PBX SYSTEMS
TIE TRUNK CIRCUIT
NO. 552A, 552D, 556A, 605A, 606A, 606B, 607A, 607B, 608A, 608B, 608D, 701A, 701B, 701PK, 702A, 711A, 711B, 711PK, 740E, 756A, 757A OR 800A
OUTGOING MANUAL AND DIAL SELECTED AND DIAL REPEATING
INCOMING PULSE CORRECTING WITH OR WITHOUT E AND M LEAD SUPERVISION

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CHANGES

A. Changed and added Functions

A.1 Effective this issue provision is made for use of Delayed Dial only when this trunk is used with the No. 756A PBX.

B. Changes in Apparatus

B.1

Superseded	Superseded By
Capacitor DT, Type 542U, .04 mf. Option YT, Fig. C and Option UG, Fig. S and Theory Schematic S.	Capacitor DT, Type 542G, 4 mf. Option UH, Figs. C, S and Theory Schematic S.
Resistance Lamp A, Type 14A, Option UJ, Figs. 1 and 18	Resistance Lamp A, Type 14B, Option UK, Figs. 1 and 18
Capacitors E&F, Type KS-13486, Option UN, Fig. 21	Capacitors E&F, Type KS-19524,L9 Option UO, Fig. 21
Resistor TP, KS-13490, Option YT, Fig. C	Resistors TP KS-19150,L1, Option UH, Fig. C

B.2 Added

Resistor DT, Type 144C, 121 ohms, Option UH, Figs. C, S and Theory Schematic S.

Network E, Type 185A, Option UP, Figs. 1 & 18

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

C.1 Test and readjust currents for relay R are modified to match the published operating specifications for type 280 DP relay, as used in common systems DX signaling circuit.

D. Description of Changes

D.1 The Title Boxes are changed to:

(a) Rerate the circuit to Addition and Maintenance Only (A&M Only) for all systems except 701PK.

(b) Correct drawing code (1J99).

(c) Indicate replacing circuit is SD-65718-02.

D.2 Options UE and UF are added and rated Standard. Prior to this issue, if an attendant at an associated 608A or 608D switchboard erroneously plugged a cord into this jack circuit and then removed the plug without having operated the TALK key, the trunk would remain partially seized until the attendant subsequently reentered the jack and fully processed a call. Such an action is construed as an attendant error. It is easily remedied however, by applying option UF. All applications involving type 606 or 607 switchboards use option UE. Options UE and UF appear in Figures C, S and note 312 (Theory Schematic Figure S). The KS-13490,L1 resistor TP is replaced with KS-19150,L1 resistor TP as a part of the option YT and UH change.

D.3 Prior to this issue, when this circuit was used with a 608 type switchboard and N carrier an objectionable noise was heard in the attendant headset until dialing was started. With this issue, capacitor DT is removed and replaced with a network (capacitor DT-4 mfd (type 542G) and resistor DT-121 ohms (type 144)) of lower impedance which eliminates the noise. Option YT is rated MD in Figure C to remove capacitor DT and gas tube and resistor TP. Option UH is added and rated Standard to add the gas tube, resistor and new capacitor/resistor DT. Option UG is added and rated MD to remove capacitor DT for Fig. S. Option UH already designated Standard is used to add new capacitor/resistor DT to Fig. S. Note 312 (Theory Schematic for Figure S) also indicates use of the new components.

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D.4 Option UJ is added and rated MD to indicate use of type 14A resistance lamp A in Figures 1 and 18 is to be discontinued. Use of the new type 14B resistance lamp will improve transmission on short loops. Option UK is added and rated Standard to indicate use of resistance lamp type 14B in Figures 1 and 18.

D.5 Options UL and UM are designated and rated Standard for use in Figures 1, 18, note 102 and note 312 (Theory Schematic for 2 wire and 4 wire operation). Option UM provides for delayed dial operation only when used with type 756A PBX. All other applications use option UL.

D.6 The two 60 mfd KS-13486 can type capacitors E and F in Figure 21 are rated Manufacture Discontinued with option UN. They are replaced by two KS-19524,L0 pigtail capacitors by use of standard option UO.

D.7 Option UP is added and rated Standard to denote addition of network E (185A) in Figs. 1 and 18. This network is required when the E & M lead type of supervision in this trunk is used with F type single frequency signaling equipment. It may also be used as desired when it is felt that use of the network will improve signaling relay contact life on other types of E & M lead signaling circuits.

D.8 Connecting information for 800A PBX is added to Figure P and to CAD 36.

D.9 Strapping information for CADs 36 and 67 is corrected.

D.10 Provision for option UP is provided in CADs 16, 36, 54 and 67.

D.11 CAD 72 is added.

D.12 Record of Figs. and options is updated.

D.13 Add SD-99421-01 to connecting circuit information.

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(WECo 5120HW-BWM-LKJ)
DEPT 5337-RVL

PBX SYSTEMS
TIE TRUNK CIRCUIT
NO. 552A, 552D, 556A, 605A, 606A, 606B, 607A, 607B, 608A, 608B, 608D, 701A, 701B, 701PK, 702A, 711A, 711B, 711PK, 740E, 756A, 757A OR 800A
OUTGOING MANUAL AND DIAL SELECTED
AND DIAL REPEATING
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E AND M LEAD SUPERVISION

CHANGES

D. Description of Changes

D.1 CADs 16, 36, 54, 64, and 67 are revised on a no-record basis to conform with the Western Electric Company wiring drawings in connection with the application of UA, UB, and UC options added in issue 22D of this circuit.

F. Changes in CD Sections

F.1 In Section II, Page 25, 13.01, the third sentence is changed to read "The 4B contact of the B2 relay should be ....."

F.2 In Section II, Page 26, 19.05, the first sentence is changed to read "When single-frequency signaling is used, varistor T is provided to stop ....."

F.3 In Section III, Page 1, 3.14-3.18, renumber to eliminate second 3.14.

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DEPT 5333-FWW-RDW

PBX SYSTEMS
TIE TRUNK CIRCUIT
NO. 552A, 552D, 556A, 605A, 606A, 606B 607A, 607B, 608A, 608B, 608D, 701A, 701B, 701PK 702A, 711A, 711B, 711PK, 740E, 756A, 757A OR 800A
OUTGOING MANUAL AND DIAL SELECTED AND DIAL REPEATING
INCOMING PULSE CORRECTING
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E AND M LEAD SUPERVISION

CHANGES

D. Description of Changes

D.1 In Fig. 1 and 18, an N1 lead is added as a multiple of the N lead for controlling the TR relay from a tie trunk access circuit, when provided.

D.2 In Fig. C and S, optional wiring UD is designated to enable its omission when the trunk is connected to a tie trunk access circuit for TOUCH-TONE to dial pulse conversion from an attendant position.

D.3 Block diagram BD1 for TOUCH-TONE to dial pulse conversion connections is revised.

D.4 Information Note 312, covering a 2-wire theory schematic, is revised.

F. Changes in CD Sections

F.1 In Section II, 10.13 Tandem Connections Via Switchboard, add:

Tandem connections at a 608-type PBX switchboard may be handled with two cords instead of three, as an alternative procedure. The rear cord of a pair may be inserted into the ANS or TALK jack of the calling trunk. The connection can then be extended to the second tie trunk by inserting the rear cord of a second pair into the THRU jack of the first tie trunk and the front cord of the second pair into the THRU jack of the second tie trunk for out dialing. The rear cord of the first pair can then be removed from the calling trunk.

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PBX SYSTEMS
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OUTGOING MANUAL AND DIAL SELECTED AND DIAL REPEATING
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CHANGES

B. Changes in Apparatus

B.1 SUPERSEDED

C Relay, Y192
UA Option,
Fig. 16 and 18

SUPERSEDED BY

C Relay, Y271
UB Option,
Fig. 16 and 18

B.1 ADDED

T Resistor, 146C, 1210 ohms, UB Option, Fig. 16 and 19
T1 Resistor, 146C, 1210 ohms, UB Option, Fig. 16 and 19

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

C.1 The armature travel for TPC relay is changed from 47 to 38 (SPL).

C.2 Test Note 9 is added for the A relay.

C.3 Test and readjust release values for the D relay are interchanged.

C.4 Test clip data for the s relay of Fig. Q is added.

D. Description of Changes

D.1 The drawing title is changed to include 608B, 608D, and 800A PBX. The title of Fig. C, G and S is changed to indicate their use with a 608B or 608D PBX. Connecting information is added to Fig. 18, P and S to permit their use with an 800A PBX. CAD 70 is added for a quick cable connection when the tie trunk circuit is used with an 800A PBX.

D.2 Connection information is added to Fig. 21 and S for a 756A line, link, and marker circuit. CADs 29 and 32 are changed accordingly. Circuit Note 113 is rated Mfr Disc.

D.3 Pairing is indicated and corrected in Fig. 17 and 18 for leads to externally connected 4-wire terminating set circuit or repeater circuit to eliminate noise. CADs 17, 22, 35, 36, 43, 44, 54, 59, and 64 are changed accordingly.

D.4 Options UA, UB, and UC are added in Fig. 1, 16, 18, and 19. Option UB provides an improved E-type repeater termination for use in 2-wire duplex arrangements to prevent repeater singing. Circuit Note 126 is added for UA and UB options and Circuit Note 109 is revised to record the provision of these options.

D.5 The use of RM (reference material) numbers for information figures is discontinued. The block diagrams are given BD (block diagram) numbers and the theory schematics are given Information Note numbers. RM2, RM3, and RM5 are changed to BD2, BD3, and BD1, respectively. RM1 and RM4 are changed to Information Notes 311 and 312, respectively.

D.6 All references to auxiliary tie trunk circuit (TOUCH-TONE) are changed to tie trunk access circuit (TOUCH-TONE).

D.7 Lead SL connects to the 757A auxiliary tie trunk circuit in Fig. S. CADs 61, 65, and 68 are corrected to read S1 and CAD 68 is corrected to show the terminal numbering to agree with SD-66765-01.

D.8 VK option is added in CAD 67.

D.9 Connection information is added to Fig. 18 and CAD 36 for Rotary Out Trunk Switch Circuit.

F. Changes in CD Sections

F.1 In SECTION III, 3. CONNECTING CIRCUITS, add:

3.037 No. 608D Cord Circuit - SD-67034-01.*

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3.038 No. 608D Auxiliary Signal, Fuse Alarm, Battery Cut-Off, and Miscellaneous Circuit - SD-67039-01.*

3.039 No. 608A, 608B, or 608D AC Lamp Relay Circuit - SD-66724-01.

3.040 No. 800A Auxiliary Trunk Circuit - SD-1E027-01.

3.041 Rotary Out Trunk Switch Circuit - SD-30868-01.*

3.042 No. 608A Cord Circuit - SD-66720-01.

3.043 No. 608D Cord Circuit - SD-65832-01.

3.044 No. 608A and 608B Auxiliary Signal, Fuse Alarm, Battery Cut-Off, and Miscellaneous Circuit - SD-66722-01.

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DEPT 5333-FWW-RDW

PBX SYSTEMS
TIE TRUNK CIRCUIT
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OUTGOING MANUAL AND DIAL SELECTED AND DIAL REPEATING INCOMING PULSE REPEATING WITH OR WITHOUT E AND M LEAD SUPERVISION

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit provides a 2-way dial repeating tie trunk between two dial PBXs. It will operate on a loop basis over long ranges or with simplex, composite, single-frequency, or carrier types of signaling.

1.02 This circuit is arranged for use as a 2-wire tie trunk or to connect to a 4-wire terminating set. Pad control features have been added to this circuit, when arranged to connect to a 4-wire terminating set at tandem locations, to insure stability and minimize echo in the through-switched condition.

2. GENERAL METHOD OF OPERATION

2.01 When the trunk is seized by a station or a switchboard at an originating PBX, a seizure (off-hook) signal is transmitted to the associated tie trunk at the terminating PBX via the appropriate signaling circuit. Dial pulses from the originating station or switchboard will then be repeated to the terminating tie trunk by the local tie trunk over this signaling circuit. At the terminating tie trunk, these dial pulses are received, corrected, and repeated to the associated switching equipment in the PBX. When the call is answered at the distant PBX, and off-hook supervision is provided, this signal is transmitted to the originating PBX and repeated back to the calling station or switchboard. In this manner, dialing and supervision may be transmitted and repeated in either direction.

2.02 When arranged for via net loss transmission with 4-wire circuits, the associated pad control relays at tandem locations will operate to remove the 2-db transmission pads automatically on calls routed to a through condition via the PBX switch train. THRU jacks are provided in the switchboard multiple for calls manually switched through the PBX by an attendant. With this arrangement, the transmission pad will be removed when the attendant establishes the through-connection.

2.03 Upon seizure, both trunks (originating and terminating) will become busy and the idle circuit termination will be removed from the talking path. Joint control is established between the originating and the terminating tie trunk to reduce the unguarded interval during the disconnect sequence.

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SECTION II - DETAILED DESCRIPTION

1. OUTGOING CALLS J OR XD OPTIONS (FIG. 1 AND 16, MFR DISC.)

DIAL SELECTED

A. Seizure

1.01 When this circuit is seized, relay TR operates from ground, which is placed on lead S by the local selector or selector connector. Relay TR operated (1) transfers the transformer from the jacks of the incoming selector to the banks of the local selector multiple, (2) opens the shunt path through the primary winding of relay D from across capacitor A (YG or YH options), (3) connects battery and ground (resistance lamp A, windings of relays A and L, and contacts of relays RV and TR) to the inside of the transformer, (4) connects resistor A in series with capacitor A across the midpoint of the transformer (resistor A is shorted with relay C normal), (5) closes the operating path for relay RV under control of relay R, (6) with YF or YE option, closes a path for grounding the selector sleeve multiple at relay B, and (7) opens one of the operating paths of relay TC. Relays A and L operate over the station loop. Relay A operated transfers lead M of the associated signaling circuit from ground to battery through resistance lamp B to signal the incoming circuit at the distant PBX. Relay L operated operates relay B. Relay B operated (XE or XF option) (1) operates relay B1, (2) with ZY or YD option, closes a path for the operation of relay C when relay L releases, (3) with YF or YE option, grounds the sleeve of the selector bank multiple through one of the applique circuits, (4) connects a holding ground for relay TR, and (5) with XF option, opens the operate path of relay OP (YA option). Relay B1 operated (1) closes a part of the shunt path across capacitor A, (2) removes ground from the message register lead, (3) with ZY or YD option, operates relay B2, (4) operates relay BY in the switchboard applique circuit, (5) closes a part of the operating path of relay TC, and (6) grounds the sleeve of the selector bank multiple (YU option). Relay B2 operated (1) removes the idle-line termination from the 4-3 winding of the transformer (YU option) and (2) connects the D1 network to the pulse corrector circuit.

1.02 When Fig. B or G is provided, relay BY operated grounds the sleeve of the TALK jack and lights the BUSY lamps. When Fig. C and E are provided, relay BY operated grounds the jack sleeve through the S relay winding and operates the IL relay. When Fig. C and F are provided, relay BY operated places battery through the S relay winding on the sleeve of the jack and operates the IL relay. When Fig. D is provided, relay BY operated operates the IL relay.

B. Dialing

1.03 Relays A and L follow the pulses from the station dial. Relay B is slow to release and holds operated over the dial pulses. Relay C operates upon the release of relay L and holds over the pulses of each digit. It releases at the end of each digit and reoperates on the first pulse of the next digit. Pulses are repeated to the distant tie trunk by relay A, which grounds lead M to the associated signaling circuit each time it releases and reconnects battery to lead M when it reoperates. Relay C operated (1) with YK option, connects capacitors C and C1 across the 4-3 and 8-7 windings of the transformer to prevent dial-pulse transients from interfering with other calls in the same phantom group, (2) with Fig. 16, connects capacitor A and resistor A in series with operated contacts 1-2T of relay TR across the tip and ring and with Fig. 17, removes the AA resistor and AA capacitor from across the tip and ring to improve pulsing, and (3) short circuits the primary winding of relay D which also improves pulsing.

C. Call Answered

1.04 When the call is answered at a distant PBX arranged to provide off-hook supervision, the associated signal circuit connects ground to lead E, which operates relay R. Relay R operated connects ground to lead D through one of the applique circuits to operate relay RV. When Fig. M is provided, relay R operates relay RA which extends ground to lead D, through one of the applique circuits, to operate relay RV. Relay RV operated reverses the battery and ground toward the calling party to provide answering supervision in case the call originated in a distant PBX.

D. Disconnection

Called Party Disconnects First

1.05 When the called party disconnects, the associated signal circuit removes ground from lead E which releases relay R. The release of relay R causes relay RV to release, which restores the polarity over the tip and ring to normal to give disconnect supervision if the call originated at a distant PBX. When Fig. M is provided, relay R releases relay RA, which releases relay RV.

1.06 When the calling party disconnects, relays A and L release. Relay A released transfers lead M from battery to ground for an idle circuit condition.

1.07 Relay L released (1) operates relay C (no function) and (2) releases relay B. Relay B released releases relay C and B1. Relay B1 released (1) opens a part of the

shunt across capacitor A, (2) connects ground to the message register lead, (3) releases relays B2 and BY, (4) opens a part of the operating path of relay TC, (5) with YU option, removes the ground from the sleeve of the selector bank multiple to release the preceding switches and releases relay TR, and (6) reestablishes a part of the operate path for a relay OP when YA option is used (XF option).

1.08 Relay BY released (1) with Fig. B or G, removes ground from the sleeve of the jack and extinguishes the busy lamp, (2) with Fig. C and E, removes ground from jack sleeve and releases the IL relay, (3) with Fig. C and F, removes battery from the sleeve of the jack and releases the IL relay, and (4) with Fig. D, releases the IL relay.

1.09 Relay B2 released connects the idle line termination across the 4-3 winding of the transformer (YU option).

1.10 Relay TR released (1) transfers the transformer from the local selector banks to the jacks of the incoming selector, (2) connects a part of a shunt path across capacitor A through the primary windings of relay D (YG or YH option), (3) removes battery and ground through resistance lamp A, windings of relays A and L, and contacts of relay RV from inside the transformer, (4) disconnects resistor A from in series with capacitor A, (5) opens the operating paths of relay RV, (6) with YE or YF option, opens a path for grounding the selector sleeve multiple at relay B, and (7) closes a path for operating relay TC.

Calling Party Disconnects First

1.11 When the calling party disconnects first, relays A and L release. Relay A released transfers lead M from battery to ground as a signal through the associated signaling equipment for the distant PBX to release. Relay L released (1) operates relay C (no function) and (2) releases relay B. Relay B released (1) releases relay C and (2) transfers the holding of relay B1 under control of the signaling circuit through a make contact to ground on relay R, which is held by the ground on the E lead.

1.12 When the equipment at the distant PBX releases, ground is removed from lead E by the associated signaling circuit to release relay R. Relay R released releases relays RV and B1. Relay RV released restores the polarity of the trunk toward the calling party to normal. The release of relay B1 and following events are the same as in 1.05 through 1.10.

CALL FROM ATTENDANT

A. Fig. G (A&M Only) YN Option (552A, 552D, 556A, 605A, or 608A PBX)

Seizure

1.13 Talk Jack Operation: The attendant may plug a cord into either the talking or dial jack to make an outgoing call. If a cord is plugged into the talking jack first, relay S operates from battery and ground in the cord circuit. With option YS (for 556A or 608 A PBX) a low resistance ground is extended to the sleeve of the jack via the S diode to condition the cord circuit for providing battery and ground to the trunk circuit.

1.14 In the case of a call from a station, the battery and ground are supplied from the cord, while on a call from a trunk, the battery and ground may originate from the central office or from another trunk circuit. Relay S operated causes relay T to operate from ground on lead C1 of the talk jack. Relay T operated (1) locks operated through its own contacts to ground on lead C1, (2) grounds lead P to operate relay B1, (3) operates relay T1, (4) releases relay S, and (5) partially closes a path for the operation of relays A and L. Relay B1 operated (1) connects a shunt (winding of relay D) across capacitor A, (2) removes ground from the message register lead, (3) with YD or ZY options, operates relay B2, (4) operates relay BY, (5) with YU option, grounds the sleeve of the selector multiple to make the circuit test busy, and (6) closes the operating path to relay TC. Relay B2 (1) removes the idle line termination from the 4-3 winding of the transformer (YU option) and (2) connects the D1 network to the pulse corrector circuit.

1.15 Relay T1 operated (1) locks operated under control of relay T, (2) transfers the transformer from the incoming selector jacks to the talking jacks, (3) completes the circuit through the H resistor to operate relays A and L, (4) opens the operating path for relay TR, (5) opens the C relay operate path through the contacts of relay LU operated and relay D1 released, and (6) opens a locking path of relay OP. Relay L operated operates relay B. Relay B operated connects additional holding ground for relay B1, closes a part of the operating path for relay C, and opens the operate path of relay OP when option YA is used (option XF).

1.16 Relay A operated transfers lead M of the associated signaling circuit from ground to battery as a seizure signal to the distant tie trunk. Relay BY operated grounds the sleeve of the talk jack and lights the busy lamps.

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1.17 Dial Jack Operation (552A, 552D, 556A, or 605A PBX): When the front cord of an idle pair is plugged into the dial jack, relay DS operates over lead C in series with the cord sleeve relay to ground. Relay DS operated (1) operates relay TR, (2) provides battery to hold relay DL when it operates, and (3) connects the T and R leads of the dial jacks to the T and R of the selector multiple.

1.18 Dial Jack Operation (608A PBX): When a cord is inserted into the dial jack, ground will be extended from the jack to (1) operate relay DS and (2) provide high-resistance ground through resistor SL to the sleeve, establishing a high-sleeve condition on the cord. Relay DS operated (1) operates relay TR, (2) provides battery to hold relay DL when it operates, and (3) connects the T and R leads of the dial jack to the T and R of the selector multiple.

1.19 Dial Jack Operation (552A, 552D, 556A, 605A, or 608A PBX): Relay TR operated (1) transfers the transformer from the talk jack to the dial jack, (2) opens the shunt path across capacitor A, (3) connects battery and ground through the windings of relay A and L to the inside of the transformer, (4) connects resistor A in series with capacitor A, (5) closes the operating path for relay RV, (6) with YE or YF option, connects an additional ground from relay B to the sleeve of the selector multiple, and (7) opens an operating path for relay TC. When the talk and dial key of the cord that is plugged into the dial jack is operated, relay DL operates over the bridge across the tip and ring in the attendant's telephone and dial circuit. The cord circuit bridge also holds the A and L relays operated. Relay DL operated (1) locks operated on its secondary winding under control of relay DS, (2) short circuits its primary winding, and (3) opens the circuit through the H resistor to relays A and L.

1.20 If a cord is plugged into the dial jack first, the operation is similar to the above, with the functions of the talk and dial jack reversed in occurrence.

1.21 Relays A and L repeat the dial pulses from the attendant's dial and the circuit functions as described in 1.03.

1.22 When dialing has been completed, the dial cord is removed from the dial jack releasing relays DS, A, and L. Relay DS released (1) releases relays TR and DL and (2) disconnects the T and R leads of the dial jack from the selector multiple. Relay DL released closes the circuit to relays A and L, which reoperate. Relay TR released (1) transfers the transformer from the selector multiple to the T and R leads of the jack, (2) disconnects relays A and L from across the midpoint of the transformer, (3) opens the operating path of relay RV, (4) connects a shunt across the A capacitor, (5) disconnects the A resistor from in series with the A capacitor at the midpoint of the repeating coil, (6) closes the operate path of relay TC to ground at relay R, and (7) with YE or YF option, disconnects the additional ground on the sleeve of the selector multiple from relay B. Relay TC operated (1) operates relays LU and TO, (2) partially shunts the winding of relay LU1, and (3) with ZY or YD option, operates relay C. Relay LU operated releases relay TC, which is slow in releasing, and on releasing removes the shunt from the winding of relay LU1, which then operates in series with relay LU to remove the shunt from capacitor A. The removal of the shunt lights the supervisory lamp in the attendant's cord circuit. Relay TC released causes relay TO and C to release (no function).

Call Answered and Supervision

1.23 When the call is answered at the distant PBX, the associated signaling circuit places ground on lead E to operate relay R. Relay R operated removes ground from the winding of relay LU1 and relays LU and LU1 release. The release of relay LU1 replaces the shunt across capacitor A in the transformer, extinguishing the supervisory lamp.

1.24 The party at the distant end may flash the PBX attendant. Under this condition, ground is alternately removed and replaced on lead E by the associated signaling circuit which causes relay R to release and operate. This alternately removes and replaces the shunt across capacitor A, as described in 1.22 and 1.23, thereby flashing the supervisory lamp in the cord circuit.

1.25 The attendant at the originating end may flash the attendant at the distant PBX by plugging in and out of the talking jack. This releases and operates relay T1 through relay T and S, as described in 1.13 through 1.16. Relay T1 released and reoperated causes relay A to release and operate, which transfers lead M from battery to ground, signaling the distant PBX through the associated signaling circuit.

Disconnection

1.26 Called Party Disconnects First: When the called party disconnects, the associated signaling circuit removes ground from lead E to release relay R. The release of relay R operates LU1 which removes the shunt from across capacitor A, causing the supervisory lamp to light. When the attendant removes the cord from the talk jack, relay T releases, in turn releasing relays T1, A, and L. Relay A released connects ground to lead M for an idle circuit condition. Relay L released releases relay B, which in turn releases relay B1.

1.27 Relay B1 released (1) grounds the message register lead, (2) releases relays B2, BY, LU, and LU1, (3) removes the

ground from the selector sleeve banks. Relay BY released (1) removes ground from the sleeve of the talk jack and (2) extinguishes the busy lamp. Relay B2 released connects the idle line termination across the 4-3 winding of the transformer.

1.28 Calling Attendant Disconnects First: When the calling attendant disconnects, ground is removed from lead C1 at the jack causing relay T to release. Relay T releases relays T1, A, and L. Relay A released transfers the M lead from battery to ground to signal the distant PBX through the associated signaling circuit to disconnect. Relay L released causes relay B to release (relay C may operate until B releases, which has no function). Relay B released transfers the holding of relay B1 to relay R.

1.29 When the equipment at the distant PBX releases, the associated signaling circuit removes ground from lead E to release relay R. Relay R released releases relay B1 which functions as described in 1.26 and 1.27.

B. Fig. G and M, Flashing Recall (Special) (552A, 552D, 556A, 605A, or 608A)

Seizure

1.30 When connected to switchboards arranged for flashing recall, the circuit will function as described in A., with the exception that relays TA and RA will function to transfer the D relay bridge circuit around the pulse repeating and supervisory contacts of relays TC, TO, and LU1, thereby assuring that the supervisory bridge (shunt path across capacitor A) remains open until the called party answers.

1.31 During seizure, ground on lead C1 will operate relay TA of Fig. M in parallel with relay T. Relay TA operated transfers the D relay bridge around the pulse repeating and supervisory circuit (contacts of relays TC, TO, and LU1) and prepares the shunt path across capacitor A in series with contacts 1-2B of relay RA.

Supervision

1.32 When the call is answered at the distant PBX, the associated signal circuit places ground on the E lead to operate relay R. Relay R operates RA which (1) closes the D relay path across capacitor A and (2) provides an additional holding ground for relay B1. When the called station at the distant end flashes, a momentary open on lead E will cause relay R and RA to release and reoperate. This alternately removes and replaces the shunt across capacitor A, thereby flashing the cord circuit supervisory lamp.

Disconnection

1.33 During disconnection, the release sequence is similar to that described in E., with the exception that if the called party disconnects first, removal of ground on lead E releases relay R. Relay R released causes RA to release, which will remove the shunt from across capacitor A causing the cord circuit supervisory lamp to light. Disconnecting the cord from the talk jack will cause relay TA to release in parallel with relay T. Relay TA released transfers the D relay bridge back through the pulse repeating and supervisory relay contacts (TC, TO, and LU1).

C. Fig. C (A&M Only) YW Option (606A, 606B, or 607A PBX) Option YX (608A PBX)

Seizure

1.34 When a cord is plugged into the jack of this circuit, automatic ringing is tripped by tube TP (option YT). Relay ST operates its 6-7T and 6-7B springs from battery on the ring of the cord (option YW) or from ground on the SL lead (option YX). This partial operation of relay ST (1) closes a loop through resistor H to operate relays A and L and (2) grounds the sleeve of the jack through the winding of relay S. If Fig. E is used, relay S will operate from the positive potential on the cord sleeve, in turn operating relay SA and fully operating relay ST. Relay SA operated causes relay T to operate. If Fig. F is used, relay S will operate to resistance battery on the cord sleeve and cause relay ST to fully operate, operating relay T. Relay SA1 operates from ground on relay SA (Fig. E) or relay S (Fig. F) and locks to ground at relay T. Relay T operated (1) opens the operating circuit of relay RV, (2) transfers the transformer from the incoming selector jacks toward the talk jack, (3) with ZU option, parallels the contact of relay TR in the operating path of relay TC, (4) provides locking ground for relay SA1, (5) prepares an operating path for relay TR during dialing, and (6) with option YT, extends dial tone from the distant PBX to the cord circuit through capacitor DT.

1.35 Relay A operated transfers lead M of the associated signaling circuit from ground to battery as a seizure signal to the distant PBX. Relay L operated operates relay B. Relay B operated (1) grounds the sleeve of the selector multiple, (2) partially completes an operating path for relay C, and (3) operates relay B1. Relay B1 operated (1) shunts capacitor A with the primary winding of relay D, (2) removes ground from the message register lead, (3) operates relay B2, (4) operates relay BY, (5) completes the operating path for relay

TC, and (6) transfers the sleeve of the selector multiple from ground at relay B to relay B1. Relay B2 operated removes the idle line termination from the 4-3 windings of the repeating coil. Relay BY operated (1) operates relay IL, (2) connects ground through the winding of relay S (Fig. E) to the sleeve of the jack to hold relay S, (3) transfers the holding path of relay ST from relay S to relay SA, and (4) places resistance battery on the sleeve of the jack through the winding of relay S (Fig. F) to hold relay S operated. Relay TC operated (1) operates relays LU and TO, (2) with ZY or YD option, operates relay C, and (3) shunts the winding of relay LU1. Relay LU operated releases relay TC which permits relay LU1 to operate and releases relays TO and C. Relay LU1 operated opens the shunt through the primary winding of relay D from capacitor A. Relay IL operated (1) with ZC option, advances the idle indicating circuit and (2) with ZD option, lights the ac busy lamp. Relay SA1 operated prepares a path for the operation of relays RT and DL during dialing and locks operated under control of relay T.

Dialing

1.36 If the dial key in the cord circuit is operated and the dial is moved off normal, relay S will release causing relays DL, TR, and RT to operate. Relay RT operated (1) locks under control of relay SA1 and (2) closes the ring side of the line and shunts capacitor DT when option YT is furnished. Relay DL operated transfers relays A and L across the tip and ring of the cord circuit and then disconnects the H resistance bridge, leaving relays A and L held operated by the cord bridge circuit. Relays A and L follow the dial pulses and function as described in B. Relay S and SA (Fig. E), or relay S (Fig. F), and relay DL release between each digit. Relay TR also operates at the beginning of each digit and releases at the end of each digit, connecting resistor A in series with capacitor A to improve pulsing (see operation of relay C in B).

1.37 The cord supervisory lamp at the calling end remains lighted even though relay LU1 also operates and releases at the beginning and end of each digit since relay TR operated opens the shunt across capacitor A.

1.38 With option ZU, relay T operated operates relays TC, TO, LU, and LU1 when the trunk is seized to prevent the cord circuit from being connected to the primary winding of relay D after dialing is completed and before relay LU1 operates to change the D relay bridge to high resistance. This prevents the S relay in the cord from operating falsely if the talk and dial key is restored immediately after dialing.

1.39 Relay T operated provides an alternate path to hold relays LU and LU1 operated until relay R operates in response to the answered signal.

Manual Operation (Option XG)

1.40 When arranged for manual service on outgoing calls to a distant PBX, the circuit will function as described in 1.34 and 1.35, with the exception that relay S (Fig. F) or SA (Fig. E) also closes through the ring side of the line to the trunk. This will prepare a talking and supervisory path for the calling party after the operation of relay T.

Call Answered and Supervision

1.41 When relays DL and TR release at the end of the last digit, the tip and ring of the cord is connected through to the transformer. When the call is answered at the distant end, ground is placed on lead E by the associated signaling circuit, operating relay R. Relay R operated releases relay LU1, which closes the shunt across capacitor A and extinguishes the supervisory lamp. The party at the distant end may flash the PBX attendant. Under that condition, ground is alternately removed and replaced on lead E, which alternately releases and operates relay R. Relay R released permits relays TC, TO, LU, and LU1 to operate as described in 1.21 and 1.22. Relay LU1 operated removes the shunt from across capacitor A, lighting the attendant's cord supervisory lamp.

1.42 The attendant at the originating end may flash an attendant at the distant end by plugging in and out of the jack, the call being held from the distant end under control of relay D.

Disconnection

1.43 Called Party Disconnects First: If the distant end disconnects first, ground is removed from lead E, releasing relay R. This operates relay LU1 which removes the shunt from capacitor A, lighting the supervisory lamp. When the cord at the calling end is removed from the jack, the circuit functions as described in 1.44.

1.44 Calling Party Disconnects First: When the attendant disconnects, relay S of Fig. F or relays S and SA of Fig. E release. Relay S released operates relay DL which opens the circuit to release relays A and L. Relay A released transfers lead M from battery to ground to signal the distant PBX. Relay L released releases relay B which transfers the holding of relay B1 under control of relay R (relay C will operate until relay B releases).

1.45 When the equipment at the distant PBX releases, the associated signaling circuit removes ground from lead E to

release relay R. Relay R released causes relay B1 to release. Relay B1 released (1) opens the shunt across capacitor A, (2) grounds the message register lead, (3) releases relays B2 and BY, (4) opens the operating path of relay TC, and (5) with option YU, removes the ground from the selector sleeve bank. Relay B2 (option YU) connects the idle line termination across the 4-3 winding of the transformer. Relay BY released releases relays IL and ST. Relay IL released (1) with ZC option, restores the idle line indication and (2) with ZD option, extinguishes the busy lamp. Relay ST released releases relay T in turn releasing relay SA1, in turn releasing relay RT, which restores the circuit to normal.

D. Fig. D (A&M Only) (607B PBX)

Seizure

1.46 A cord may be plugged into either the talking or dial jack to make an outgoing call.

1.47 If a cord is plugged first into the talking jack, battery on the ring of the cord will partially operate relay TT to close springs 6-7T and 6-7B which (1) operates relay S from ground through the sleeve of the cord and (2) operates relays A and L through H resistor. Relay S operated fully operates relay TT. Relay TT operated (1) operates relay T, (2) opens the operating path of relay TR from relay B, and (3) closes the ring of the talk jack through to the T relay. Relay T operated (1) opens the operating path of relay RV and (2) transfers the tip and ring of the repeating coil from the incoming selector jacks to the talk jack. Relay A operated transfers lead M from ground to battery to signal the distant PBX through the associated signal circuit. Relay L operated operates relay B which (1) operates relay B1, (2) grounds the sleeve of the selector multiple to make the circuit test busy, and (3) partially prepares an operating path for relay C. Relay B1 operated (1) shunts capacitor A, (2) removes ground from the message register lead, (3) operates relay B2 and BY, (4) closes the operating path of relay TC, and (5) transfers the ground on the sleeve of the selector bank from relay B to relay B1 (option YU). Relay B2 operated, removes the idle line termination from the 4-3 winding of the transformer.

1.48 Relay BY operated (1) opens the ground from relay B to the sleeve of the selector bank and (2) operates relay IL which advances the idle line indicating circuit.

1.49 When the front cord of an idle pair is plugged into the dial jack, battery on the ring of the cord causes relay CT to close the 6-7T and 6-7B springs to (1) close the tip from the dial jack and (2) operate relay JS from ground on the sleeve of the cord. Relay JS operated (1) fully operates relay CT through its primary and secondary windings and (2) prepares a locking path for relay DS. Relay CT fully operated (1) operates relay TR and (2) transfers the ring of the dial jack from the secondary winding of relay CT to the primary winding of relay DS. Relay TR operated (1) transfers the transformer from the talk jack to the dial jack, (2) removes the shunt from capacitor A, (3) connects relays A and L to the dial jack, (4) connects an additional ground (relay B) to the sleeve of the selector multiple, (5) connects resistor A in series with capacitor A, and (6) opens the operating path for relay TC. When the talk and dial key in the cord circuit is operated, relay DS operates on its primary winding and locks on its secondary windings, short circuits its own primary winding, and opens the H resistor bridge, leaving relays A and L held by the cord in the dial jack.

1.50 If a cord is plugged into the dial jack first, relay CT will operate partially from battery on the ring of the cord to close 6-7T and 6-7B springs which close the tip conductor and operate relay JS from ground on the sleeve of the cord. Relay JS operated (1) fully operates relay CT and (2) prepares a locking path for relay DS. Relay CT fully operated (1) operates relay TR, (2) transfers the ring of the dial jack from the secondary winding of relay CT to the primary winding of relay DS, and (3) grounds the sleeve of the selector multiple (lead AB). Relay TR operated (1) transfers the transformer to the dial jack, (2) connects relays A and L to the dial jack, (3) connects an additional ground to the sleeve of the selector multiple (lead AG), (4) connects resistor A in series with capacitor A, (5) removes the shunt from capacitor A, and (6) opens the operating path of relay TC. When a cord is plugged into the talking jack, battery on the ring of the cord will partially operate relay TT to close 6-7T and 6-7B springs, which operates relay S from ground through the sleeve of the cord and closes the circuit through resistor H to operate relay A and L. Relay S operated fully operates relay TT. Relay TT fully operated (1) operates relay T, (2) opens the operating path of relay TR from relay B, and (3) closes the ring of the talk jack through to relay T. Relay T operated (1) opens the operating path of relay RV and (2) transfers the tip and ring of the talk jack to the contacts of relay TR. Relay A operated transfers lead M from ground to battery to signal the distant PBX through the associated signal circuit. Relay L operated operates relay B. Relay B operated (1) operates relay B1, (2) partially prepares a path to operate relay C, and (3) connects ground to the sleeve lead (lead AB). Relay B1 operated (1) removes ground from the message register lead, (2) operates relay B2 and BY, (3) closes a path for operating relay TC,

and (4) with YU option, transfers ground on the sleeve of the selector multiple from lead AB to relay B1. Relay B2 operated removes the idle line termination from across the 4-3 winding of the transformer (option YU).

1.51 Relay BY operated operates relay IL, to advance the idle line indication. The operation of the talk and dial key then operates relay DS which prepares the circuit for dialing as described above.

Dialing

1.52 Relays A and L function during dialing as described in B.

1.53 When dialing has been completed, the cord is removed from the dial jack releasing relay JS which releases relays DS and CT. Relay CT released (1) opens the tip of the dial jack,(2) releases relay TR, (3) transfers the ring of the dial jack from the primary winding of relay DS to the secondary winding of relay CT, and (4) opens the operating path of relay JS. Relay DS released closes the bridge to relays A and L. Relay TR released (1) transfers the transformer to the talk jack, (2) replaces the shunt across capacitor A, and (3) operates relay TC which results in relays LU and LU1 operating to open the shunt from capacitor A for supervision.

Call Answered and Supervision

1.54 When the call is answered at the distant PBX, the associated signaling circuit places a ground on lead E to operate relay R. Relay R operated releases relay LU1 which opens the shunt from across capacitor A to extinguish the supervisory lamp in the cord circuit.

1.55 The party at the distant end may flash the attendant. Under this condition ground is alternately removed and replaced on lead E by the associated signal circuit, which causes relay R to release and reoperate. This alternately removes and replaces the shunt across capacitor A to flash the supervisory lamp in the cord circuit.

1.56 The attendant may flash the distant PBX by plugging in and out of the talking jack. This will release and operate relay TT, which causes relay A to alternate battery and ground on lead M which signals the distant PBX over the associated signal circuit.

Disconnection

1.57 Called Party Disconnects First: When the called party disconnects, ground is removed from lead E releasing relay R, which operates relay LU1 as described in 1.26, to remove the shunt from across capacitor A, causing the supervisory lamp in the cord circuit to light.

1.58 When the attendant removes the cord from the talk jack, relay S releases which (1) releases relay TT and (2) partially closes the operate path for relay C through contacts of relays LU, S, and D1. Relay TT released (1) releases relays A, L, and T, (2) operates relay TR, and (3) connects the ring of the talk jack to the secondary winding of relay TT. Relay TR operated releases relay LU and LU1. Relay A released transfers lead M from battery to ground as an idle circuit condition to the associated signal circuit. Relay L released causes relay B to release which releases relays B1 and TR. Relay B1 released (1) connects ground to the message register lead, (2) releases relays B2 and BY, and (3) with option YU, removes the ground from the selector sleeve multiple. Relay B2 released, with option YU, connects the idle line termination across the 4-3 winding of the transformer. Relay BY released releases relay IL which restores the idle line indication.

1.59 Attendant Disconnects First: When the attendant disconnects, relay S releases releasing relay TT. Relay TT released releases relays A, L, and T and operates relay TR. Relay A released transfers lead M from battery to ground to signal the distant PBX to disconnect (through the associated signal circuit). Relay L released releases relay B and operates relay C. Relay B released (1) releases relay C and TR and (2) transfers the holding of relay B1 to relay R. When the equipment at the distant end releases, ground is removed from lead E by the associated signal circuit to release relay R. Relay R released releases relay B1. Relay B1 released (1) connects ground to the message register lead, (2) releases relays B2 and BY, and (3) with YU option, removes the ground from the sleeve of the selector bank multiple. Relay B2 released, with YU option, connects the idle line termination across the 4-3 windings of the transformer. Relay BY released releases relay IL which restores the idle line indication.

E. Fig. B (Mfr Disc.) (552A, 552D, 556A, or 605A PBX)

Seizure

1.60 A cord may be plugged into either the talking jack or the dial jack to make an outgoing call.

1.61 If a cord is plugged into the talking jack first, relay S operates from battery and ground in the cord circuit. In the case of a call from a station, the battery and ground are supplied by the cord, while

on a call from a trunk, the battery and ground may originate in the central office or in the trunk circuit. Relay S operated operates relay T from ground on the C1 lead to the jack. Relay T operated locks to lead C1 through a contact on itself, operates relays B1 and T1, and releases relay S. Relay B1 places ground on the sleeve of the switch multiple to make the circuit test busy, operates relay BY, and removes ground from this circuit to the K lead. Relay T1 transfers the transformer from the incoming switch to the talking jack and operates relays A and L through resistor H. Relay L operates relay B and relay A transfers lead M of the signaling circuit from ground to battery. Relay BY operated grounds the jack sleeve and lights the busy lamps.

1.62 When the front cord of an idle pair is plugged into the dial jack, relay DS operates in series with the cord sleeve relay to ground. Relay DS operates relay TR through a make contact to ground on relay B, or directly if A option is provided, connects the transformer to the tip and ring of the dial jack and provides battery for locking relay DL when the DL relay operates. When the TALK and DIAL key of the cord circuit plugged into the dial jack is operated, relay DL operates on its primary winding through the bridge across the tip and ring in the attendant's telephone and dial circuit. The cord circuit bridge also holds the A and L relays. Relay DL operated locks on its secondary winding, shorts its primary winding, and disconnects the H resistor, leaving the A and L relays held only by the cord circuit bridge.

1.63 If a cord is plugged into the dial jack first, the operation is similar to the above with the functions of the talk and dial jack reversed in occurrence.

Dialing

1.64 Relays A and L repeat the pulses from the attendant's dial and the circuit functions as described in B.

1.65 When dialing has been completed, the dial cord is pulled down, releasing relays DS, A, and L. The release of relay DS releases relay DL, which reoperates relays A and L, opens the tip and ring to the dial jack, and releases relay TR. The release of relay TR closes a path to operate relay TC to ground through a break contact on relay R. The operation of relay TC operates relays TO and LU. Relay LU releases relay TC. Relay TC releases slowly and, on releasing, removes a short from the winding of relay LU1 which then operates in series with relay LU to remove the bridge from capacitor A in the transformer. Removal of the bridge lights the supervisory lamp in the attendant's cord circuit.

Call Answered and Supervision

1.66 When the call is answered at the distant PBX, the associated signaling circuit places ground on the E lead, which operates relay R. The operation of relay R removes ground from the winding of relay LU1, releasing this relay and relay LU. The release of relay LU1 replaced the bridge across capacitor A in the transformer, retiring the supervisory lamp.

1.67 The party at the distant end may flash the PBX attendant. Under that condition, ground is alternately removed and replaced on lead E, which alternately operates and releases relay R. This alternately removes and replaces the bridge from capacitor A, as discussed in 1.22 and 1.23, thereby flashing the supervisory lamp.

1.68 The attendant at the originating end may flash an attendant at the distant PBX by plugging in and out of the talking jack. This releases and operates relay T1 through relays T and S, as described in 1.13 through 1.16. Relay T1 releases and reoperates relay A to transmit signals to the distant PBX.

Disconnection

1.69 Called Party Disconnects First: When the called party disconnects, ground is removed from the E lead which releases relay R. The release of relay R reoperates relay LU1, which removes the bridge across capacitor A, lighting the supervisory lamp. When the attendant disconnects, relay T releases, releasing relays T1, A, and L. The release of relay L releases relay B, which in turn releases relay B1, which releases relay BY. The release of relay BY removes ground from the jack and selector bank sleeves and extinguishes the busy lamp.

1.70 Calling Attendant Disconnects First: When the attendant disconnects, relay T releases, relay T releases relay T1, A, and L. The release of relay A places battery on the M leads to signal the distant PBX. The release of relay L releases relay B, which in turn releases relay B1. Relay B1 releases relay BY which retires the busy lamps and removes ground from the sleeves of the talking jack and selector bank.

1.71 When the equipment at the distant PBX releases, ground is removed from the E lead which releases relay R. The release of relay R restores the circuit to normal.

2. OUTGOING CALLS WD OPTION (FIG. 18 AND 19)

DIAL SELECTED

A. Seizure

2.01 When this circuit is seized, relay TR operates from ground which is placed on lead S by the local selector or selector connector. Relay TR operated (1) transfers the transformer from the jacks of the incoming selector to the banks of the local selector multiple, (2) opens the shunt path

through the primary winding of relay D from across capacitor A, (3) connects battery and ground (resistor lamp A, windings of relays A and L, and contacts of relays RV and TR) to the inside of the transformer, (4) connects resistor A in series with capacitor A across the midpoint of the transformer (resistor A is shorted with relay C normal), (5) closes the operating path for relay RV under control of relay R, (6) closes a path for grounding the selector sleeve multiple at relay B, and (7) opens one of the operating paths of relay TC. Relays A and L operate over the station loop. Relay A operated transfers lead M of the associated signaling circuit from ground to battery through resistance lamp B to signal the incoming circuit at the distant PBX. Relay L operated operates relay B. Relay B operated (1) operates relay B1, (2) closes a path for the operation of relay C when relay L releases, (3) grounds the sleeve of the selector bank multiple through one of the applique circuits, (4) connects a holding ground for relay TR, and (5) opens the operate path of relay OP (WA option). Relay B1 operated (1) closes a part of the shunt path across capacitor A, (2) removes ground from the message register lead, (3) operates relay B2, (4) operates relay BY in the switchboard applique circuit, (5) closes a part of the operating path of relay TC, and (6) grounds the sleeve of the selector bank multiple. Relay B2 operated (1) removes the idle circuit termination from the 4-3 winding of the transformer and (2) connects the D1 network to the pulse corrector circuit.

2.02 When Fig Q is provided, relay BY operated grounds the sleeve of the TALK jack and lights the BUSY lamps. When Fig. S and E are provided, relay BY operated grounds the jack sleeve through the S relay winding and operates the IL relay. When Fig. S and F are provided, relay BY operated places battery through the S relay winding on the sleeve of the jack and operates the IL relay. When Fig. R is provided, relay BY operated operates the IL relay.

B. Dialing

2.03 Relays A and L follow the pulses from the station dial. Relay B is slow to release and holds operated over the dial pulses. Relay C operates upon the release of relay L and holds over the pulses of each digit. It releases at the end of each digit and reoperates on the first pulse of the next digit. Pulses are repeated to the distant tie trunk by relay A, which grounds lead M to the associated signaling circuit each time it releases and reconnects battery to lead M when it reoperates. Relay C operated (1) connects capacitors C and C1 across the 4-3 and 8-7 windings of the transformer to prevent dial-pulse transients from interfering with other calls in the same phantom group, (2) short circuits the primary winding of relay D and the A inductor, and (3) when arranged for 2-wire operation (Fig. 19), connects capacitor A and resistor A in series with operated contacts 1-2T of relay TR across the tip and ring, or when arranged for 4-wire operation, (Fig. 21 and 4-wire terminating circuit) disconnects the AC bridge (AA resistor and associated midpoint capacitor) from across the tip and ring.

C. Call Answered

2.04 When the call is answered at the distant PBX, the associated signal circuit connects ground to lead E which operates relay R. Relay R operates relay RA. Relay RA connects ground to lead D through one of the applique circuits to operate relay RV. Relay RV operated reverses the battery and ground toward the calling party to provide answering supervision in case the call originated in a distant PBX.

D. Disconnection

Called Party Disconnects First

2.05 When the called party disconnects, the associated signal circuit removes ground from lead E, which releases relay R. The release of relay R causes relay RA to release, which in turn releases relay RV, restoring the polarity over the tip and ring to normal to give disconnect supervision if the call originated at a distant PBX.

2.06 When the calling party disconnects, relays A and L release. Relay A released transfers lead M from battery to ground for an idle circuit condition.

2.07 Relay L released (1) operates relay C (no function) and (2) releases relay B. Relay B released (1) releases relay C and B1 and (2) reestablishes a part of the operate path for relay OP when option WA is used. Relay B1 released (1) opens a part of the shunt across capacitor A, (2) connects ground to the message register lead, (3) releases relays B2 and BY, (4) opens a part of the operating path of relay TC, (5) removes the ground from the sleeve of the selector bank multiple to release the preceding switches, and (6) releases relay TR.

2.08 Relay BY released (1) with Fig. Q, removes ground from the sleeve of the jack and extinguishes the busy lamp, (2) with Fig. S and E, removes ground from the jack sleeve and releases the IL relay, (3) with Fig. S and F, removes battery from the

sleeve of the jack and releases the IL relay, and (4) with Fig. R, releases the IL relay.

2.09 Relay B2 released connects the idle line termination across the 4-3 winding of the transformer.

2.10 Relay TR released (1) transfers the transformer from the local selector lector banks to the jacks of the incoming (2) connects a part of a shunt path across capacitor A through the primary windings of relay D, (3) removes battery and ground through resistor lamp A, windings of relays A and L, and contacts of relay RV from inside the transformer, (4) disconnects resistor A from in series with capacitor A, (5) opens the operating paths of relay RV, (6) opens a path for grounding the selector sleeve multiple at relay B, and (7) closes a path for operating relay TC.

Calling Party Disconnects First

2.11 When the calling party disconnects first, relays A and L release. Relay A released transfers lead M from battery to ground as a signal through the associated signaling equipment for the distant PBX to release. Relay L released (1) operates relay C (no function) and (2) releases relay B. Relay B released (1) releases relay C and (2) transfers the holding of relay B1 under control of the signaling circuit through a make contact to ground on relay R, which is held by the ground on the E lead.

2.12 When the equipment at the distant PBX releases, ground is removed from lead E by the associated signaling circuit to release relay R. Relay R released releases relays RA and B1. Relay RA released releases RV which restores the polarity of the trunk toward the calling party to normal. The release of relay B1 and following events are the same as covered in 2.07 through 2.10

CALL FROM ATTENDANT

A. Fig. Q (552A, 552D, 556A, or 605A PBX)

Seizure

2.13 The attendant may plug a cord into either the talking or dial jack to make an outgoing call. If a cord is plugged into the talking jack first, ground is extended to the jack sleeve via the S diode. Ground on the sleeve will condition the cord circuit, where necessary, to supply battery and ground on the tip and ring to the tie trunk operating relay S. In the case of a call from a station, battery and ground are supplied from the cord. While on a call from a trunk, the battery and ground may originate from the central office or from another trunk circuit. Relay S operated causes relay T to operate from ground on lead C1 of the talk jack. Relay T operated (1) locks operated through its own contacts to ground on lead C1, (2) grounds lead P to operate relay B1, (3) operates relay T1, (4) releases relay S, (5) partially closes a path for the operation of relays A and L, and (6) transfers the D relay bridge around the pulse repeating and supervisory circuit (contacts of relays TC, TO, and LU1) and prepares a shunt path across capacitor A through contacts 1-2B of relay RA. Relay B1 operated (1) connects a shunt (winding of relay D) across capacitor A, (2) removes ground from the message register lead, (3) operates relay B2, (4) operates relay BY, (5) grounds the sleeve of the selector multiple to make the circuit test busy, and (6) closes the operating path to relay TC. Relay B2 operated (1) removes the idle line termination from the 4-3 winding of the transformer and (2) connects the D1 network to the pulse corrector circuit. Relay T1 operated (1) locks operated under control of relay T, (2) transfers the transformer from the incoming selector jacks to the talking jacks, (3) completes the circuit through the H resistor to operate relays A and L, (4) opens the operating path for relay TR, (5) opens the C relay operate path through the contacts of relay LU operated and relay D1 released, and (6) opens a locking path of relay OP. Relay L operated operates relay B. Relay B operated connects additional holding ground for relay B1, closes a part of the operating path for relay C, and opens the operate path of relay OP when option WA is used. Relay A operated transfers lead M of the associated signaling circuit from ground to battery as a seizure signal to the distant tie trunk. Relay BY operated grounds the sleeve of the talk jack and lights the busy lamps.

2.14 When the front cord of an idle pair is plugged into the dial jack, relay DS operates over lead C in series with the cord sleeve relay to ground. Relay DS operated (1) operates relay TR, (2) provides battery to hold relay DL when it operates, and (3) connects the T and R leads of the dial jacks to the T and R of the selector multiple.

2.15 Relay TR operated (1) transfers the transformer from the talk jack to the dial jack, (2) opens the shunt path across capacitor A, (3) connects battery and ground through the windings of relay A and L to the inside of the transformer, (4) connects resistor A in series with capacitor A, (5) closes the operating path for relay RV, (6) connects an additional ground from relay B to the sleeve of the selector multiple, and (7) opens an operating path for relay TC. When the talk and dial key of the cord that is plugged into the dial jack is operated, relay DL operates over the bridge across the tip and ring in the attendant's telephone and dial circuit. The cord circuit bridge also holds the A and L relays operated. Relay DL operated (1)

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locks operated on its secondary winding under control of relay DS, (2) short circuits its primary winding, and (3) opens the circuit through the H resistor to relays A and L.

2.16 If a cord is plugged into the dial jack first, the operation is similar to the above with the functions of the talk and dial jack reversed in occurrence.

2.17 Relays A and L repeat the dial pulses from the attendant's dial and the circuit functions as described in 2.03.

2.18 When the dialing has been completed, the dial cord is removed from the dial jack releasing relays DS, A, and L. Relay DS released (1) releases relays TR and DL and (2) disconnects the T and R leads of the dial jack from the selector multiple. Relay DL released closes the circuit to relays A and L which reoperate. Relay TR released (1) transfers the transformer from the selector multiple to the T and R leads of the jack, (2) disconnects relays A and L from across the midpoint of the transformer, (3) opens the operating path of relay RV, (4) connects a shunt across the A capacitor, (5) disconnects the A resistor from in series with the A capacitor at the midpoint of the transformer, (6) closes the operate path of relay TC to ground at relay R, and (7) disconnects the additional ground on the sleeve of the selector multiple from relay B. Relay TC operated (1) operates relays LU and TO and (2) partially shunts the winding of relay LU1. Relay LU operated (1) releases relay TO, which is slow in releasing, and on releasing, removes the shunt from the winding of relay LU1 which then operates in series with relay LU to remove the shunt from capacitor A. The removal of the shunt lights the supervisory lamp in the attendant's cord circuit. Relay TC released causes relay TO to release (no function).

Call Answered and Supervision

2.19 When the call is answered at the distant PBX, the associated signaling circuit places ground on lead E to operate relay R. Relay R operated (1) removes ground from the winding of relay LU1 and relays LU and LU1 release and (2) operates relay RA. Relay RA operated places the shunt across capacitor A in the transformer extinguishing the supervisory lamp.

2.20 The party at the distant end may flash the PBX attendant. Under this condition, ground is alternately removed and replaced on lead E by the associated signaling circuit, which causes relays R and RA, if provided, to release and operate. This alternately removes and replaces the shunt across capacitor A, thereby flashing the supervisory lamp in the cord circuit. If relay RA is not provided, relay LU1 controls the shunt path.

2.21 The attendant at the originating end may flash the attendant at the distant PBX by plugging in and out of the talking jack. This releases and operates relay T1 through relay T and S, as described in 2.13. Relay T1 released and reoperated causes relay A to release and operate, which transfers lead M from battery to ground, signaling the distant PBX through the associated signaling circuit.

Disconnection

2.22 Called Party Disconnects First: When the called party disconnects, the associated signaling circuit removes ground from lead E to release relay R. The release of relay R (1) releases relay RA, which removes the shunt from across capacitor A, causing the supervisory lamp to light and (2) operates the pulse correcting relays (TC, TO, LU, and LU1) which serve no function. If relay RA is not provided, relay LU1 controls the shunt path. When the attendant removes the cord from the talk jack, relay T releases, in turn releasing relays T1, A, and L. Relay A released connects ground to lead M for an idle circuit condition. Relay L released releases relay B, which in turn releases relay B1.

2.23 Relay B1 released (1) grounds the message register lead, (2) releases relays B2, BY, LU, and LU1, and (3) removes the ground from the selector sleeve banks. Relay BY released (1) removes ground from the sleeve of the talk jack and (2) extinguishes the busy lamp. Relay B2 released connects the idle line termination across the 4-3 winding of the transformer.

2.24 Calling Attendant Disconnects First: When the calling attendant disconnects, ground is removed from lead C1 at the jack, causing relay T to release. Relay T releases relays T1, A, and L. Relay A released transfers the M lead from battery to ground to signal the distant PBX through the associated signaling circuit to disconnect. Relay L released causes relay B to release (relay C may operate until B releases, which has no function). Relay B released transfers the holding of relay B1 to relay R.

2.25 When the equipment at the distant PBX releases, the associated signaling circuit removes ground from lead E to release relay R. Relay R (1) releases RA and (2) causes relays TC, TO, LU, and LU1 to operate (no function). Relay R or RA released releases relay B1 which functions as described in 2.23.

B. Fig. S, WB Option (606A, 606B, or 607A PBX) WC Option (608A PBX)

Seizure

2.26 When a cord is plugged into the jack of this circuit (1) automatic ringing from the cord circuit is tripped when tube

TP fires during the ringing cycle and (2) relay ST operates its 6-7T and 6-7B springs from battery on the ring of the cord (option WB) or from ground on lead SL (option WC). This partial operation of relay ST (1) closes a loop through resistor H to operate relays A and L and (2) grounds the sleeve of the jack through the winding of relay S. If Fig. E is used, relay S will operate from the positive potential on the cord sleeve, in turn operating relay SA and fully operating relay ST. Relay SA operated causes relay T to operate. If Fig. F is used, relay S will operate to resistance battery on the cord sleeve and cause relay ST to fully operate, operating relay T. Relay SA1 operates from ground on relay SA (Fig. E) or relay S (Fig. F) and locks to ground at relay T. Relay T operated (1) opens the operating circuit of relay RV, (2) transfers the transformer from the incoming selector jacks toward the talk jack, extending dial tone originating at the distant PBX to the cord circuit through capacitor DT, (3) parallels the contact of relay TR in the operating path of relay TC, (4) provides a locking ground for relay SA1, and (5) prepares an operating path for relay TR during dialing.

2.27 Relay A operated transfers lead M of the associated signaling circuit from ground to battery as a seizure signal to the distant PBX. Relay L operated operates relay B. Relay B operated (1) grounds the sleeve of the selector multiple, (2) partially completes an operating path for relay C, (3) operates relay B1, and (4) opens the operate path for relay OP (WA option). Relay B1 operated (1) shunts capacitor A with the primary winding of relay D, (2) removes ground from the message register lead, (3) operates relay B2, (4) operates relay BY, (5) completes the operating path for relay TC, and (6) transfers the sleeve of the selector multiple from ground at relay B to relay B1. Relay B2 operated removes the idle line termination from the 4-3 windings of the transformer. Relay BY operated (1) operates relay IL, (2) connects ground through the winding of relay S (Fig. E) to the sleeve of the jack to hold relay S, (3) transfers the holding path of relay ST from relay S to relay SA, and (4) places resistance battery on the sleeve of the jack through the winding of relay S (Fig. F) to hold relay S operated. Relay TC operated (1) operates relays LU and TO, (2) operates relay C, and (3) shunts the winding of relay LU1. Relay LU operated releases relay TC, which permits relay LU1 to operate and release relays TO and C. Relay LU1 operated opens the shunt through the primary winding of relay D from capacitor A. Relay IL operated (1) with WK option, advances the idle indicating circuit and (2) with WL option, lights the ac busy lamp. Relay SA1 operated prepares a path for the operation of relays RT and DL during dialing and locks operated under control of relay T.

Dialing

2.28 If the dial key in the cord circuit is operated and the dial is moved off-normal, relay S will release, causing relays DL, TR, and RT to operate. Relay RT operated (1) locks under control of relay SA1 and (2) closes the ring side of the line, shunting capacitor DT. Relay DL operated transfers relays A and L across the tip and ring of the cord circuit and then disconnects the H resistance bridge, leaving relays A and L held operated by the cord bridge circuit. Relays A and L follow the dial pulses and function as described in 2.03. Relay S and SA (Fig. E) or relay S (Fig. F) and relay DL release between each digit. Relay TR also operates at the beginning of each digit and releases at the end of each digit, connecting resistor A in series with capacitor A to improve pulsing (see operation of relay C in 2.03).

2.29 The cord supervisory lamp at the calling end remains lighted even though relay LU1 also operates and releases at the beginning and end of each digit, since relay TR operated opens the shunt across capacitor A.

2.30 Relay T operated operates relays TC, TO, LU, and LU1, when the trunk is seized to prevent the cord circuit from being connected to the primary winding of relay D after dialing is completed and before relay LU1 operates to change the D relay bridge to high resistance. This prevents the S relay in the cord from operating falsely if the talk and dial key is restored immediately after dialing.

2.31 Relay T operated provides an alternate path to hold relays LU and LU1 operated until relay R operates in response to the answered signal.

2.32 TOUCH-TONE® Dialing: When the associated switchboard is equipped with a TOUCH-TONE dial, no dial off-normal function exists. It is therefore necessary to provide VW optional wiring for operating the RT relay. When a cord is inserted into the tie trunk jack, the RT relay will operate and close a transmission path through the switchboard applique to the tie trunk and place a holding bridge on the A and L relays over the U and V leads. The dial and talk path is now established over the H and J leads, either towards the distant end or to a tie trunk access circuit for TOUCH-TONE to dial pulse conversion.

Call Answered and Supervision

2.33 When relays DL and TR release at the end of the last digit, the tip and ring of the cord is connected through to the transformer. When the call is answered at the distant end, ground is placed on lead E by the associated signaling circuit, operating relay R. Relay R operated

releases relay LU1, which closes the shunt across capacitor A and extinguishes the supervisory lamp. The party at the distant end may flash the PBX attendant. Under that condition, ground is alternately removed and replaced on lead E, which alternately releases and operates relay R. Relay R released operates relays TC, TO, LU, and LU1 as described in 2.17 and 2.18. Relay LU1 operated removes the shunt from across capacitor A, lighting the attendant's cord supervisory lamp.

2.34 The attendant at the originating end may flash an attendant at the distant end by plugging in and out of the jack, the call being held from the distant end under control of relay D.

Disconnection

2.35 Called Party Disconnects First: If the distant end disconnects first, ground is removed from lead E, releasing relay R. This operates relay LU1, which removes the shunt from capacitor A, lighting the supervisory lamp. When the cord at the calling end is removed from the jack, the circuit functions as described in 2.36.

2.36 Calling Party Disconnects First: When the attendant disconnects, relay S of Fig. F, or relays S and SA of Fig. E, release. Relay S released operates relay DL, which opens the circuit to release relays A and L. Relay A released transfers lead M from battery to ground to signal the distant PBX. Relay L released releases relay B which transfers the holding of relay B1 under control of relay R (relay C will operate until relay B releases).

2.37 When the equipment at the distant PBX releases, the associated signaling circuit removes ground from lead E to release relay R. Relay R released causes relay B1 to release. Relay B1 released (1) opens the shunt across capacitor A, (2) grounds the message register lead, (3) releases relays B2 and BY, (4) opens the operating path of relay TC, and (5) removes the ground from the selector sleeve bank. Relay B2 connects the idle line termination across the 4-3 winding of the transformer. Relay BY released releases relay IL and ST. Relay IL released (1) with WK option, restores the idle line indication and (2) with WL option, extinguishes the busy lamp. Relay ST released releases relay T, in turn releasing relay SA1, which releases relay RT, restoring the circuit to normal.

Manual Operation (Option WT)

2.38 When arranged for manual service on outgoing calls to a distant PBX, the circuit will function as described in 2.26 and 2.27, with the exception that relay S (Fig. F) or SA (Fig. E) also closes through the ring side of the line to the trunk. This will prepare a talking and supervisory path for the calling party after the operation of relay T.

C. Fig. R (607B PBX)

Seizure

2.39 A cord may be plugged into either the talking or dial jack to make an outgoing call.

2.40 If a cord is plugged first into the talking jack, battery on the ring of the cord will partially operate relay TT to close springs 6-7T and 6-7B, which (1) operate relay S from ground through the sleeve of the cord and (2) operate relays A and L through H resistor. Relay S operated fully operates relay TT. Relay TT operated (1) operates relay T, (2) opens the operating path of relay TR from relay B, and (3) closes the ring of the talk jack through to the T relay. Relay T operated (1) opens the operating path of relay RV and (2) transfers the tip and ring of the transformer from the incoming selector jacks to the talk jack. Relay A operated transfers lead M from ground to battery to signal the distant PBX through the associated signal circuit. Relay L operated operates relay B, which (1) operates relay B1, (2) grounds the sleeve of the selector multiple to make the circuit test busy, and (3) partially prepares an operating path for relay C. Relay B1 operated (1) shunts capacitor A, (2) removes ground from the message register lead, (3) operates relay B2 and BY, (4) closes the operating path of relay TC, and (5) transfers the ground on the sleeve of the selector bank from relay B to relay B1. Relay B2 operated removes the idle line termination from the 4-3 winding of the transformer.

2.41 Relay BY operated (1) opens the ground from relay B to the sleeve of the selector bank and (2) operates relay IL, which advances the idle line indicating circuit.

2.42 When the front cord of an idle pair is plugged into the dial jack, battery on the ring of the cord causes relay CT to close the 6-7T and 6-7B springs which (1) closes the tip from the dial jack and (2) operates relay JS from ground on the sleeve of the cord. Relay JS operated (1) fully operates relay CT through its primary and secondary windings and (2) prepares a locking path for relay DS. Relay CT fully operated (1) operates relay TR and (2) transfers the ring of the dial jack from the secondary winding of relay CT to the primary winding of relay DS. Relay TR operated (1) transfers the transformer from the talk jack to the dial jack, (2) removes the shunt from capacitor A, (3) connects relays A and L to the dial jack, (4) connects

an additional ground (relay B) to the sleeve of the selector multiple, (5) connects resistor A in series with capacitor A, and (6) opens the operating path for relay TC. When the talk and dial key in the cord circuit is operated, relay DS operates on its primary winding, locks on its secondary winding, short circuits its own primary winding, and opens the H resistor bridge, leaving relays A and L held by the cord in the dial jack.

2.43 If a cord is plugged into the dial jack first, relay CT will operate partially from battery on the ring of the cord to close 6-7T and 6-7B springs, which close the tip conductor and operate relay JS from ground on the sleeve of the cord. Relay JS operated (1) fully operates relay CT and (2) prepares a locking path for relay DS. Relay CT fully operated (1) operates relay TR, (2) transfers the ring of the dial jack from the secondary winding of relay CT to the primary winding of relay DS, and (3) grounds the sleeve of the selector multiple (lead AB). Relay TR operated (1) transfers the transformer to the dial jack, (2) connects relays A and L to the dial jack, (3) connects an additional ground to the sleeve of the selector multiple (lead AG), (4) connects resistor A in series with capacitor A, (5) removes the shunt from capacitor A, and (6) opens the operating path of relay TC. When a cord is plugged into the talking jack, battery on the ring of the cord will partially operate relay TT to close 6-7T and 6-7B springs, which operate relay S from ground through the sleeve of the cord and close the circuit through resistor H to operate relay A and L. Relay S operated fully operates relay TT. Relay TT fully operated (1) operates relay T, (2) opens the operating path of relay TR from relay B, and (3) closes the ring of the talk jack through to relay T. Relay T operated (1) opens the operating path of relay RV and (2) transfers the tip and ring of the talk jack to the contacts of relay TR. Relay A operated transfers lead M from ground to battery to signal the distant PBX through the associated signal circuit. Relay L operated operates relay B. Relay B operated (1) operates relay B1, (2) partially prepares a path to operate relay C, (3) connects ground to the sleeve lead (lead AB). Relay B1 operated (1) removes ground from the message register lead, (2) operates relay B2 and BY, (3) closes a path for operating relay TC, and (4) transfers ground on the sleeve of the selector multiple from lead AB to relay B1. Relay B2 operated removes the idle line termination from the 4-3 winding of the transformer. Relay BY operated operates relay IL to advance the idle line indication. The operation of the talk and dial key then operates relay DS, which prepares the circuit for dialing as described above.

Dialing

2.44 Relays A and L function during dialing as described in 2.03.

2.45 When dialing has been completed, the cord is removed from the dial jack, releasing relay JS which releases relay DS and CT. Relay CT released (1) opens the tip of the dial jack, (2) releases relay TR, (3) transfers the ring of the dial jack from the primary winding of relay DS to the secondary winding of relay CT, and (4) opens the operating path of relay JS. Relay DS released closes the bridge to relays A and L. Relay TR released (1) transfers the transformer to the talk jack, (2) replaces the shunt across capacitor A, and (3) operates relay TC, which results in relays LU and LU1 operating to open the shunt from capacitor A for supervision.

Call Answered and Supervision

2.46 When the call is answered at the distant PBX, the associated signaling circuit places a ground on lead E to operate relay R. Relay R operated releases relay LU1 which closes the shunt from across capacitor A to extinguish the supervisory lamp in the cord circuit.

2.47 The party at the distant end may flash the attendant. Under this condition ground is alternately removed and replaced on lead E by the associated signal circuit, which causes relay R to release and reoperate. This alternately removes and replaces the shunt across capacitor A to flash the supervisory lamp in the cord circuit.

2.48 The attendant may flash the distant PBX by plugging in and out of the talking jack. This will release and operate relay TT, causing relay A to alternate battery and ground on lead M, which signals the distant PBX over the associated signal circuit.

Disconnection

2.49 <u>Called Party Disconnects First</u>: When the called party disconnects, ground is removed from lead E, releasing relay R, which operates relay LU1 to remove the shunt from across capacitor A, causing the supervisory lamp in the cord circuit to light.

2.50 When the attendant removes the cord from the talk jack, relay S releases which (1) releases relay TT and (2) partially closes the operate path for relay C through contacts of relays LU, S, and D1. Relay TT released (1) releases relays A, L, and T, (2) operates relay TR, and (3) connects the ring of the talk jack to the secondary winding of relay TT. Relay TR

operated releases relaysLU and LU1. Relay A released transfers lead M from battery to ground as an idle circuit condition to the associated signal circuit. Relay L released causes relay B to release, which releases relay B1 and TR. Relay B1 released (1) connects ground to the message register lead, (2) releases relay B2 and BY, and (3) removes the ground from the selector sleeve multiple. Relay B2 released, connects the idle line termination across the 4-3 winding of the repeating coil. Relay BY released releases relay IL, which restores the idle line indication.

3. OUTGOING CALLS H OPTION (FIG. 1 AND 16 MFR DISC.)

3.01 The operation of an outgoing call for H option is essentially the same as that described in 1. for J or XD option, with the exception of the outward signaling of relay A and the incoming signals that operate relay R, described in 9.

4. OUTGOING CALLS WH OPTION (FIG. 18 AND 19)

4.01 The operation of an outgoing call for WH option is essentially the same as that described in 2. for WJ option, with the exception of the outward signaling of relay A and the incoming signals that operate relay R, described in 9.

5. INCOMING CALLS J OR XD OPTION (FIG. 1 AND 16 MFR DISC.)

SEIZURE

5.01 When the trunk circuit is seized at the distant PBX, ground is placed on lead E by the associated signaling circuit to operate relay R.

5.02 When YN and XE or XF options are used, relay R operated (1) operates relay B1 and (2) with option E of Fig. B or with options YA and ZZ of Fig. C, D, and G, operates relay OP, which lights the trunk lamp.

5.03 When Fig. G and M are used, relay R operates RA. Relay RA,in turn, performs the functions of relay R as stated above.

5.04 Relay B1 operated (1) connects the low resistance winding of relay D inside the transformer to prepare the incoming switch for pulsing, (2) removes ground from the message register lead, (3) operates relay B2, (4) operates the BY relay in Fig. B, C, D, or G, (5) connects ground to the sleeve of the selector multiple to make the circuit test busy (option YH), (6) connects the pulse correcting relays to the back contact of relay R, and (7) connects resistors B and C in parallel with relay TC to make that relay somewhat slow to release. Relay B2 operated, with YH option, removes the idle line termination from the 4-3 windings of the repeating coil. Relay BY operated (1) in Fig. B, with F option, grounds the sleeve of the talk jack and lights the busy lamp, (2) with Fig. C, operates relay IL, which advances the idle indicating circuit, if option ZC is furnished, or lights the busy lamp if ZD option is furnished, and grounds the sleeve of the talk jack, (3) with Fig. D, operates relay IL, which advances the idle line indication, and (4) with Fig. G, grounds the sleeve of the talk jack and lights the busy lamp.

DIALING

5.05 Dial pulses are repeated from the distant end to this circuit by the associated signaling circuit, ground being removed from lead E on each pulse. Relay R releases each time ground is removed and reoperates when ground is restored. When Fig. M is used, relay R will release and reoperate relay RA.

5.06 Relay B1 remains operated during dialing, since it is slow releasing and holds over the dial pulses. Each time relay R or RA releases, relay TC operates and locks under control of relay LU. Relay TC operated (1) operates relay TO and LU, (2) shunts relay LU1, (3) with Fig. A, C, D, and G and ZY or YD option, operates relay C, and(4) closes a contact in parallel with a break contact of relay TO to maintain the closure to the incoming switch. Relay TO operated (1) opens the contact just mentioned, (2) with ZY or YD option, connects ground to hold relay B1, and (3) with ZY or YD option, connects resistor A in parallel with capacitor A across the midpoint of the transformer. Relay C operated (1) connects capacitor C and C1 across the 4-3 and 8-7 windings of the transformer, (2) short circuits the primary winding of relay D, and (3) removes resistor A and capacitor A from across the midpoint of the transformer.

5.07 The operation of relay LU opens the circuit to relay TC and prepares a path for the operation of relay LU1. Relay TC is slightly slow to release, as it is shunted by resistors B and C, and when it releases, it opens the circuit to relay LU, releases relays TO and C, and opens the bridge to the incoming switch. If lead E is still not grounded so that relay R (or RA) is still released, relay LU holds and relay LU1 operates, in series with relay LU, to hold open the bridge to the incoming switch. If lead E has been grounded during this time, relay R will have operated, removing the ground (or if Fig. M is used, R operates relay RA, which removes the ground) and relay LU and relay LU1, if operated, will release, preparing the circuit for operating relay TC on the next pulse. Relay TO is

slow to release and when it releases, it closes the bridge, provided that relay LU1 has released. Relay C is slow to release and remains operated until the end of the digit.

5.08 With a fast dial, in the order of 10 pps or greater, relay TO remains operated during the entire digit and relay TC alone repeats the pulses to the switches. The slow release characteristic of relay TC provides a timed closure to the switches. Relay LU1 has no effect on the pulsing, even though it may or may not operate since, at the time it operates, relay TC has already opened the pulsing bridge. With a slow dial, in the order of 9 pps or less, relay TO follows the pulses. Since the release of relay TC releases relay TO at the same instant it opens the pulsing bridge, the slow releasing characteristics of relay TO provide a timed open interval for the pulses. If relay LU1 has operated during pulses, it will have released before relay TO releases and will, therefore, have no effect on the pulsing. For dial speeds between the approximate limits of 9 to 11 pps, either relay TC or TO will control the output pulse, depending upon the releasing time of the particular relay involved.

5.09 The correct pulse operates the associated switch or switches to complete the call.

CALL TO A STATION OR TO ANOTHER TIE TRUNK

A. Call Answered and Supervision

5.10 If off-hook supervision is provided when the call is answered (battery and ground reversed by the connector) since relay D is polarized, it will operate, in turn operating relay D1. Relay D1 operated (1) transfers lead M from ground to battery to signal the originating PBX, (2) closes the circuit to the secondary winding of relay D, and (3) transfers the operating ground for relay C to a holding ground for relay B1. If the called party flashes, relay D will respond to the reversals, releasing and reoperating relay D1, which repeats the supervision over lead M to the originating PBX.

B. Disconnection - Called Party Disconnects First

5.11 When the called party disconnects, battery and ground are restored to normal, releasing relay D, which releases relay D1. Relay D1 released (1) transfers lead M from battery to ground to signal the originating PBX and (2) with YD option, removes a holding ground from relay B1. (Relay B1 at this time, however, is still held operated by relay RA or R, which is held operated by ground on the E lead.)

5.12 When the calling party disconnects, ground is removed from lead E by the associated signaling circuit to release relay R. With YN option, relay R released (1) releases relay B1 and (2) operates relay TC, which operates relays TO and LU. When Fig. M is used, relay R released releases relay RA. Relay RA in turn performs the functions of relay R, as stated above.

5.13 Relay LU operated releases relay TC and prepares a path for locking in series with relay LU1. The release of relay TC opens the bridge toward the incoming switch and removes the shunt from relay LU1, which operates in series with relay LU to the ground at relay R or RA. Relay LU1 operated opens the bridge at another point. Relay B1 released (1) opens the bridge to the incoming switch at another point, (2) grounds the message register lead, (3) releases relay B2, BY, LU, and LU1, and (4) removes ground from the sleeve of the selector bank multiple with YH option. Relay B2 connects the idle line termination across the 4-3 winding of the transformer with option YH. Relay BY released (1) extinguishes the busy lamps, (2) removes ground from the talk jacks, and (3) releases relay IL, which restores the idle line indication.

Calling Party Disconnects First

5.14 When the calling party disconnects, ground is removed from lead E by the associated signaling circuit to release relay R. Relay R released operates relay TC, which operates relays TO and LU and removes a holding ground from relay B1. (Relay B1 at this time remains operated, being held by a ground through operate contacts of relay D1.)

5.15 Relay LU operated releases relay TC and prepares a path for operating relay LU1. The release of relay TC removes the shunt from relay LU1 which operates in series with relay LU and removes the short circuit from the secondary winding of relay D. The high-resistance winding of relay D causes the release of the A relay in the connector circuit or releases the supervisory relay in the tie trunk circuit, beyond.

5.16 When the connector or the trunk releases, battery and ground are restored to normal, which releases relay D, in turn releasing relay D1. D1 released transfers lead M from battery to ground to indicate an idle circuit to the originating PBX. Relay B1 released (1) grounds the message register lead, (2) releases relays B2, BY, LU, and LU1, and (3) with option YH, removes the ground from the sleeve of the selector bank multiple. Relays B2 and BY released function as described in 5.13.

5.17 With option ZY, relay D1 is held operated through a make contact of relay LU until relay B1 releases. This delays sending a disconnect signal to the distant end until B1 has released to remove the low-resistance trunk bridge from the A relay in the incoming selector. If the disconnect signal is not delayed until relay B1 releases, a pumping action between the incoming selector and the trunk results. Relay B2 acts to guard the selector bank sleeve after relay B1 releases.

5.18 With option YD, relay D1 is held operated under control of relay D. When the disconnect signal is received from the calling party, relay R releases, and in releasing, triggers the pulse corrector relays causing the release of the A relay of the incoming selector. Upon receiving the connector disconnect signal, relay D releases, releasing relay D1. Relay D1 released (1) extends the disconnect signal to the originating tie trunk, (2) removes the holding ground to relay B1, and (3) provides an operate ground for relay C through operated contacts of relay LU, during disconnect, until relay B1 releases. This operation (1) establishes joint control on disconnect between interconnected tie trunks, thereby assuring a minimum unguarded interval during disconnect, (2) eliminates a pump-on-answer condition between two tie trunks, and (3) eliminates a pump-on-disconnect condition between the terminating tie trunk and the incoming selector.

CALL TO ATTENDANT (FIG. B, MFR DISC., FIG. C, D, G, A&M ONLY)

A. Trunk Seizure

Option YN

5.19 On an incoming call, ground is placed on the E lead by the associated signaling circuit, which operates relay R. Relay R operates relay B1, which functions as described in 5.01 through 5.04 and grounds lead AC to the switchboard applique circuit.

Fig. M (Special)

5.20 If Fig. M is provided, relay R operated will operate relay RA. Relay RA will (1) prepare a supervisory path around the pulse corrector relay contacts and (2) operate relay B1, which functions as described in 5.01 through 5.04.

B. Lighting the Trunk Lamps

Manual Switchboard Only

5.21 With option E, ground on lead AC operates relay OP, which (1) lights the trunk lamp and (2) locks operated to lead AC under control of one of the following; relay T1 of Fig. B or G, relays RT1 and BY of Fig. C, or relay TT of Fig. D.

5.22 With options YA, ZZ, and XE, or YA, ZZ and XE, Fig. C, D, and G, ground on lead AC operates relay OP, which (1) lights the trunk lamp, (2) locks operated to ground at relay B1 over lead A, under control of one of the following; relay T of Fig. C, relay TT of Fig. D, or relay T1 of Fig. G, and (3) with YR option, grounds the MS lead to the power ring circuit and extends audible ring tone to the calling party via capacitor AR.

Lighting the Trunk Lamp by Dialing Zero

5.23 With F option, the incoming switch is arranged to ground lead O when the digit zero is dialed to operate relay OP, which lights the trunk lamp and holds under control of lead O.

5.24 With ZZ and ZS options of Fig. C and D, or with ZZ and ZN options of Fig. G, the incoming selector switch is arranged to ground lead O when the digit zero is dialed to operate relay OP. Relay OP operated (1) lights the trunk lamp, (2) locks operated over lead A to ground at relay B1, (3) opens the ring conductor of Fig. C and D, or opens the tip and ring conductors of Fig. G to drop the incoming selector switch, and (4) with YR option, grounds the MS lead to the power ring circuit and extends audible ring tone to the calling party via capacitor AR.

5.25 The selector switch is dropped to prevent seizing an attendant trunk if zero is dialed when both local and incoming selectors are mounted on the same shelf.

C. Call Answered

Fig. B (Mfr Disc.) or G (A&M Only)

5.26 When the attendant plugs into the talk jack to answer a call, battery and ground on the cord operate relay S. (With option YS [for 552A or 608A PBX] ground is extended to the sleeve of the jack via the S diode to condition the cord circuit to provide battery and ground for the trunk). Relay S operated causes relay T and TA (Fig. M) to operate from ground on lead C1 of the talk jack. Relay T operated (1) locks operated through its own contacts to ground on lead C1, (2) grounds lead P to hold relay B1, (3) operates relay T1, (4) releases relay S, (5) partially closes a path for the operation of relays A and L, and (6) prepares a locking path for relay T1. If Fig. M is used, relay TA operated completes the D relay bridge around the pulse correctors relay circuit, in series with operated contacts of relay RA, toward the cord.

5.27 Relay T1 operated (1) operates relays A and L, (2) transfers the trunk from the incoming selector jack to the talk jack,

(3) locks operated to relay T, (4) opens the operating path for relay TR, and (5) releases relay OP, which extinguishes the trunk lamp and removes the audible ring tone from the trunk.

5.28 Relay A operated transfers the M lead from ground to battery as a supervision signal to the originating PBX. Relay L operated causes relay B to operate, which connects holding ground to relay B1.

Fig. C, A&M Only, Option YW (606A, 606B, or 607A PBX) Option YX (608A PBX)

5.29 When the attendant plugs into the jack to answer the call, tube TP trips the automatic ring on the cord (option YT) and battery on the ring of the cord (option YW), or ground on lead SL (option YX) partially operates relay ST to close the 6-7T and 6-7B springs to operate relays A and L. (Relay S is grounded by relay BY and relay ST partially operated.) If Fig. F is used, relay S will operate from positive potential on the cord sleeve, in turn operating relay SA and causing relay ST to fully operate. If Fig. E is used, relay S operates from resistance battery on the cord sleeve, causing relay ST to fully operate. Relay S and SA operated causes relay SA1 to operate. Relay A operated transfers lead M from ground to battery to signal the originating PBX. Relay L operated operates relay B which, in turn, holds relay B1, which functions as described in 5.04. Relay ST operated operates relay T, which (1) operates relay RT, (2) transfers the tip and ring from the incoming switch toward the talk jack, (3) with F option, extinguishes the trunk lamp, and (4) with ZZ option, releases relay OP, which in turn extinguishes the trunk lamp and removes audible ring tone from the trunk (option YT). Relay BY operated advances the idle line indication.

5.30 When option E is provided, relay RT operated operates relay RT1 which releases relay OP. Relay OP released extinguishes the trunk lamp and removes audible ring tone from the trunk (option YT).

Fig. D, A&M Only

5.31 When the attendant plugs into the jack to answer a call, battery on the ring of the cord partially operates relay TT to close 6-7T and 6-7B springs, which (1) operate relay A and L through resistor H and (2) operate relay S to ground over the sleeve of the cord. Relay S operated fully operates relay TT, which (1) operates relay T, (2) opens one of the operating paths of relay TR, (3) with F option, extinguishes the trunk lamp, (4) with ZZ or E option, releases relay OP, and (5) closes the ring side to relay T. Relay OP released, with ZZ or E option, extinguishes the trunk lamp and with YT option, removes audible ring tone from the trunk. Relay T operated transfers the tip and ring of the trunk from the jacks of the incoming selector switch to the talk jack and the circuit functions as described in 5.01 through 5.04.

D. Disconnection

Calling Party Disconnects First

5.32 When the calling party disconnects, the associated signaling circuit removes ground from lead E to release relay R.

5.33 When option YN is used, relay R released operates relay TC, which in turn operates relays LU, TO, and C (ZY option) or relays LU and TO (YD option). Relay LU operated releases relay TC and operates relay LU1, which opens the shunt across capacitor A to light the cord supervisory lamp.

5.34 When Fig. M is used (with Fig. G only) relay R released will release relay RA. Relay RA released (1) opens the shunt across capacitor A to light the cord supervisory lamp and (2) operates relay TC, which in turn operates the pulse corrector relays (no function).

5.35 When the attendant removes the cord from the talk jack, all the operated relays in this circuit release and restore the circuit to normal.

Attendant Disconnects First

5.36 Fig. B, Mfr Disc. and G, A&M Only: When the attendant disconnects first, relay T releases, which releases relays A and L. In Fig. B, relay T released releases relay T1, but in Fig. G, relay T1 remains locked to lead P. Relay A released transfers the M lead from battery to ground to signal the originating PBX. Relay L released operates relay C momentarily and releases relay B. Relay B released transfers the holding of relay B1 to relay R and opens the operating path of relay C.

5.37 When the originating end disconnects, the associated signaling circuit removes ground from lead E to release relay R which in turn releases relays B1 and T1. Relay B1 released (1) removes the shunt from the A capacitor, (2) grounds the message register lead, (3) releases relays B2 and BY, and (4) with YU option, removes the ground from the sleeve of the selector multiple. Relay B2, with YU option, removes the idle line termination from across the 4-3 winding of the transformer. Relay BY released extinguishes the busy lamps.

5.38 Fig. G, A&M Only, and M, Spl: When Fig. M is used (flashing recall) the release sequence is similar to that described in 5.36 for Fig. G, except that when the attendant disconnects, relay TA releases in parallel with relay T, and when

relay R releases, it releases relay RA, which in turn releases relays B1 and T1.

5.39 Fig. C, A&M Only: If the attendant disconnects first, relay S releases. Relay S released releases relay SA and operates relays TR and DL. Relay DL operated opens the circuit to relays A and L. Relay A released removes battery from lead M, which transmits the disconnect signal to the distant end. Relay L released transfers ground for relay B1 to relay R. When ground is removed from lead E, signifying a disconnect from the distant end, relay R releases releasing relay B1.

5.40 Relay B1 released (1) grounds the message register lead, (2) releases relays B2, BY, LU, and LU1, and (3) removes the ground from the selector sleeve banks.

5.41 Relay BY released (1) removes ground from the sleeve of the talk jack, (2) extinguishes the busy lamp, and (3) releases relay ST. Relay B2 connects the idle line termination across the 4-3 winding of the transformer. Relay ST released releases relays T and SA1, relay SA1 released releases relays RT and DL.

5.42 Fig. D, A&M Only: When the attendant disconnects first, relay S releases, causing relay TT to release, which releases relays A, L, and T. Relay T released transfers the tip and ring of the trunk to the incoming selector jacks. Relays A, B, B1, B2, C, L, and R function as described in 5.35 and 5.36. Relay BY released releases relay IL, which restores the idle line indication.

6. INCOMING CALLS WJ OPTION (FIG. 18 AND 19)

SEIZURE

6.01 When the trunk circuit is seized at the distant PBX, ground is placed on lead E by the associated signaling circuit to operate relay R. Relay R, with WE or WF option, operates relay B1, and with WA option of Fig. R or S, operates relay OP, which lights the trunk lamp. When Fig. Q is used and relay RA, VX option, is provided, relay R operates relay RA. Relay RA, in turn, performs the functions of relay R stated above.

6.02 Relay B1 operated (1) connects the low-resistance winding of relay D inside the transformer to prepare the incoming switch for pulsing, (2) removes ground from the message register lead, (3) operates relay B2, (4) operates the BY relay in Fig. Q, R, or S, (5) connects ground to the sleeve of the selector multiple to make the circuit test busy, (6) connects the pulse correcting relays to the back contact of relay R, and (7) connects resistors B and C in parallel with relay TC to make that relay somewhat slow to release. Relay B2 operated removes the idle line termination from the 4-3 windings of the transformer.

6.03 Relay BY operated (1) with Fig. S, operates relay IL, which advances the idle indicating circuit if option WK is furnished, or lights the busy lamp if WL option is furnished, and grounds the sleeve of the talk jack, (2) with Fig. R, operates relays IL, which advances the idle line indication, and (3) with Fig. Q, grounds the sleeve of the talk jack and lights the busy lamp.

DIALING

6.04 Dial pulses are repeated from the distant end to this circuit by the associated signaling circuit, ground being removed from lead E on each pulse. Relay R releases each time ground is removed and reoperates when ground is restored. When Fig. Q is used, relay R will release and reoperate relay RA.

6.05 Relay RA is part of VX option and should only be applied when the attendants' cord circuits have been modified for automatic flashing recall. This modification precludes the possibility of a calling station dialing through the attendant's cord circuit, since the RA relay provides a shunt path around the pulse correcting contacts of the pulsing loop once the cord circuit is connected.

6.06 Relay B1 remains operated during dialing since it is slow releasing and holds over the dial pulses. Each time relay R or RA releases, relay TC operates and locks under control of relay LU. Relay TC operated (1) operates relay TO and LU, (2) shunts relay LU1, (3) with Fig. P. Q, R, and S, operates relay C, and (4) closes a contact in parallel with a break contact of relay TO to maintain the closure to the incoming switch. Relay TO operated (1) opens the contact just mentioned, (2) connects ground to hold relay B1, and (3) connects resistor A in parallel with capacitor A across the midpoint of the transformer. Relay C operated (1) connects capacitors C and C1 across the 4-3 and 8-7 windings of the transformer, (2) short circuits the primary winding of relay D, and (3) removes resistor A and capacitor A from across the midpoint of the transformer.

6.07 The operation of relay LU opens the circuit to relay TC and prepares a path for the operation of relay LU1. Relay TC is slightly slow to release, as it is shunted by resistors B and C, and when it releases, it opens the circuit to relay LU, releases relays TO and C, and opens the bridge to the incoming switch. If lead E is still not grounded so that relay R is still released, relay LU holds and relay LU1 operates in series with relay LU to hold

open the bridge to the incoming switch. If lead E has been grounded during this time, relay R will have operated, which removes the ground (or if Fig. Q is used, R operates relay RA, which removes the ground) and relay LU and relay LU1, if operated, will release, preparing the circuit for operating relay TC on the next pulse. Relay TO is slow to release and when it releases, it closes the bridge, provided that relay LU1 has released. Relay C is slow to release and remains operated until the end of the digit.

6.08 With a fast dial, in the order of 10 pps or greater, relay TO remains operated during the entire digit and relay TC alone repeats the pulses to the switches. The slow-release characteristic of relay TC provides a timed closure to the switches. Relay LU1 has no effect on the pulsing, even though it may or may not operate, since at the time it operates, relay TC has already opened the pulsing bridge. With a slow dial, in the order of 9 pps or less, relay TO follows the pulses. Since the release of relay TC releases relay TO at the same instant it opens the pulsing bridge, the slow-releasing characteristics of relay TO provides a timed open interval for the pulses. If relay LU1 has operated during pulses, it will have released before relay TO releases and therefore, will have no effect on the pulsing. For dial speeds between the approximate limits of 9 to 11 pps, either relay TC or TO will control the output pulse, depending upon the releasing time of the particular relay involved.

6.09 The correct pulse operates the associated switch or switches to complete the call.

CALL TO A STATION OR TO ANOTHER TIE TRUNK

A. Call Answered and Supervision

6.10 If off-hook supervision is provided when the call is answered (battery and ground reversed by the connector) since relay D is polarized, it will operate, in turn operating relay D1. Relay D1 operated (1) transfers lead M from ground to battery to signal the originating PBX, (2) closes the circuit to the secondary winding of relay D, and (3) transfers the operating ground for relay C to a holding ground for relay B1. If the called party flashes, relay D will respond to the reversals, releasing and reoperating relay D1, which repeats the supervision over lead M to the originating PBX.

B. Disconnection - Called Party Disconnects First

6.11 When the called party disconnects, battery and ground are restored to normal, releasing relay D which releases relay D1. Relay D1 released (1) transfers lead M from battery to ground to signal the originating PBX and (2) removes a holding ground from relay B1. (Relay B1 at this time, however, is still held operated by relay R or RA, which is held operated by ground on lead E.)

6.12 When the calling party disconnects, ground is removed from lead E by the associated signaling circuit to release relay R. When Fig. Q is used, relay R releases relay RA if provided. Relay R or RA released (1) releases relay B1 and (2) operates relay TC, which operates relays TO and LU. Relay LU operated releases relay TC and prepares a path for locking in series with relay LU1. The release of relay TC opens the bridge toward the incoming switch and removes the shunt from relay LU1, which operates in series with relay LU to the ground at relay R. Relay LU1 operated opens the bridge at another point. Relay B1 released (1) opens the bridge to the incoming switch at another point, (2) grounds the message register lead, (3) releases relay B2, BY, LU, and LU1, and (4) removes ground from the sleeve of the selector bank multiple. Relay B2 removes the idle line termination from across the 4-3 winding of the transformer.

6.13 Relay BY released (1) extinguishes the busy lamps, (2) removes ground from the talk jacks, and (3) releases relay IL, which restores the idle line indication.

Calling Party Disconnects First

6.14 When the calling party disconnects, ground is removed from lead E by the associated signaling circuit to release relay R. Relay R released operates relay TC, which operates relays TO and LU and removes a holding ground from relay B1. (Relay B1 at this time remains operated, being held by a ground through operated contacts of relay D1.)

6.15 Relay LU operated releases relay TC and prepares a path for operating relay LU1. The release of relay TC removes the shunt from relay LU1 which operates in series with relay LU and removes the short circuit from the secondary winding of relay D. The high-resistance winding of relay D causes the release of the A relay in the connector circuit or releases the supervisory relay in the tie trunk circuit beyond.

6.16 When the connector or the trunk releases, battery and ground are restored to normal, which releases relay D, in turn releasing relay D1. D1 released (1) transfers lead M from battery to ground to indicate an idle circuit to the originating PBX, (2) removes the holding ground to relay B1, and (3) provides an operate ground for relay C through operated contacts of relay LU, during disconnect, until relay B1 releases.

6.17 The foregoing operation establishes joint control on disconnect between interconnected tie trunks, thereby assuring a minimum unguarded interval during disconnect.

CALL TO ATTENDANT (FIG. Q, R, OR S)

A. Trunk Seizure

6.18 On an incoming call, ground is placed on the E lead by the associated signaling circuit, which operates relay R. When connected to Fig. S and R, relay R operates relay B1, which functions as described in 6.01, 6.02, and 6.03, and grounds lead AC to the switchboard applique circuit. When connected to Fig. Q, relay R operates relay RA of Fig. Q if provided, which performs the functions of relay R above, and prepares a D relay bridge path around the contacts of the pulse corrector relays.

B. Lighting the Trunk Lamps

Manual Switchboard Only

6.19 With options WA and WE, or WA and WF, ground on lead AC operates relay OP, which (1) lights the trunk lamp and (2) locks operated to ground at relay B1 over lead A under control of one of the following, relay T of Fig. S, relay TT of Fig. R, or relay T1 of Fig. Q, (3) grounds lead MS to the power ring circuit, and (4) extends audible ring tone to the calling party via capacitor AR.

Lighting the Trunk Lamp by Dialing Zero

6.20 When the incoming switch is arranged to ground lead O when digit zero is dialed, relay OP will operate. Relay OP operated (1) lights the trunk lamp, (2) locks operated over lead A to ground at relay B1, (3) opens the ring conductor of Fig. S or R, or opens the tip conductor of Fig. Q, to drop the incoming selector, and (4) grounds the MS lead to the power ring circuit and extends audible ring tone to the calling party via capacitor AR. The selector switch is dropped to prevent seizing the attendant trunk if zero is dialed when both local and incoming selectors are mounted on the same shelf.

C. Call Answered

Fig. Q

6.21 When the attendant plugs into the talk jack to answer a call, relay S operates. Ground is extended to the sleeve of the talk jack via the S diode. If the 556A switchboard is used, this ground will condition the cord circuit to extend battery and ground on the T and R of the trunk, causing relay S to operate. Relay S operated causes relay T to operate from ground on lead C1 of the talk jack.

6.22 Relay T operated (1) locks operated through its own contacts to ground on lead C1, (2) grounds lead P to hold relay B1, (3) operates relay T1, (4) releases relay S, (5) partially closes a path for the operation of relays A and L, (6) prepares a locking path for relay T1, and (7) completes the D relay bridge around the pulse corrector circuit, in series with operated contacts of relay RA, toward the cord.

6.23 Relay T1 operated (1) operates relays A and L, (2) transfers the trunk from the incoming selector jack to the talk jack, (3) locks operated to relay T, (4) opens the operating path for relay TR, and (5) releases relay OP, which extinguishes the trunk lamp. Relay A operated transfers the M lead from ground to battery as a supervision signal to the originating PBX. Relay L operated causes relay B to operate, which connects holding ground to relay B1.

Fig. S - Option WB (606A, 606B, or 607A PBX)
Option WC (608A PBX)

6.24 When the attendant plugs into the jack to answer the call, tube TP trips the automatic ring on the cord and battery on the ring of the cord (option WB), or ground on lead SL (option WC) partially operates relay ST to close the 6-7T and 6-7B springs to operate relays A and L. (Relay S is grounded by relay BY and relay ST partially operated.) If Fig. F is used, relay S will operate from positive potential on the cord sleeve, in turn operating relay SA and causing relay ST to fully operate. If Fig. E is used, relay S operates from resistance battery on the cord sleeve, causing relay ST to fully operate. Relay S or SA operated causes relay SA1 to operate. Relay A operated transfers lead M from ground to battery to signal the originating PBX. Relay L operated operates relay B, which in turn holds relay B1, which functions as described in 5.04. Relay ST operated operates relay T, which (1) operates relay RT, (2) transfers the tip and ring from the incoming switch toward the talk jack, (3) with F option, extinguishes the trunk lamp, and (4) releases relay OP, which in turn extinguishes the trunk lamp and removes audible ring tone from the trunk. Relay BY operated advances the idle line indication.

Fig. R

6.25 When the attendant plugs into the jack to answer a call, battery on the ring of the cord partially operates relay TT to close 6-7T and 6-7B springs, which (1) operates relays A and L through resistor H and (2) operates relay S to ground over the sleeve of the cord. Relay S operated fully operates relay TT, which (1) operates relay T, (2) opens one of the operating paths of relay TR, (3) releases relay OP, and (4) closes the ring side to relay T. Relay OP

released extinguishes the trunk lamp. Relay T operated transfers the tip and ring of the trunk from the jacks of the incoming selector switch to the talk jack. Relays A, L, B, and B1 function as described in 6.22 and 6.23.

D. Disconnection

Calling Party Disconnects First

6.26 When the calling party disconnects, the associated signaling circuit removes ground from lead E to release relay R.

6.27 When Fig. R and S are used, relay R released operates relay TC, which in turn operates relay LU and TO. Relay LU operated releases relay TC and operates relay LU1, which opens the shunt across capacitor A to light the cord supervisory lamp.

6.28 When Fig. Q is used, relay R released releases relay RA, if provided. Relay RA released (1) opens the shunt across capacitor A to light the cord supervisory lamp and (2) operates relay TC, which in turn operates the pulse corrector relays (no function). Relay LU1 controls the supervisory lamp when relay RA is not provided.

6.29 When the attendant removes the cord from the talk jack, all operated relays in the circuit release and restore the circuit to normal.

Attendant Disconnects First

6.30 Fig. Q: When the attendant disconnects first, relay T releases, which releases relays A and L. Relay A released transfers the M lead from battery to ground to signal the originating PBX. Relay L released operates relay C momentarily, and releases relay B. Relay B released transfers the holding of relay B1 to relay R and opens the operating path of relay C.

6.31 When the originating end disconnects, the associated signaling circuit removes ground from lead E to release relay R, which in turn releases relay RA. Relay R or RA released releases relay B1 and T1 and removes the shunt from across the A capacitor. Relay B1 released (1) grounds the message register lead, (2) removes ground from the sleeve of the selector multiple, and (3) releases relays B2 and BY. Relay B2 removes the idle line termination from across the 4-3 winding of the repeating coil. Relay BY extinguishes the busy lamps.

6.32 Fig. S: If the attendant disconnects first, relay S releases. Relay S released releases relay SA and operates relays TR and DL. Relay DL operated opens the circuit to relays A and L. Relay A released removes battery from lead M, which transmits the disconnect signal to the distant end.

Relay L released transfers ground for relay B1 to relay R. When ground is removed from lead E, signifying a disconnect from the distant end, relay R releases releasing relay B1.

6.33 Relay B1 released (1) grounds the message register lead, (2) releases relays B2, BY, LU, and LU1, and (3) removes the ground from the selector sleeve banks.

6.34 Relay BY released (1) removes ground from the sleeve of the talk jack, (2) extinguishes the busy lamp, and (3) releases relay ST.

6.35 Relay B2 connects the idle line termination across the 4-3 winding of the repeating cord. Relay ST released releases relays T and SA1. Relay SA1, in turn, releases RT, DL, and TR.

6.36 Fig. R: When the attendant disconnects first, relay S releases causing relay TT to release, which releases relays A, L, and T. Relay T released transfers the tip and ring of the trunk to the incoming selector jacks. Relays A, B, B1, B2, C, L, and R function as described in 6.32 and 6.33.

7. INCOMING CALLS H OPTION (FIG. 1 AND 16 MFR DISC.)

7.01 The operation of incoming calls with H option is essentially the same as that described in 5. for J option, with the exception of the outward signaling of relay A and the incoming signal that operates relay R, described in 9.

8. INCOMING CALLS WH OPTION (FIG. 18 AND 19)

8.01 The operation of incoming calls with WH option is essentially the same as that described in 6. for WJ option, with the exception of the outward signaling of relay A and the incoming signal that operates relay R, described in 9.

9. DESCRIPTION OF OPERATION RELAY R

H OR WH OPTION (DX METHOD)

9.01 The signaling circuit uses the same cable pair as the talking path, therefore, no filter is required to separate the signaling from the voice transmission. One wire (tip) of the pair is used for signaling and the other (ring) to compensate for differences in ground potential and partially for variations in battery voltages.

9.02 At each end of the line, a polar (R) relay with four equal windings is connected to the trunk conductors at the midpoints of the transformer. A balancing network consisting of resistance

(Fig. J) and capacitance (capacitor N or N1) is provided at each terminal between the P2 and P3 windings. The resistance of this network is adjusted to equal the conductor loop resistance plus 1250 ± 125 ohms at each end.

9.03 When the trunk is idle, the junction of the P1-P2 windings of both R relays is grounded by the A relays released. Both R relays are electrically biased to the non-operated position by their P2 and P3 windings from a negative potential (-20 volts) of the voltage divider (resistor R). Assuming no earth potential difference, there is no current flowing over either trunk conductor.

9.04 When one end is off-hook, relay A operated connects battery through the P1 winding of relay R, tip side of the trunk, to operate the distant R relay on its P1 winding to ground at its A relay. At the originating end, current in the P2 and P3 windings is reversed, tending to operate relay R, but the signal current through the P1 winding more than offsets this effect and holds relay R nonoperated.

9.05 When both ends are off-hook, both A relays operated connect battery through their respective P1 windings of relay R to the tip side of the trunk and no current flows if no earth potential is assumed. Both R relays are held operated by the battery from the A relays through their respective P2-P3 windings to ground through the voltage divider (resistor R). When earth potential differences do exist, they produce opposite and approximately equal effects in the P1 and P4 winding of each R relay and so are neutralized.

J, XD, OR WJ OPTION (E&M LEAD SIGNALING)

9.06 The E&M lead signaling circuit uses a separate path from the one used for voice transmission. The same R relay, however, associated with DX signaling, is used to receive dial pulses and supervision from the distant end on lead E. When so arranged, relay R is biased to the nonoperate position by a circuit from 48 volts through the 600-ohm portion of resistance R, windings P2 and P3, 1000-ohm portion of resistance NA, and 250 ohms of resistance L to ground.

9.07 When the near end is off-hook, relay A operates, connecting battery to lead M, which causes the associated signaling circuit at the distant end to connect ground to lead E. Ground on lead E establishes an operate path for relay R through its P4 winding and 600 ohms of resistor R to battery. Relay R operated performs the functions described in the previous pages.

9.08 When the distant end goes off-hook, its A relay operates and connects battery to lead M, causing the associated signal circuit to ground the E lead at the near end. Ground on lead E establishes an operate path for relay R through its P4 winding and 600 ohms of resistor R to battery. Relay R performs the functions described in the previous pages.

9.09 Winding P1 is not used when E&M lead signaling is provided.

10. 4-WIRE CONNECTIONS

GENERAL

10.01 4-wire termination and pad control circuit interconnections between the tie trunk and 4-wire circuit are shown schematically in BD2 and BD3.

4-WIRE CONNECTING CIRCUIT AND "THRU" JACKS (MFR DISC.) (FIG. 1, 12, 13, 14, AND 17)

A. Circuit Operation

10.02 When this trunk circuit is arranged for use with the 4-wire Terminating Set and Pad Control Circuit, the function and operation of the various relays is the same as previously described with the exceptions given below.

10.03 Relay A with H option signals the distant PBX through the P1 windings of relay R via the midpoint (simplex leg) of one of the transformers in the 4-wire circuit to operate relay R at the distant PBX instead of over the tip of the trunk.

10.04 Relay C operated (1) short circuits two windings of the transformer hybrid coil in the 4-wire terminating set to prevent singing during pulsing and (2) with option YJ, opens the short circuit from across resistor A if the pad-out relay in the 4-wire circuit is operated, and with option YK, removes the AA capacitor bridge from across the midpoint of the hybrid coil.

10.05 Relay B2 controls the idle line termination across the transformer hybrid.

10.06 Relay TR controls (1) the tip and ring of the transformer hybrid rather than the transformer, (2) the application of battery and ground through relays A and L to the midpoint of the hybrid coil rather than to the midpoint of the transformer, and (3) the shunt through the D relay to the midpoint of the transformer hybrid rather than the transformer.

10.07 Relay R is operated with H option over a path via the midpoint (simplex leg) of one of the transformers in the 4-wire circuit instead of over the tip side of the trunk.

10.08 The midpoint (simplex leg) of the other transformer in the 4-wire circuit is used to compensate for differences in ground potential and variations in battery voltage.

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

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

10.11 Resistor A is the shunt leg of a 2-db pad and the series legs are located in the 4-wire circuit.

B. Tandem Connections Via Switchboard

10.12 When this tie trunk is used with a 4-Wire Terminating Set and Pad Control Circuit, the THRU jack is connected in parallel with either the talk or answer jack depending upon which applique circuit is used.

10.13 When the attendant answers a call and it is determined that the call will be completed via another tie trunk arranged for 4-wire service (tandem switched with transmission pads out) the THRU jacks of both the incoming and outgoing tie trunks are connected by a pair of cords. The attendant then inserts another dial cord into the dial or answer jack of the outgoing trunk and dials the connection. Upon the completion of dialing, the dial cord and the first answering cord are removed from the jacks. The cords in the THRU jacks hold the equipment operated as described in 1.13 through 1.16, 1.30 and 1.31, 1.34 and 1.35, 1.46 through 1.51, 5.26 through 5.29 and 5.30, depending upon the applique circuit used.

4-WIRE TERMINATION - PAD CONTROL CIRCUIT AND "THRU" JACKS (FIG. 18, 20, 21, 12, 13, AND 14)

A. Circuit Operation - Fig. 18

10.14 When this circuit is arranged for use with 24 V-4 type repeaters, the functions and operation of the various relays of Fig. 18 are the same as previously described with the following exceptions.

10.15 Relay A with WH option signals the distant PBX through the P1 winding of relay R via the midpoint (simplex leg) of one of the repeating coils in the 4-wire circuit to operate relay R at the distant PBX instead of over the tip of the trunk.

10.16 Relay C operated (1) short-circuits two windings of the transformer hybrid in the 4-wire terminating set to prevent singing during pulsing and (2) removes the capacitor bridge from across the midpoint of the hybrid coil.

10.17 Relay B2 controls the idle line termination across the transformer hybrid.

10.18 Relay TR controls (1) the tip and ring of the transformer hybrid rather than the transformer, (2) the application of battery and ground through relays A and L to the midpoint of the hybrid coil rather than to the midpoint of the transformer, and (3) the shunt through the D relay to the midpoint of the transformer hybrid rather than the transformer.

10.19 Relay R is operated with WH option over a path via the midpoint (simplex leg) of one of the transformers in the 4-wire circuit instead of over the tip side of the trunk.

10.20 The midpoint (simplex leg) of the other transformer in the 4-wire circuit is used to compensate for difference in ground potential and variations in battery voltage.

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

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

10.23 Resistor A is the shunt leg of a 2-db pad and the series legs are located in the 4-wire circuit.

B. Pad Controls - Fig. 21

Call from One PBX to Another PBX Via A Tie Trunk

10.24 On a terminating call from one PBX to a station of a second PBX, via a tie trunk circuit, the normal post springs of the incoming selector of the called PBX will not be arranged to cause the 2-db transmission pad to be removed.

10.25 When any level is dialed which requires that the call be directed to the attendant, the incoming selector-normal post springs will be arranged to place ground on lead O of Fig. 21, causing relays DVT and TPC to operate. Relay DVT

operated grounds lead O to the tie trunk applique circuit, which results in lighting the trunk lamp and releasing the incoming selector. Relay TPC operated operates relay PO, which removes the transmission pad, but upon the release of the incoming selector, relays TPC, DVT, and PO are released. Relay PO released inserts the transmission pad.

Tandem Connections

10.26 When a call comes to an intermediate PBX from a tie trunk and the call is to be completed via another tie trunk to a third PBX (tandem switched, with transmission pads out) the normal post springs of the incoming selector are adjusted to place a resistance ground on lead O of Fig. 21 associated with the incoming circuit. Relays DVT and TPC are connected in series to lead O, but the resistance ground will only operate relay TPC. Relay TPC operated operates relay PO, which removes the 2-db transmission pad in the incoming circuit. As soon as the incoming selector completes the circuit through its banks, relay TSP of Fig. 21, associated with the outgoing circuit, will operate, causing its associated relay PO to operate, which removes the 2-db transmission pad in the outgoing circuit.

Attendants THRU Jacks (Fig. 12, 13, and 14)

10.27 When this tie trunk is used with a 4-wire terminating set or 24 V-4 repeater, the THRU jack is connected in parallel with either the TALK or ANSWER jack, depending on which applique circuit is used.

10.28 On incoming calls to the attendant, the circuit functions as described in 6.18 through 6.20. When it is determined that the call will be completed via another tie trunk arranged for 4-wire service (tandem-switched with transmission pads out) the THRU jacks of both the incoming and outgoing tie trunks are connected by a pair of cords. As soon as the loop is complete, relays ASP in both circuits operate, causing the associated PO relays to operate, which removes the transmission pad in each circuit. The attendant then inserts another dial cord into the dial or answer jack of the outgoing trunk and dials the connection. Upon completion of dialing, the dial cord and the first answering cord are removed from the jack.

10.29 The cords in the THRU jacks hold the equipment operated, depending upon the applique circuit used.

SIGNALING

10.30 DX signaling from the tie trunk circuit is passed on a simplex basis to the 4-wire trunk. The simplex path is through either the transmit or receive loop associated with the 4-wire terminating set.

11. JACKS A, B, C, AND D

11.01 These jacks are provided to facilitate making the circuit busy and for making various tests.

12. MAKING TRUNK BUSY

12.01 A dummy jack placed in jack C will transfer lead M from ground to battery, and with Fig. B, C, or D, operate BY. BY makes the circuit test busy by grounding the sleeves of the selector multiple and the talking jacks and by lighting the busy lamps, if they are provided by Fig. B. Battery on lead M causes the circuit at the distant PBX to make the trunk busy. When Fig. A is provided, the C jack directly grounds the selector bank multiple.

13. PERCENT BREAK TESTS

PULSE CORRECTING RELAYS

13.01 Percent break tests of the pulse correcting relays may be made by patching jack SW of the pulsing test circuit to jack C of the trunk. The output of the pulse corrector may be measured by patching jack B of the trunk to jack PLS CHK of the pulse repeating test set. The 4B contact of the TO relay should be insulated in order to remove the D1 network while making pulse repeating tests. The LU1 and D1 shall be blocked nonoperated.

13.02 With the patching cord plugged into jack B, the incoming switch is cut off and B1 is operated from the local contact to ground on the jack. B1 closes the bridge inside the repeating coil and prepares a path for operating the pulse correcting relays. The output of the pulse corrector is measured at the tip and ring of jack B. The tip of jack C is grounded and ring is connected to the pulse correcting relays, which repeat the pulses from the pulsing test set.

14. HAND TELEPHONE TEST SET

14.01 A connection in the distant PBX may be set up by plugging a hand telephone test set into jack A and dialing the desired number. The talking circuit is closed through to permit conversation under this condition.

15. TESTING R RELAY

15.01 The D jack is provided for testing and readjusting the R relay. Current flow tests may be made as indicated in the Circuit Requirements table.

16. ALL-TRUNKS-BUSY REGISTER

16.01 When all circuits in a group are busy, all of the B1 relays will be operated, thus removing ground from the K lead. That causes the all-trunks-busy register to score.

17. IDLE INDICATING LAMPS ZC WIRING OF FIG. C (A&M ONLY) OR WK WIRING OF FIG. 5

17.01 When ac idle indicating lamps are provided, the operation of the IL relay removes battery from this circuit to the idle trunk indicating circuit. The idle indicating circuit causes the idle indicating lamp corresponding to the trunk seized to be retired and the lamp corresponding to the next available trunk to be lighted. When the IL relay is released, battery is again provided to the idle indicating circuit, permitting the lamp to be lighted when the trunk again becomes the next available.

17.02 When dc idle indicating lamps are provided, the operation of the IL relay extinguishes the IND lamp and furnishes the next released IL relay battery to light the associated IND lamp. When the IL relay releases, the IND lamp of this circuit lights, if it is the lowest numbered circuit with a released IL relay.

18. USE WITH SIGNAL LEADS EXTENSION CIRCUIT

18.01 When the carrier, CX, or SF signaling circuit is not located close to this circuit, no additional equipment is required to operate with a signal leads extension circuit located at the signaling circuit end. H option enables this circuit to operate with a signaling circuit end of the signal leads extension circuit.

19. MISCELLANEOUS

APPARATUS

19.01 Resistance LU is provided to make LU1 and LU slightly slow to release, so that they will not release falsely due to a momentary release of relay R caused by a contact chatter on the pulsing relay in the associated signaling circuit. The false release of LU would cause the circuit to transmit an extra pulse.

19.02 Resistor A, which is bridged in series with capacitor A across the tip and ring during outward dialing, is provided to protect the contacts in the attendant's dial. Without the resistance, the dial would place a direct short circuit across the condenser. The same applies on calls from stations on which the loop resistance is low.

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

19.04 Resistor IL provides a termination for a telephone repeater to prevent repeater singing when the circuit is idle.

19.05 When single-frequency signaling is used, varistors T and R are provided to stop the transmission of clicks caused by the break of the first pulse in each digit. If the varistors were not provided, these clicks would cause intolerable distortion in the first pulse of each digit. The C relay does the same job on the subsequent pulses in each digit.

19.06 The N network is provided to prevent kickoff of relay R when pulses are sent out.

OPTIONS

19.07 Prior to Issue 13B of the SD, various options were added to provide additional features and corrections. As a matter of record, the following options were added.

19.08 In Fig. C and D, option ZS was previously added for the purpose of opening the ring conductor to drop the incoming selector when the attendant digit 0 was dialed. The fault introduced by this change was, with F option, relay OP would operate from ground on lead O to signal the attendant, but as soon as relay OP operated, the incoming selector would release, removing ground from lead O. Relay OP would then release, extinguishing the trunk lamp.

19.09 This was corrected by adding option ZZ and rating option E and F as Mfr Disc. Option YA replaced option E and relay RT1 was no longer required in Fig. C.

19.10 In Fig. G, option ZN was previously added to release the incoming selector when the attendant's digit 0 was dialed by opening the ring conductor. A part of options F and ZN caused relay OP to operate from ground on lead P on every incoming call which signaled the attendant; and with E option, relay OP had a race condition on lock-up from relays B1 and BY.

19.11 To correct these conditions, option ZQ was removed, option ZM and ZN changed, options ZZ and YA added, and options E and F rated Mfr Disc.

19.12 Relay OP was changed to a code which was faster operating and had contacts to open the tip and ring conductors.

19.13 With these changes, relay OP would not operate on every incoming call, would be locked up under control of relay T1 when the attendant's digit was dialed, and with option YA, would operate fast enough to lock up before relay BY operated.

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19.14 Option ZU was added in Fig. 1 and C to delay closure of the tip and ring after dialing to prevent a false flashing recall signal when called party answered.

19.15 Option ZY was added in Fig. 1 to prevent a pumping action between the incoming selector and the tie trunk when the calling party disconnected first.

19.16 Option ZP was added in Fig. 1 to prevent shunting SV relay in one connected-recorded telephone dictation trunk.

19.17 The following options are added to Fig. 1, 16, 17, C, D, or G to provide for modification or addition of features to one existing tie trunk circuit.

19.18 Wiring option YD is added to Fig. 1, A, C, D, and G, superseding option ZY to (1) clear a pumping condition between tie trunks when the called station answers and (2) establish the pulsing path for an incoming tie trunk calling party to dial through the jack circuit.

19.19 Wiring option YF is added to Fig. C to prevent a lock-up condition when used with the 607A or 608A switchboard during attendant signaling, or when the attendant changes cords during an established connection.

19.20 Wiring option YH is added to Fig. 1 to clear a lock-up and pumping condition on disconnect, when used with 607A or 608A switchboard when the attendant disconnects.

19.21 Option YK is added to Fig. 1, 16, and 17 to improve pulsing and reduce transients during dialing. The D1 network capacitor is changed to 0.5 uf and capacitors C and C1 are added in series with the shunt path across the transformer to reduce interdigital clicks and pulse transients during dialing.

19.22 Wiring option YL is added as an additional strapping option to the NC resistor of Fig. J to permit balance network adjustment for loops less than 1000 ohms, when arranged for DX signaling.

19.23 The N capacitor is provided as YM option to allow for proper balance network adjustment, ie, when DX signaling leads are connected on a simplex basis over a 4-wire network, the reactive impedance of the line may require the removal of the N or N1 capacitor (refer to Notes 117 and 311).

19.24 Relays RA and TA are provided in Fig. M for use with Fig. G when associated switchboards are arranged for flashing recall.

19.25 Option YR is added to switchboard applique circuit, Fig. C, D, and G, to provide for audible ring tone to the trunk when the distant station dials the operator.

19.26 Option YT is added to Fig. C to provide for tripping the automatic ring from the cord circuit on outgoing calls from the switchboard and to provide dial tone to the attendant when the incoming selector at the distant end is seized.

19.27 YX option is added to Fig. C and E to provide for use with the 608A switchboard.

19.28 Wiring option YU is added to Fig. 1 to reduce the unguarded interval to the switchboard on disconnect of a call originated by a local station.

19.29 YY option is added to Fig. 16, changing the value of the A capacitor to 1 uf to improve return loss in transmission and reduce a pulse transient toward the incoming selector on disconnect.

19.30 Wiring option XA is added to Fig. C to provide the busy lamp feature when used with the 608A switchboard.

19.31 Option XB is designated and is for use with the 4-Wire Terminating Set and Pad Control Circuit, SD-65789-01. Option XC is added for use with the 24 V-4 telephone repeater (a) tandem location when Fig. 21 is furnished or (b) when provided at a terminal location.

19.32 Wiring option XD is added to Fig. J to provide higher voltage on lead E to permit proper operation of the 18B toll testboard test circuit when testing the trunk.

19.33 YS option is added to Fig. G to provide for two-jack operation of 608A switchboard.

19.34 ZF option is added to Fig. G to provide sleeve ground through diode S to the talk jack to activate the cord circuit when associated with the 556A switchboard.

19.35 Option XF is added to Fig. 1 to eliminate false operation of switchboard line lamp on outgoing station selected calls, when local tie trunk is arranged to route incoming calls directly to switchboard (YA option) and distant tie trunk is connected to equipment arranged to send back immediate delay-dial polarity on seizure.

19.36 Wiring option XG is added to Fig. E and F to provide for automatic cut-through of the ring side of the line when the trunk is connected to a manual PBX at the distant end.

19.37 Fig. 18, 19, 20, 21, Q, R, and S, and their associated options, are provided as new circuit figures and options, replacing the Mfr Disc. and A&M Only figures and options.

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SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Station pulsing and supervision maximum conductor loop resistance, 1500 ohms. Minimum insulation resistance, 15,000 ohms.

1.02 Trunk pulsing and supervision, maximum conductor loop resistance, 5000 ohms. Minimum insulation resistance, 30,000 ohms.

2. FUNCTIONAL DESIGNATIONS

None.

3. FUNCTIONS

OUTGOING CALLS

3.01 When this circuit is seized by a selector or selector connector or when a cord is plugged into the talking jack or dial jack:

(a) To ground the sleeve of the selector multiple.

(b) To ground the sleeves of the talking jacks and THRU jacks, when provided.

(c) To light the busy lamps or extinguish idle indicating lamps.

(d) To signal the PBX at the distant end of the trunk.

(e) To disconnect the incoming selector from the trunk.

3.02 To repeat dial pulses to the signaling circuit or to the distant PBX.

3.03 To furnish a talking path.

3.04 To furnish transmitter battery to the calling station on dial selected calls.

3.05 To provide answering supervision.

3.06 To hold under joint control of the calling and called parties.

3.07 To remove the idle line termination when this circuit is seized.

3.08 To provide DX, E&M lead, or SF types of signaling.

3.09 To connect to a 4-wire termination set or 24 V-4 terminal repeater.

3.10 To short the transformer hybrid during signaling.

3.11 To provide THRU jacks when used with a 4-wire circuit.

3.12 To provide pad control at tandem locations.

INCOMING CALLS

3.13 When this circuit is selected at the distant end:

(a) To ground the sleeve of the selector multiple.

(b) To ground the sleeves of the talking jacks and THRU jacks, when provided.

(c) To light the busy lamps or extinguish the idle indicating lamps.

(d) To seize the incoming selector.

(e) To correct and repeat the dial pulses from the signaling circuit of the distant PBX to the incoming selector.

(f) On a call to a station or to another tie trunk, to repeat supervision from the called party to the originating end.

3.14 On a call to the attendant:

(a) To light the trunk lamps.

(b) To provide audible ring tone to the calling party.

(c) To release the incoming selector.

(d) To retire the line lamps when the attendant answers the call.

(e) To furnish supervision to the originating end.

(f) To lock out the line lamps, if the attendant disconnects first.

(g) To permit the calling party to dial through the cord circuit when a connection suitable for this type of operation has been established by the attendant. Through-dialing of this type cannot be done when Fig. Q is provided with VX option where the cord circuits have been modified per ES-65440-01 rated Special for the application of automatic flashing recall. Neither can through-dialing of this type be accomplished when in-band signaling facilities are used regardless of the type of switchboard in use.

3.14 To hold under joint control of the calling and called parties.

3.15 To provide means for making the circuit test busy at both ends of the trunk.

3.16 To provide means for making percent break tests of the pulsing features of the circuit.

3.17 To provide for the operation of an all-trunks-busy register.

3.18 To provide a balance for an associated telephone repeater while the tie trunk is idle.

4. CONNECTING CIRCUITS

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

(a) First Selector Circuit - SD-66359-01 (typical).

(b) Selector Connector Circuit - SD-65721-01.

(c) Incoming Selector - SD-66360-01 (typical).

(d) Incoming Connector - SD-66049-01 (typical).

(e) Cord Circuit - SD-66198-01 (typical).

(f) Type B CX Signaling Circuit - SD-95048-01 (typical).

(g) Night Alarm Circuit - SD-66653-01 (typical).

(h) Buzzer Circuit - SD-66914-01 (typical).

(i) Traffic Register Circuit - SD-65774-01 (typical).

(j) 24 V-4 Telephone Repeater Circuit - SD-97047-01.

(k) Pulsing Test Set Circuit - SD-31481-01 (typical).

(l) Pulse Repeating Test Circuit - SD-31667-01 (typical).

(m) Tie Trunk Circuit at Distant PBX - SD-65718-01 (typical).

(n) Idle Trunk Indicating Circuit - SD-66657-01 (typical).

(o) N1 Carrier Application Schematic - SD-95121-01 (typical).

(p) Signaling 2400- or 2600-Cycle Single-Frequency Signaling Circuit - SD-56292-01.

(q) Simplex Signaling Circuit - SD-95051-01.

(r) Repeating Coil Circuit - SD-95492-01.

(s) Power Supply for AC Idle-and Busy-Line Indicating Lamps - SD-80770-01.

(t) Line, Link, and Marker Circuits - SD-65741-01.

(u) 4-Wire Terminating Set and Pad Control Circuit - SD-65789-01.

(v) 4-Wire Terminating Circuit - SD-97138-01.

(w) 757A Auxiliary Tie Trunk Circuit - SD-66765-01.

(x) Tie Trunk Access Circuit - SD-1E034-01.

(y) Tie Trunk Access Circuit - SD-1E052-01.

(z) Tie Trunk Access Circuit - SD-1E053-01.

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 In SECTION III, 3. FUNCTIONS, (g) has been revised to indicate that a calling party cannot dial through a cord circuit when the tie trunk circuit switchboard applique, Fig. Q, is wired with VX option. It has also been revised to indicate that it is not possible to dial through the cord circuit of any type switchboard when in-band signaling facilities are used.

D. Description of Changes

D.1 Wiring options VX and VY are added in Fig. Q so that the RA relay, VX option, can be applied only when the 552A, 552D, 556A, or 605A switchboard cord circuits have been modified on a Special basis for automatic flashing recall. Note 125 is added to specify this application. The trunks equipped, per Fig. Q, should normally be wired with VY option.

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