ground to indicate disconnect to the switch center.
- (b) Closes a path to light the precedence busy lamp.

6.47. When the distant end disconnects, ground is removed from lead E. Relay E releases. Relay E released:

- (a) Starts the timed operation of relay Ptl.
- (b) Opens the operate path for relay EA which remains operated.
- (c) Operates relay C (no function).

6.48 Relay Ptl operates in about 250 ms. Relay Ptl operated operates relay Pt.

- 6.49 Relay PT operated:
- (a) Releases relay PTL.
 - (b) Releases relay EA.
 - (c) Releases relay Bl.
 - (d) Starts the timed operation of relay AT.

6.50 Relay EA released starts the timed operation of relay PTL.

6.51 Relay PTL operates in about 250 ms. Relay PTL operated releases relays PT and CC.

6.52 Relay PT released releases relay PTL and opens the operate path for relay AT.

6.53 Relay Bl released:

- (a) Releases relays B2 and C.
- (b) Removes the busy indication to the local selector bank.

6.54 Relay B2 released:

- (a) Opens the paths to the busy lamps extinguishing them.
- (b) Inserts the idle line termination (resistor IL).
- (c) Removes ground from the traffic register and busy indication leads.

F. Disconnect - Called Party Releases First

6.55 When the distant end disconnects, ground is removed from lead E. Relay E releases. Relay E released:

- (a) Starts the timed operation of relay PTL.
- (b) Opens the operate path for relay EA which remains operated.

6.56 Relay PTL operates in about 250 ms. Relay PTL operated operates relay PT.

6.57 Relay PT operated:

- (a) Releases relay PTL.
- (b) Releases relay EA.
- (c) Closes a path to light the precedence busy lamp.
- (d) Starts the timed operation of relay AT.

6.58 Relay EA released:

- (a) Starts the timed operation of relay PTL.

(b) Releases relay JPl.

6.59 Relay PTL operates in about 250 ms. Relay PTL operated releases relays PT and CC

6.60 Relay PT released releases relay PTL and opens the operate path for relay AT.

6.61 If the call has been extended to a PBX station, the cord circuit supervisory lamp lights when the station goes on hook. This signals the attendant to remove the cord plug from the routine jack starting the slow release of relay S.

6.62 Relay S released releases relay J.

6.63 Relay J released releases relay J1.

6.64 Relay J1 released releases relay D1.

6.65 Relay D1 released:

- (a) Switches lead M from battery to ground to indicate disconnect to the switch center.
- (b) Releases relay Bl.
- (c) Operates relay C (no function).

6.66 Relay Bl released:

- (a) Releases relays B2 and C.
- (b) Removes the busy indication to the local selector bank.

6.67 Relay B2 released:

- (a) Opens the paths to the busy lamps extinguishing them.
- (b) Inserts the idle line termination (resistor IL).
- (c) Removes ground from the traffic register and busy indication leads.

7. PRECEDENCE OUTGOING CALLS - ATTENDANT COMPLETED

A. Seizure

7.01 To place a precedence outgoing call, the attendant inserts a trunk or calling cord plug into the precedence jack of an idle access line. Ground or low resistance battery is connected to the sleeve of the cord plug to indicate a station appearance to the cord circuit.

7.02 Relay SP operates from ground or +6 volt battery on the sleeve lead to -48 volt battery on the ring lead.

7.03 Relay SP operated:

- (a) Locks operated via its own contact.
- (b) Operates relay JP either directly for options W and Z or through thermistor JP.
- (c) Switches resistor P across the T and R leads to trip ringing for options K, X or Y.

7.04 Relay JP operated:

- (a) Operates relay JPl.
- (b) Shunts out thermistor JP.
- (c) Removes resistor P from across the T and R leads.
- (d) Completes part of the talking path.
- (e) Prevents operation of relay J1.

7.05 Relay JPl operated:

- (a) Operates relay PE.
- (b) Completes the talking path.
- (c) Opens the loop to the incoming selector.

7.06 Relay PE operated operates relay Ptl. Relay Ptl operates to insure that the access line goes on hook before reseizure of the switch center during switch center pre-emption.

7.07 Relay Ptl operated operates relay PR.

7.08 Relay PR operated:

- (a) Operates relay Dl.
- (b) Releases relay PE.

7.09 Relay Dl operated:

- (a) Operates relays B1 and B2.
- (b) Connects battery to lead M to seize the switch center.

7.10 Relay PE released releases relay Ptl.

7.11 Relay B1 operated:

- (a) Lights the routine busy lamp.
- (b) Provides a locking path for relay B2.
- (c) Grounds lead S to the local selector bank to indicate the access line is busy to outgoing dial selected calls.

7.12 Relay B2 operated:

- (a) Removes the idle line termination (resistor IL).

- (b) Grounds leads ALL and S to traffic register and connecting circuits to indicate busy.

B. Dialing

7.13 Insertion of a trunk or calling cord into the precedence jack allows TOUCH-TONE calls to be completed using one cord. Precedence calls must be placed by an attendant at a switchboard position equipped with a 16 button TOUCH-TONE dial.

C. Answer by Switch Center

7.14 When the distant end answers, ground is applied to lead E of the access line operating relay E. Relay E operated operates relay EA.

7.15 Relay EA operated:

- (a) Starts the timed operation of relay CC.
- (b) Locks operated via its own contact and under control of relay PT.

7.16 Relay CC operates in about 1.1 seconds and locks operated.

D. Disconnect - Calling Party Releases First

7.17 If the call has been extended to a PBX station, the cord circuit supervisory lamp lights when the station goes on hook. This signals the attendant to remove the cord plug from the precedence jack starting the slow release of relay SP.

7.18 Relay SP released releases relay JP.

7.19 Relay JP released:

- (a) Releases relay JPl.
- (b) Opens the talking path for the cord circuit.

7.20 Relay JPl released releases relay Dl.

7.21 Relay Dl released:

- (a) Switches lead M from battery to ground to indicate disconnect to the switch center.
- (b) Opens a holding path for relay B1.

7.22 When the distant end disconnects, ground is removed from lead E. Relay E releases. Relay E released:

- (a) Starts the timed operation of relay Ptl.
- (b) Opens the operate path for relay EA which remains operated.
- (c) Operates relay C (no function).

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- 7.23 Relay PTL operates in about 250 ms.
Relay PTL operated operates relay PT.
- 7.24 Relay PT operated:
- (a) Releases relay PTL.
 - (b) Releases relay EA.
 - (c) Releases relay Bl.
 - (d) Starts the timed operation of relay AT.
- 7.25 Relay EA released:
- (a) Starts the timed operation of relay PTL.
 - (b) Releases relay PR.
- 7.26 Relay PTL operates in about 250 ms.
Relay PTL operated releases relays PT and CC.
- 7.27 Relay PT released releases relay PTL and opens the operate path for relay AT.
- 7.28 Relay Bl released:
- (a) Releases relays B2 and C.
 - (b) Removes the busy indication to the local selector bank.
- 7.29 Relay B2 released:
- (a) Opens the paths to the busy lamps extinguishing them.
 - (b) Inserts the idle line termination (resistor IL).
 - (c) Removes ground from the traffic register and busy indication leads.
- E. Disconnect - Called Party Releases First
- 7.30 When the distant end disconnects, ground is removed from lead E.
Relay E releases. Relay E released:
- (a) Starts the timed operation of relay PTL.
 - (b) Opens the operate path for relay EA which remains operated.
- 7.31 Relay PTL operates in about 250 ms.
Relay PTL operated operates relay PT.
- 7.32 Relay PT operated:
- (a) Releases relay PTL.
 - (b) Releases relay EA.
 - (c) Starts the timed operation of relay AT.
- 7.33 Relay EA released starts the timed operation of relay PTL.
- 7.34 Relay PTL operates in about 250 ms.
Relay PTL operated releases relays PT and CC.
- 7.35 Relay PT released releases relay PTL and opens the operate path for relay AT.
- 7.36 If the call has been extended to a PBX station, the cord circuit supervisory lamp lights when the station goes on hook. This signals the attendant to remove the cord plug from the precedence jack starting the slow release of relay SP.
- 7.37 Relay SP released releases relay JP.
- 7.38 Relay JP released:
- (a) Releases relay JPl.
 - (b) Opens the talking path for the cord circuit.
- 7.39 Relay JPl released releases relays Dl and PR.
- 7.40 Relay Dl released:
- (a) Switches lead M from battery to ground to indicate disconnect to the switch center.
 - (b) Releases relay Bl.
 - (c) Operates relay C (no function).
- 7.41 Relay Bl released:
- (a) Releases relays B2 and C.
 - (b) Removes the busy indication to the local selector bank.
- 7.42 Relay B2 released:
- (a) Opens the paths to the busy lamps extinguishing them.
 - (b) Inserts the idle line termination (resistor IL).
 - (c) Removes ground from the traffic register and busy indication leads.
8. PRE-EMPTION BY SWITCH CENTER
- A. General
- 8.01 The access line may be pre-empted by the switch center at any time. The pre-empt signal is a nominal 345 ms on-hook signal from the switch center. The on-hook signal is timed to verify that it exceeds the minimum 250 ms pre-empt time but does not exceed the minimum 500 ms disconnect time.

- 8.02 If the call being pre-empted is outgoing from the PBX and unanswered at the switch center, the pre-empt wink will be preceded by a 100-560 ms off-hook wink (ground on lead E) to simulate answer.
- 8.03 If the access line is being pre-empted for nonreuse, the pre-empt wink will be followed by a 100 ms off-hook wink (ground on lead E).
- 8.04 Relay E releases during the 345 ms on-hook signal from the switch center. Relay E released:
- (a) Starts the timed operation of relay PTL.
 - (b) Opens the operate path for relay EA which is held operated via its own contact under control of relay PT.
- 8.05 Relay PTL operates in about 250 ms. Relay PTL operation times for the minimum pre-empt signal. Relay PTL operated operates relay PT.
- 8.06 Relay PT operated:
- (a) Releases relays EA and PTL.
 - (b) Starts the timed operation of relay AT.
 - (c) Closes a path to light the precedence busy lamp if it is not lighted.
- 8.07 Relay E reoperates at the end of the pre-empt on-hook signal and pre-empt tone is furnished from the switch center.
- 8.08 Relay E operated operates relay EA. Relays EA and PT operated prevent the reoperation of relay PTL. Since relay PTL does not reoperate, the E lead signal is not a disconnect signal.
- 8.09 Relay AT operates in about 3 seconds. Relay AT operated:
- (a) Releases relay CC.
 - (b) Opens the tip and ring leads to cause disconnect.
- B. Network-Out-Dialed Call (NOD)**
- 8.10 If the call being pre-empted is a network-out-dialed call (station or tie trunk originated) and the originator remains off hook, the operated relays AT and B operate relay RL1 and the opening of the tip and ring leads releases relays A and L.
- 8.11 Relay RL1 operated:
- (a) Operates relay RL2.
 - (b) Grounds lead S to the local selector bank to indicate the access line is busy to outgoing dial selected calls.
- (c) Opens the path from the selector bank.
- 8.12 Relay RL2 operated opens the operate path for relay TR to prevent the ground from relay RL1 operated from seizing the access line.
- 8.13 Relay A released switches lead M from battery to ground to indicate disconnect to the switch center.
- 8.14 Relay L released:
- (a) Releases relay B.
 - (b) Operates relay C (no function).
- 8.15 Relay B released releases relays B1 and TR.
- 8.16 Relay B1 released releases relays B2 and C.
- 8.17 Relay B2 released:
- (a) Operates relay PR.
 - (b) Inserts the idle line termination (resistor IL).
 - (c) Removes ground from the traffic register and busy indication leads.
- 8.18 Relay PR operated releases relay PT.
- 8.19 Relay PT released:
- (a) Operates relay B1.
 - (b) Releases relay AT.
- 8.20 Relay B1 operated operates relay AR.
- 8.21 Relay AR operated:
- (a) Grounds leads to start the ringing machine and the interrupter.
 - (b) Provides precedence audible ringing to the switch center.
- 8.22 When the originating station or tie trunk goes on hook, relay RL1 releases. Relay RL1 released:
- (a) Releases relay RL2.
 - (b) Reconnects the path from the local selector bank.
- 8.23 The slow release of relay RL2 holds lead S open after relay RL1 releases to wink the outgoing switchtrain released. (Ground is held on lead S until the station or tie trunk goes on hook to prevent a faulty release of the outgoing switchtrain.)

C. Network-In-Dialed Call (NID)

8.24 If the call being pre-empted is a network-in-dialed call and the called party remains off hook, the operated relay AT releases relay D and the open tip and ring leads release the incoming switchtrain.

8.25 Relay D released:

- (a) Releases relay F1.
- (b) Operates relay F2.

8.26 Relay F1 released releases relays D1 and F2.

8.27 Relay D1 released:

- (a) Switches lead M from battery to ground to indicate disconnect to the switch center.
- (b) Releases relay B1.
- (c) Opens the path to the routine busy lamp extinguishing it if lighted.

8.28 Relay B1 released:

- (a) Releases relay B2.
- (b) Release sequence count relay P4.
- (c) Releases relay DB.

8.29 Relay B2 released:

- (a) Operates relay PR if not already operated.
- (b) Inserts the idle line termination (resistor IL).
- (c) Removes ground from the traffic registers and busy indication leads.

8.30 Relay DB released releases relay DE.

8.31 Relay PR operated:

- (a) Releases relay PT.
- (b) Closes a path to light the routine busy lamp if not already lighted.

8.32 Relay PT released:

- (a) Operates relay B1.
- (b) Releases relay AT.

8.33 Relay B1 operated:

- (a) Operates relay AR.
- (b) Grounds lead S to the local selector bank to mark the access line busy to outgoing dial selected calls.

8.34 Relay AR operated:

- (a) Grounds leads to start the ringing machine and the interrupter.
- (b) Provides precedence audible ringing to the switch center.

D. Attendant Handled Routine Calls

8.35 If the call being pre-empted is an attendant completed or originated routine connection and the attendant has not disconnected in response to the pre-empt tone, relays AT and PT operated:

- (a) Open the tip and ring leads to the cord circuit to light the cord lamps as a disconnect signal for the attendant.
- (b) Release relay J1.

8.36 Relay J1 released releases relay D1.

8.37 Relay D1 released:

- (a) Releases relay B1.
- (b) Switches lead M from battery to ground to indicate disconnect to the switch center.
- (c) Opens the path to the routine busy lamp extinguishing it.

8.38 Relay B1 released releases relay B2.

8.39 Relay B2 released:

- (a) Operates relay PR.
- (b) Inserts the idle line termination (resistor IL).
- (c) Removes ground from the traffic registers and busy indication leads.

8.40 Relay PR operated:

- (a) Releases relay PT even though the attendant has not disconnected from the pre-empted connection. This allows the new incoming precedence call to be completed.
- (b) Closes a path to light the routine busy lamp.

8.41 In response to the lighted cord lamp, the attendant removes the cord plug from the routine jack releasing relay S. Relay S released releases relay J.

8.42 Relay PT released:

- (a) Operates relay B1.
- (b) Releases relay AT.

8.43 Relay B1 operated operates relay AR.

8.44 Relay AR operated:

- (a) Grounds leads to start the ringing machine and the interrupter.
- (b) Provides precedence audible ringing to the switch center.

E. Attendant Handled Precedence Calls

8.45 If the call being pre-empted is an attendant completed or originated precedence connection and the attendant has not disconnected in response to the pre-empt tone, relays AT and PT operated open the tip and ring leads to the cord circuit to light the cord lamps as a disconnect signal for the attendant.

8.46 No further disconnect action occurs until the attendant removes the cord plug from the precedence jack. When the cord plug is removed, relay SP releases.

8.47 Relay SP released releases relay JP.

8.48 Relay JP released releases relay JPl.

8.49 Relay JPl released releases relay Dl.

8.50 Relay Dl released:

- (a) Switches lead M from battery to ground to indicate disconnect to the switch center.
- (b) Releases relay Bl.

8.51 Relay Bl released:

- (a) Releases relay B2.
- (b) Releases the operated sequence count relay Pl, 2 or 3.
- (c) Releases relay DB.

8.52 Relay B2 released:

- (a) Releases relay PT.
- (b) Inserts the idle line termination (resistor IL).
- (c) Removes ground from the traffic register and busy indication leads.

8.53 Relay DB released releases relay DE.

8.54 Relay PT released:

- (a) Operates relay Bl.
- (b) Releases relay AT.

8.55 Relay Bl operated:

- (a) Operates relay AR.
- (b) Grounds lead S to the local selector bank to mark the access line busy to

to outgoing dial selected calls.

8.56 Relay AR operated:

- (a) Grounds leads to start the ringing machine and the interrupter.
- (b) Provides precedence audible ringing to the switch center.

8.57 The completion of the incoming precedence call for which the access line is being pre-empted is as described in the section covering incoming precedence calls.

9. PRE-EMPTION BY ATTENDANT

A. General

9.01 The attendant can pre-empt a routine call by inserting a trunk or calling cord plug into the precedence jack of a busy access line having a precedence busy lamp which is dark. Relay SP operates when the attendant plugs into the precedence Jack.

9.02 Relay SP operated operates relay JP.

9.03 Relay JP operated:

- (a) Operates relay JPl if not already operated.
- (b) Operates relay PE on routine attendant outward dialed calls which have been answered. (Relay JPl previously operated.)
- (c) Closes a path to light the precedence busy lamp.

9.04 Relay JPl operated operates relay PE on other than routine attendant outward calls which have been answered.

9.05 Relay PE operated:

- (a) Supplies pre-empt tone to the calling and called parties of the call in progress.
- (b) Starts the timed operation of relay AT.
- (c) Shunts out time delay Tl from operate path of relay PTL.

9.06 Relay AT operates in about 3 seconds.

B. Attendant-Out-Dialed Call

9.07 Relay AT operated:

- (a) Releases relays J1 and CC
- (b) Opens tip and ring leads to the cord circuit to light the cord lamps as a disconnect signal for the attendant handling the pre-empted routine call.

- 9.08 Relay J1 released releases relay D1.
- 9.09 Relay D1 released switches lead M from battery to ground to indicate disconnect to the switch center.

C. Network-Out-Dialed Call (NOD)

- 9.10 Relay AT operated:
 - (a) Releases relay CC.
 - (b) Operates relay RL1.
 - (c) Opens tip and ring leads to force disconnect.
- 9.11 Relay CC released releases relay RV.
- 9.12 Relay RL1 operated:
 - (a) Operates relay RL2.
 - (b) Grounds lead S to the local selector bank to indicate the access line is busy to outgoing dial selected calls.
 - (c) Opens the path from the selector bank.
- 9.13 Relay RL2 operated opens the operate path for relay TR to prevent the ground from relay RL1 operated from seizing the access line.
- 9.14 The opening of the tip and ring leads to force disconnect releases relays A and L. Relay A released switches the lead M from battery to ground to indicate disconnect to the switch center.
- 9.15 Relay L released:
 - (a) Releases relay B.
 - (b) Operates relay C (no function).
- 9.16 Relay B released releases relays TR and C.
- 9.17 When the originating station or tie trunk goes on hook, relay RL1 releases. Relay RL1 released:
 - (a) Releases relay RL2.
 - (b) Reconnects the path from the local switchtrain.
- 9.18 The slow release of relay RL2 holds lead S open after relay RL1 releases to wink the outgoing switchtrain released. (Ground is held on lead S until the station or tie trunk goes on hook to prevent a faulty release of the outgoing switchtrain.)

D. Network-In-Dialed Call (NID)

- 9.19 Relay AT operated:
 - (a) Releases relays D and CC.
 - (b) Opens the tip and ring leads to force disconnect.

- (c) Releases the incoming switchtrain.
 - 9.20 Relay D released:
 - (a) Releases relay F1.
 - (b) Operates relay F2.
 - 9.21 Relay F1 released releases relays D1 and F2.
 - 9.22 Relay D1 released switches lead M from battery to ground to indicate disconnect to the switch center.
- E. Switch Center Disconnect
- 9.23 The switch center disconnect appears as an on-hook signal over lead E releasing relay E. Relay E released:
 - (a) Operates relay PT1.
 - (b) Opens the operate path for relay EA which is held operated via its own contact under control of relay PT.
 - (c) Operates relay C (no function).
 - 9.24 Relay PT1 operated operates relay PT.
 - 9.25 Relay PT operated releases relays B1, EA and PT1.
 - 9.26 Relay EA released operates relay PT1.
 - 9.27 Relay PT1 operated releases relay PT. Relay PT released releases relay PT1.
 - 9.28 Relay B1 released:
 - (a) Releases relays B2 and C.
 - (b) Releases relays DB and P4 on pre-empted incoming calls.
 - 9.29 Relay DB released releases relay DE.
 - 9.30 Relay B2 released:
 - (a) Operates relay PT1.
 - (b) Inserts the idle line termination (resistor IL).
 - (c) Removes ground from the traffic register and busy indication leads.
 - 9.31 Relay PT1 operated operates relay PR.
 - 9.32 Relay PR operated:
 - (a) Releases relay J on attendant handled calls if the other attendant has not disconnected from the routine jack.
 - (b) Operates relay D1.
 - (c) Releases relay PE on calls not involving attendant.

- (d) Grounds lead PY to mark the access line as precedence busy.

9.33 Relay J released releases relay PE.

9.34 Relay PE released:

- (a) Discontinues pre-empt tone being supplied to calling and called parties of pre-empted call.

- (b) Releases relay AT.

9.35 Relay DI operated:

- (a) Switches lead M from ground to battery to seize the switch center for the new precedence call.

- (b) Operates relays B1 and B2.

9.36 The switch center returns dial tone when ready to receive the digits. The call is completed by the same procedure as described in another section for a precedence outgoing call.

10. PAD CONTROL

10.01 A 2 db transmission pad is normally in the access line transmission circuit. The pad is comprised of the 185-ohm resistor AA in series with the capacitor in the transmission termination and the 3480-ohm resistor A and capacitor A bridged across the tip and ring. Relay PO (pad out) removes the pad by removing resistor A and capacitor A from across the tip and ring and shunting resistor AA.

A. Incoming Tandem Dial Connection

10.02 An incoming call that is terminated through another trunk requires pad removal. The off-normal post springs of the incoming selector used with the access line are adjusted to place a resistance ground on lead O for levels requiring pad removal. Relays DVT and TPC are connected in series but resistance ground operates only relay TPC.

10.03 Relay TPC operated operates relay PO. Relay PO operated:

- (a) Shunts resistor AA.
- (b) Removes resistor A and capacitor A from across the tip and ring.
- (c) Locks operated via relay B2.

10.04 Relay TPC and DVT both operate if lead O is connected directly to ground. Relay DVT operated operates relay OP to transfer the call to the attendant.

B. An Outgoing Tandem Dial Connection

10.05 An outgoing call that is originated by another trunk removes the 2 db

transmission pad by the operation of relay TSP. Relay TSP operates whenever an outgoing dial-selected call originates from selector-bank levels that require pad removal. Relay TSP operated operates relay PO. Relay PO operated removes the transmission pad.

C. Attendant Completed

10.06 For an attendant completed call that is tandem connected (trunk-to-trunk), the attendant depresses the nonlocking push button associated with the access line for pad removal.

10.07 The push button (nonlocking) depressed operates relay PO.

10.08 Relay PO operated:

- (a) Shunts resistor AA.
- (b) Removes resistor A and capacitor A from across the tip and ring.
- (c) Locks operated via relay B2.

11. EXCHANGE OF BUSY CONDITIONS

11.01 The access line and jack circuit for restoring air ground and data trunks requires an exchange of busy conditions with the PBX access line.

11.02 Ground is applied to lead S whenever the access line is busy and remains until the access line is idle. This is used to indicate routine busy to the connecting circuit.

11.03 Ground is applied to lead PY to indicate a precedence busy condition. The access line and jack circuit can pre-empt a routine call to use the transmission facilities normally used with the PBX access line.

11.04 Whenever a PBX access line's transmission facilities are used with the access line and jack circuit for restoring air ground and data trunks, a ground is applied on lead P to the PBX access line to mark the line precedence busy. Ground on lead P operates relay B1. Relay B1 operated:

- (a) Grounds lead S to the selector bank to mark access line busy for dial-selected outgoing calls.
- (b) Operates relay C to remove the operate path for relay AT.
- (c) Lights the routine and precedence busy lamps.

11.05 When ground is removed from lead P, relay B1 releases. Relay B1 released:

- (a) Releases relay C.

- (b) Extinguishes the busy lamps.
- (c) Removes lead S ground from the selector banks.

12. MISCELLANEOUS

12.01 Resistance M is provided to maintain a path from lead M to ground while the contacts on relays A, D1 or WK are transferring that lead from ground to battery or vice versa. This prevents false operation of the relay in the associated signaling circuit.

12.02 Resistance IL provides a termination for a telephone repeater to prevent repeater "singing" when the circuit is idle.

12.03 The shunt through the winding of relay D has the A inductor connected in series with it to prevent an antiresonant condition.

12.04 The battery to relays A and L has inductor B in series with it to prevent an antiresonant condition.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

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

2. FUNCTIONAL DESIGNATIONS

2.01 The functional meanings of the designations of the relays of the access line circuit are listed below:

<u>Designation</u>	<u>Meaning</u>
A	Pulse Transmit
AR	Audible Ringing
AT	Attendant Transfer
B	Busy
B1	Busy Auxiliary
B2	Busy Auxiliary
C	Pulse Control
CC	Call Complete
D	Historical
DB	Digit Begin
DE	Digit End
DVT	Divert to Attendant
D1	D Slave
E	Receive
EA	Receive Auxiliary
F1	Flash 1
F2	Flash 2
J	Jack
J1	Jack Auxiliary
JP	Jack Precedence
JP1	Jack Precedence Auxiliary
L	Pulse
OP	Operator
P1	Pulse Count 1
P2	Pulse Count 2
P3	Pulse Count 3
P4	Pulse Count 4
PE	Pre-empt
PO	Pad Out
PR	Precedence
PT	Precedence Timing Auxiliary
PT1	Precedence Timing
RL1	Release
RL2	Release Auxiliary
RV	Reverse
S	Sleeve
SP	Sleeve Precedence
TPC	Transmission Pad Control
TR	Transfer
TSP	Transmission Pad
WK	Wink

3. FUNCTIONS

A. General

- 3.01 To furnish a talking path.
- 3.02 To remove the idle line termination when the circuit is seized.
- 3.03 To provide E&M lead signaling.

- 3.04 To connect to a 24 V-4 terminal repeater.
- 3.05 To provide pad control at tandem locations.
- 3.06 To provide pad removal on calls to certain levels.
- 3.07 To short the repeating coil hybrid during dialing.
- 3.08 To make the trunk busy to outgoing calls by grounding the sleeve of the selector bank multiple.
- 3.09 To transmit answer supervision to distant end.
- 3.10 To give a disconnect signal to the switch center when the PBX station or attendant disconnects.
- 3.11 To hold the PBX access line busy when the PBX station or attendant disconnects until the switch center end of the access line is released.
- 3.12 To allow pre-emption at any time by the switch center.
- 3.13 To allow the attendant to pre-empt a routine call which has been answered.
- 3.14 To provide pre-empt tone to the calling and called party during pre-emption.
- 3.15 To light the routine and precedence busy lamps during precedence calls.
- 3.16 To extinguish a line lamp when the attendant inserts a cord.
- 3.17 To light the precedence busy lamp when a cord plug is in the precedence jack.
- 3.18 To provide an exchange of busy conditions with the access line and jack circuit for restoring air ground and data trunks.
- 3.19 To provide a message register ground for all calls.
- 3.20 To provide an additional message register ground for all incoming calls.
- 3.21 To provide cord lamp supervision on the lamp associated with the cord use.
- 3.22 To allow switch center pre-emption of a routine attendant handled call and completion of the higher precedence call before the attendant disconnects from the routine jack.

3.23 To allow switch center pre-emption of a precedence attendant handled call but require attendant disconnect from the precedence jack before completion of the higher precedence call.

3.24 To disable the routine jack during a precedence call.

3.25 To provide for tripping ringing from switchboards arranged to furnish automatic ringing.

B. Outgoing Calls Dial Selected from Stations or Tie Trunks or Completed by Attendant

3.26 To light routine busy lamp if call is dial selected.

3.27 To signal the switch center on seizure.

3.28 To reverse battery upon answer by the distant end to give answer supervision to connecting circuits.

3.29 To repeat dial pulses to the signaling circuit.

3.30 To furnish transmitter battery to the calling station.

3.31 To disconnect the incoming selector.

3.32 To hold the outgoing switchtrain until calling party is on hook.

3.33 To light both busy lamps (routine and precedence) on an attendant placed routine call until the call is answered.

3.34 To allow either a station (answer) or trunk (calling) cord to be used in the routine jack for an attendant placed routine call.

3.35 To present a station appearance to the talking cord (cord inserted into routine jack) of the switchboard cord circuit on routine calls.

3.36 To present a trunk appearance to the dialing cord if used (cord inserted into precedence jack for dialing) of the switchboard cord circuit on routine calls.

3.37 To allow TOUCH-TONE or rotary dialing of calls placed from a PBX station or by the PBX attendant. (Precedence calls must be placed by the attendant using TOUCH-TONE dialing via a trunk (calling cord) in a precedence jack.)

C. Incoming Calls

3.38 To seize the incoming selector.

3.39 To light both busy lamps (routine and precedence) until call is answered.

3.40 To repeat the dial pulses from the signaling circuit of the distant end to the incoming selector.

3.41 To provide precedence audible ringing on precedence calls to the distant end until answer.

3.42 To absorb digits on listed number calls.

3.43 To light a line lamp steady for attendant and listed number calls.

3.44 To release the incoming selector when attendant inserts cord.

3.45 To provide busy/don't answer transfer to the attendant for precedence class calls (time delay transfer basis).

3.46 To flash the precedence line lamp at 60 ipm for busy/don't answer transfer to attendant.

3.47 To provide switchhook transfer to attendant.

3.48 To flash a line lamp at 120 ipm for switchhook transfer to attendant.

3.49 To delay called station disconnect for 1.2 seconds before sending disconnect to the switch center.

3.50 To hold the PBX switchtrain until switch center disconnect.

3.51 To allow either a station (answer) or trunk (calling) cord to be used for attendant answering of attendant or listed number calls, busy/don't answer transfer calls, or switchhook transfer calls.

3.52 To present a station appearance to the switchboard cord circuit.

3.53 To provide routing to the attendant all routine calls (manual switchboard operation option).

3.54 To provide routing to the attendant all precedence calls and allow direct dialing of routine calls (non PNID option).

3.55 To allow direct in dialing of precedence calls (PNID option).

4. CONNECTING CIRCUITS

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

4.02 First Selector Circuit - SD-66359-01.*

4.03 Selector Connector Circuit - SD-65721-01.*

4.04 Incoming Selector - SD-65950-01.*

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- 4.05 Incoming Connector - SD-66049-01.*
- 4.06 Traffic Register Circuit - SD-65774-01.*
- 4.07 24 V-4 Telephone Repeater Circuit - SD-97047-01.
- 4.08 DX Signaling Circuit - SD-95487-01.
- 4.09 E3B Signaling Circuit 2400 or 2600 Cycle. E and M Lead Supervision - SD-98124-02.
- 4.10 556 Cord, Telephone Dial, Buzzer, Ringing, and Battery Circuit - SD-65658-01.*
- 4.11 Cord Circuits 607A - SD-66707-01*, 607B - SD-65670-01.*
- 4.12 Access Line and Jack Circuit for Restoring Air Ground and Data.
- Trunks - SD-1G207-01.
- 4.13 Power Supply Circuit - SD-81337-01.*
- 4.14 Interrupter Circuit - SD-5E014-01.
- 4.15 Signaling Circuit - Audible Ringing Tone Generator - SD-81838-01.
- 4.16 Signaling Circuit - Pre-empt Tone Generator - SD-81839-01.

*Typical

5. MANUFACTURING TESTING INFORMATION

- 5.01 The PBX access line circuit shall be capable of performing all the service functions specified in this circuit description and meeting all the requirements of the Circuit Requirements Table.

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 To provide on switch center pre-emption that the disconnect signal is sent by the access line before the attendant disconnects on routine attendant handled calls and after the attendant disconnects on precedence attendant handled calls.

A.2 To provide circuit arrangements which make the attendant transfer feature optional.

A.3 To provide for the use of 92-type switchboard jacks on 607A and 607B switchboards on an optional basis.

B. Changes in Apparatus

B.1 Removed

Replaced By

(WK) Relay AG21	(WK) Relay AG37
(J) Thermistor 1D	(J) Thermistor 8C
(JP) Thermistor 1D	(JP) Thermistor 8C
(S) & (SP) Relay AK7	(S) & (SP) Relay AK37
(C) Diode 446F	
(D) Diode 446F	
(E) Diode 446F	
(PD) Diode 446F	

B.2 Added

(SC1) & (SC2) Resistor 19YG
 (P) Resistor KS-14603 L2A 511 Ohms
 (R) Resistor KS-14603 L2A 511 Ohms
 (ST) Diode 446F

D. Description of Changes

D.1 Code of relay WK is changed to provide in FS-2 for use of EMB contact 4 in lead M to avoid bunching of contacts between battery and ground. Other contacts renumbered on drawing.

D.2 In FS-2, operating path for relay PTL is revised under Non-FNID conditions to prevent operation until after attendant answer.

D.3 In FS-2, operating path for relay PTL via relay PE contact 2 is added to eliminate time delay when attendant is placing precedence out-dialed call.

D.4 In FS-2, holding path for relay F1 via relay E contact 4 is added to be used until relay CC operates.

D.5 In FS-2, option ZB is designated and option ZA is added to provide for eliminating attendant transfer feature when not required.

D.6 In FS-2, operating path for relay PO, contact 5 of relay OP is relocated to make manual operation of PO key effective.

D.7 In FS-2, operating path for relay PE via diode C and make contacts of relays D1 and J1 is removed.

D.8 In FS-2, option R is designated at relay AR contact in holding path for relay AT.

D.9 In FS-3, holding ground path for relay JF1 is added which is not under control of relay AT to assure that on precedence call pre-empted by switch center disconnect signal is not set until attendant disconnects from precedence jack.

D.10 In FS-3, option K is added to provide for use of 92-type switchboard jacks on 607A and 607B switchboards. Code of relay S and SP is changed and method of operation is revised. In FS-6, Fig. 4 is added to showing wiring of 92-type jacks.

D.11 In FS-5, earlier operating path for busy lamps via relay E contact 12 is added.

D.12 In FS-5, operating path for precedence busy lamp via contacts of relays CC and J1 is added.

D.13 In FS-5, diode ST is added in start lead for ringing machine or interrupter to provide isolation between circuits.

D.14 In CAD 1, numerous changes are made in wiring of T.S. (A) and (B) and T.S. (C) is added.

All other headings, no change.

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(WECO 7120HW-WPF/PDS-JGW)
 DEPT 5337-RAV