

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

195 BROADWAY, NEW YORK, N. Y. 10007

DRAWING NOTICE

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TITLE

Common Systems Station Ringer Test Circuit For Crossbar No. 1 Or Panel Office Or Comb. Crossbar No. 1 And Panel Office Having Senders Equipped With 239 Or 280 Type Pulsing Relays, Individual, 2 Party Selective And 4 Party Selective Or Semi-Selective Lines

DESCRIPTION

6.1 Replacement Of Mfr. Disc. Apparatus.

- (a) FUNCTIONAL DESCRIPTION OF CHANGE: This change provides more economical and standard rated apparatus as replacements for more expensive and Mfr. Disc. apparatus.
- (b) EXTENT OF CHANGE: No change on existing circuits is required.
- (c) COORDINATING CIRCUIT CHANGES: None.
- (d) EQUIPMENT INFORMATION: Affected, covered by WE drawings J93006T-(), J93006L-().
- (e) EQUIPMENT DESIGN REQUIREMENTS: Not affected.

6.2 This change covers only manufacturing change.

6.3 Supplementary Information

- (a) DIRECT CURRENT DRAIN DATA: Current Drain is decreased.
- (b) ALTERNATING CURRENT DRAIN DATA: Is not affected.

COMMON SYSTEMS
 STATION RINGER TEST CIRCUIT
 FOR CROSSBAR NO. 1 OF PANEL OFFICE
 OR COMB. CROSSBAR NO. 1 AND PANEL OFFICE
 HAVING SENDERS EQUIPPED WITH 239 OR 280 TYPE
 PULSING RELAYS, INDIVIDUAL, 2 PARTY SELECTIVE
 AND 4 PARTY SELECTIVE OR SEMI-SELECTIVE LINES

CHANGES

B. Changes in Apparatus

<u>B.1</u>	<u>Superseded</u>	<u>Superseded By</u>
	A Diode 420A - Fig. 5, ZN Option	A Diode 459B - Fig. 5, ZP Option
	B Diode 420A - Fig. 5, ZN Option	B Diode 459B - Fig. 5, ZP Option
	Station Ringer Test Lamp 2G - Fig. 4	Station Ringer Test Lamp A3 - Fig. 4
	+9V Lamp 2Y - Fig. 6	+9V Lamp M1 - Fig. 6
	TL Lamp 2Y - Fig. J	TL Lamp M1 - Fig. J
	TL Lamp 2Y - Fig. I	TL Lamp M1 - Fig. I

Superseded (Cont)

Superseded By

L Jack 242B - Fig. 1	L Jack 242AX - Fig. 1
T Jack 291B - Fig. 1	T Jack 291A - Fig. 1
EP Jack 238A - Fig. 5	EP Jack 238AX - Fig. 5
VM- Jack 238A - Fig. 5	VM- Jack 238AX - Fig. 5
VM+ Jack 238A - Fig. 5	VM+ Jack 238AX - Fig. 5
I- Jack 239C - Fig. 5	I- Jack 239CX - Fig. 5
I+ Jack 239C - Fig. 5	I+ Jack 239CX - Fig. 5

D. Description of Changes

D.1 The apparatus changes detailed in B.1 have been made to reflect manufacturing changes.

BELL TELEPHONE LABORATORIES, INCORPORATED

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WE DEPT 367-DWW-EER-PN

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PULSING RELAYS, INDIVIDUAL, 2 PARTY SELECTIVE
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SECTION I - GENERAL DESCRIPTION

1. SEIZURE

1.01 When a ringer test, dial test or TOUCH-TONE frequency test of a subscribers station is required, a maintenance employee at the station dials or keys a station ringer test code. A connection is made by the central office equipment to an office link and connector circuit in cross-bar offices or to a district or office multiple in panel offices on which the station ringer test circuit selected appears. The circuit times to allow the subscribers sender to complete its functions and then advances the P selector to position 1 and a second dial tone is sent to the subscribers station. When this circuit is equipped to test TOUCH-TONE subscribers stations, dial tone is sent from a TOUCH-TONE frequency test receiver which is selected when the P selector is in position 1. A metallic talking path to the district circuit gives the station ringer test circuit supervisory control of the linkage.

2. DIAL TEST

2.01 When a maintenance employee receives dial tone for the second time and wishes to make a dial test, a 2, 3, 4, or 5 is dialed; stepping the P selector to position 3, 4, 5, or 6, respectively. At the completion of dialing, when the selector stops in one of these positions, a 51-type dial test circuit is seized. When dial tests are completed, the maintenance employee places the handset on the switchhook, releasing the dial test circuit which signals the station ringer test circuit, causing it to release and restore itself to its normal condition.

3. PARTY TEST AND RINGER IDENTIFICATION

- 3.01 When a ringer test is required, the maintenance employee dials a 6, 7, 8, or 9 as required. The P selector steps to 7, 8, 9, or 0. See Table I.
- 3.02 A test for ground is made on the line. If ground is present, coin return potential is applied and a second ground test is made. The second test identifies the type of ringer at a party line subscribers station. An interrupted high tone is returned to the subscribers station identifying the type of ring installed. See Table I. No ringer identification test is made on individual message rate lines.
- 3.03 The ringer at the subscribers station may be tested for bell tap at this time. A maintenance employee may dial and listen for bell tap without advancing the station ringer test circuit.
- 3.04 The handset is then placed on the switchhook. The circuit tests for the presence of ground on the tip and ring conductors. If the call is from a coin line, coin refund potential is applied to the line and the line is retested for ground. If ground is present with handset on switchhook, the ringing current flowing through the line is interrupted 60 times per minute. If no ground is present, normal ringing is heard at the subscribers station.
- 3.05 When the handset at the station under test is removed from the switchhook, the ringing is tripped at the station ringer test circuit. If the handset remains off hook, dial tone is received again, and tests may be repeated. If handset is placed on switchhook, the circuit disconnects.

TABLE I

Sub Sta Class	Pos PSA	Ring Control Relays Oper	Signal Returned	
			1000Ω Ringer	2550Ω Ringer
1 MR	7 (No Fig. 5)		High Tone	-
PTY 1	7)		60-IPM High Tone	120-IPM High Tone
P 2	8) (Fig. 5)	RV	60-IPM High Tone	120-IPM High Tone
3	9)	P	60-IPM High Tone	120-IPM High Tone
4	0)	RV P	60-IPM High Tone	120-IPM High Tone

SECTION II - DETAILED DESCRIPTION1. SEIZURE

1.01 When an outside maintenance employee at a subscribers station tests a dial or a TOUCH-TONE station, he dials or keys a certain two- or three-digit code which causes a connection to be completed to one of a group of ringer test circuits for testing ringers and connecting to the 51-type dial tester circuit, or a TOUCH-TONE frequency test circuit. When this circuit is seized ground from the office link circuit is connected to the S1 lead in crossbar offices or from the district or office selector to the S lead in panel offices holding this circuit busy. When the fundamental circuit is closed on trunk guard test, a circuit is closed from battery through L relay P winding and (if Fig. H is used P winding of DT repeating coil) L2 relay winding or (when Fig. A or C are used) through L3 relay winding over the ring through the sender, back over the tip to ground through winding of DT repeating coil. If the call is from a subscriber in a panel office or from a noncoin subscriber in a crossbar office relay L2 will operate, but if Fig. A or C are used and the call is from a coin line in a crossbar office relay L3 will operate. (Coin lines in panel offices are handled the same as noncoin lines.) Relays L and L2 or L3 will operate in series with TG relay of the sender. The operation of the L2 or L3 relay will operate the TG relay which locks through relay STL normal to ground on relay RN normal. The operation of relay TG operates relay RA, relay TGI through B contact of TG interrupter, and if the L3 relay is operated, operates relay CN, Fig. A or C. Relay CN locks to its operate ground. The TGI relay locks under control of the TG relay and short circuits the L2 or L3 relay winding, releasing the operated relay. The TG relay also closes the circuit for the biasing winding of the L relay and grounds the S and S1 leads to hold the district and the connection. The operation of TGI relay completes the circuit for operating the CTI relay, when the F contact of the TG interrupter makes. Relay CTI operated, locks under control of the TG relay and operates relays SR and L1 from ground through contacts of TGI relay, and maintains the short circuit around the L2 or L3 relay winding. Relay L1 operated releases relay RA. Relay SR operated, steps selector P from normal to position 1. With the selector off-normal, ground from arc RN operates relay G which operates relay G1. Relay G1 operated, operates relay CT and replaces ground from TG relay to hold the biasing winding of L relay

and the locking circuit of CTI relay closed. Relays G and CT hold ground on the off-normal ground leads. Relay CT operated starts the timing circuit by grounding INT lead. Relay G1 holds ground on S and S1 leads, holding the connection and maintaining a busy trunk condition. Relay CT operated, operates relay ST from ground through arc RV and normal contacts of RA and RN relays. Relay ST locks under control of relay CT, and operates the STL relay through the operated contacts of relays C and SR. The operation of relay STL closes the circuit from the back contact of L relay to P stepping magnet, connects the PH relay winding to the back contact of P selector and with ZF option grounds lead ST to the TOUCH-TONE frequency test connector, starting the seizure of a TOUCH-TONE frequency test receiver. It also releases the TG relay in turn releasing the TGI relay. The TGI relay released, removes a ground that can hold the L1 and SR relays, placing these relays under control of the L relay. In position 1 relay SS operates from ground through arc CL. The operation of relays STL and SS closes a tone through, S winding Fig. G, or T winding Fig. H, of DT coil to ground at relay SS. With ZF wiring this tone comes from the TOUCH-TONE test circuit. The seizure of the TOUCH-TONE test circuit is explained in 3.

2. DIALING

2.01 The tone through the S or T winding of the repeating coil DT induces a tone in the P winding which is audible at the station under test and is the signal to dial a single digit. The W and ZC wiring and apparatus is special for New York Telephone Company and it increases the volume of tone and prevents the removal of tone in the ringer test position. The particular digit dialed depends upon the test it is desired to make. Relay L is a polarized relay and operates on its primary winding over the subscriber loop. The L relay secondary winding, which is in series with a capacitor, reinforces the primary winding and makes its operation and release quicker and more energetic. The tertiary winding of the L relay biases it, and tends to keep its armature on the back contact. Relay L1 operates and releases with L relay, providing additional contacts. Relay SR operated by relay L, holds operated during the momentary releases of the L relay due to the dial breaks. Relay RA operates through a back contact of relay L1 on the first dial break of each digit dialed, and remains operated throughout that string of pulses despite the repeated momentary breaking of its operating path. The operated RA relay releases

relay SS (removing dial tone) and operates the CO relay if ZF wiring and Fig. 7 is provided. Relay CO operated, locks and releases the TOUCH-TONE frequency test circuit by removing ground from lead H. Relay RA releases when the dial comes to rest after sending pulses for one digit. The P stepping magnet operates and releases, stepping its brushes one position each time the L relay releases and reoperates.

2.02 As the dial restores to normal the dialing loop is successively opened and closed, the number of opens corresponding to the digit dialed. Relay L releases during the opens, opening the circuit to SR and Ll relays and closing the circuit to the P stepping magnet and PH relay. Relay SR is a slow-release relay and remains operated during pulsing. Relay Ll follows the pulses and on releasing, operates the RA relay. On pulses of short duration, relay PH remains operated until the P stepping magnet operates, opening the operate path of the PH relay. The release of the PH relay or the reoperation of the L relay opens the circuit of the P stepping magnet, causing it to release, moving the selector brushes one step. Relay Ll reoperates and the circuit to SR relay is reclosed. Relay RA is a slow-release relay and remains operated while the L and Ll relays are operated between pulses, removing ground from the feeder brushes of RV, A, and CL arcs while the selector switch is stepping. After the L

and Ll relays reoperate at the conclusion of a train of pulses, relay RA releases. As the P selector switch advances out of position 1, relay SS releases, removing dial tone.

3. KEYING (FIG. 7, H, AND OPTION ZF)

3.01 This circuit is connected to a TOUCH-TONE frequency test circuit through a TOUCH-TONE frequency test connector circuit. The TOUCH-TONE frequency test circuits are common to several ringer test circuits.

3.02 When this circuit is seized, as previously described, the operated SR and STl relays connect ground, through the normal SP relay, to lead ST to the TOUCH-TONE frequency test connector circuit. The connector circuit functions to seize an idle TOUCH-TONE frequency receiver circuit.

3.03 When the TOUCH-TONE test receiver is seized it sends a ground on the BL lead to operate relay SP. Relay SP operated, opens the start lead to the connector circuit and locks operated through relays RPl and TPl normal. If a preliminary digit, used to identify the type of TOUCH-TONE station (see TABLE II), is keyed into the receiver, a relay corresponding to the digit keyed operates in the TOUCH-TONE frequency test circuit. The SP relay will be held operated under control of the G1 relay until ringing digits (see TABLE II) are keyed.

TABLE II

A. Preliminary Digits Keyed

<u>Digit</u>	<u>Type of TOUCH-TONE Station</u>
none keyed	10-Button Station
2	Automatic Card Dialer
4	12-Button Station
5	16-Button Station

B. Ringing Digits (Keyed After All Frequency Testing)

<u>Digit</u>	<u>Type of Ringing</u>
6	Individual or Ring Party
7	Tip Party 1-Ring Code
8	Ring Party 2-Ring Code
9	Tip Party 2-Ring Code
0	Bell Adjust Ringing

3.04 The TOUCH-TONE frequency test circuit supplies tone which is transmitted to the station, and is a signal to start testing. When it is required to test the ringer as well as the tones of the station, the maintenance employee keys a ringing digit (6 or 7) after testing the tones. When the ringing digit is keyed, a relay in the tone test

circuit operates, which in turn operates relay RPl if digit 6 is keyed, or relay TPl if digit 7 is keyed. Any one of these relays operated transfers the locking path of relay SP and places it under control of relay RN, thereby allowing the SP relay to release when the RN relay operates. This permits reseizure of the test receiver for subsequent

tests. In order to test the tones of a station the maintenance employee keys all the digits in order, going from left to right and down the keyset. The frequency test circuit sends two spurts of high-tone signal if the frequencies meet the test requirements, and one spurt of high tone if the frequencies do not meet the test requirements. This test may be repeated at 15 second intervals.

3.05 When the station disconnects, or the switchhook flashed, the L relay releases. The released L relay operates the RA relay which operates the CO relay. The operated CO relay releases the TOUCH-TONE frequency test circuit by removing ground from the H lead.

4. CONNECTION TO DIAL TESTER

4.01 When 2, 3, 4, or 5 is dialed the switch steps to position 3, 4, 5, or 6, respectively. When the dial returns to normal after dialing 2, 3, 4, or 5, relay RA releases connecting ground to RV, A, and CL brushes. Relay D operates from ground through arc CL, closing lead HL to relay H, connecting battery through resistance H to lead HG, connecting resistance E across leads T and R to 51-type dial tester circuit, opening the circuit of RA relay so it will not reoperate, and connecting ground to lead ST to the dial test circuits, which is common to other ringer test circuits in the same group and also to connecting circuits at the local test desk. This starts the idle dial tester circuits, hunting for this circuit. If the station under test disconnects before this circuit is seized by a dial test circuit, relay L releases, releasing the LL and SR relays and operating relay DS which operates relay RN on noncoin operation. In case Fig. A or C are used and the call is from a coin line in a crossbar office ground from relay G operated through relays SR and RS normal through arc RT on terminal 1 to 6 will be closed to the CN interrupter over the ST lead to cause the coin to be returned before disconnection occurs. See 9.02. The RN relay operated disconnects ground from RV, A, and CL brushes releasing relay D, opening leads ST, HL, T, R, and HG and restoring to normal as described in 9. When this circuit is found by a dial tester circuit, the closed circuit across the leads T and R causes the dial tester circuit to move off-normal and connect ground to lead HL operating relay H. Relay H operated, removes ground from lead ST stopping other hunting dial tester circuits, removes battery from lead HG and operates relays DL and RS which lock under control of relay G. The

operation of relay DL opens the circuit of relay L, releasing it, in turn releasing the LL and SR relays. Relay DL operated, disconnects battery from lead HG and ground from lead ST to prevent the reclosure of these leads when relay H releases, removes resistance E from across leads T and R to the dial tester circuit, transfers the "tip" and "ring" to the dial tester circuit, connects ground through relay RS operated to lead G3 and closes in part the operating circuit of relay DS. The release of relay SR causes relay STL to release. The circuit is now under control of the dial tester circuit which is held over the subscriber loop. The kind of test that the dial tester makes depends upon the condition placed upon lead SP which is dependent on the position in which selector P stops, which in turn is dependent on the number dialed. If 2 is dialed the selector stops in position 3, relays RV and A do not operate and lead SP is open. This is the condition for low-speed dial test. If 3 is dialed the selector stops in position 4, relay A operates, connecting ground through resistance A to lead SP. Relay RV does not operate. This is the condition for low-speed dial readjust. If 4 is dialed the selector stops in position 5, relay RV operates and connects 48-volt battery to lead SP. Relay A does not operate. This is the condition for high-speed dial test. If 5 is dialed the selector stops in position 6. Both relays A and RV operate connecting direct ground to lead SP. This is the condition for the high-speed dial readjust.

5. DISCONNECTION FROM DIAL TESTER

5.01 When the station under test disconnects, the dial tester circuit removes ground from lead HL releasing relay H, operating relay DS which locks to ground under control of relay CT on noncoin operation. When Fig. A or C are used and the call is from a coin line, the operate circuit for relay DS is transferred (relay CN is operated) causing the coin to be returned before the DS relay is operated. The release of relay H:

- (a) Opens the operate circuit of relay DL leaving it locked to relay G operated.
- (b) Opens the operate circuit of relay RS which also holds to relay G operated.
- (c) Prepares the idle battery circuit in part to the HG lead.
- (d) Closes ground to the armature of the L relay.

(e) Closes ground through relay D1 operated over lead ST to Fig. A or C through relay CN operated to the CN interrupter.

When the B contact of interrupter CN is closed relay W operates and relay Z is held shunted. When the B contact opens relay Z operates. Relays W and Z lock to ground on relay RN normal Fig. 1 on lead L1 through relay CN operated, prepare the coin return potential path to the CN1 relay and operate relay CN1 from ground on relay D1 operated through relay RS operated over lead G3. Relay CN1 operated transfers the T and R lead to the coin return potential to cause the coin at the subscribers station to be returned. Relay CN1 also locks to the ST lead ground through relay CN2 normal and relay CN operated. When the B contact of interrupter CN is again closed relay W is shunted down through relay Z operated, causing the coin return potential to be disconnected from the tip and ring leads. When the B contact of interrupter CN is again opened relay Z releases. If Fig. C is used the release of relay Z at this time connects the T and R lead to the winding of the LT relay and if the coin is stuck in the box or there is a false ground on either lead, relay LT operates to signal the coin supervisory operator. (See 9.02 for details.) If Fig. A is used the release of relay Z closes ground from relay D1 operated through relay RS operated over lead G3 through relays W and Z normal, relay CN1 operated and relay CN2 normal over the DS lead to the winding of relay DS causing it to operate. If Fig. C is used the disconnect is delayed to allow a line test. When the B contact of CN interrupter is again closed relay W operates for the third time closing the G3 ground through relay W operated, through Z normal, through CN1 operated, through relays OP and CN2 normal over the DS lead to operate relay DS. Relay DS operated, opens the tip, ring, and sleeve releasing the district circuit, and operates relay RN, which opens the circuit to relay PH, opens the pulsing circuit, removes ground from RV, A, and CL brushes releasing relay D and relays RV and A if operated, and connects ground from RN arc to stepping magnet P through its break-contact causing selector P to step to the normal position. Relay DS operated, holds ground on the S1 lead in crossbar office to hold the test line busy after the office link hold magnet is released. The RN relay operated, also closes the circuit of the biasing winding of L relay to guarantee that the L relay contacts 4 and 9 are left open when the circuit is normal. In the normal position relay G releases in turn releasing relays RS, D1, and G1. Relay G1 released, releases relays CT and CTL and relays CN, CN1, and OP Fig. A or C if operated, relay CT in turn releases relays ST and S. Relay CT released, releases relay RN. The release of the RN relay opens the circuit to the

biasing winding of relay L and the circuit is normal. Relay DS is held operated until after the district circuit is released to prevent interference with the release of the connection, if this circuit is seized by a panel selector before it has returned to normal.

6. PREPARING FOR RINGING TEST

PREPARATION FROM DIAL STATION

6.01 When 6, 7, 8, or 9 is dialed, the switch steps to position 7, 8, 9, or 10, respectively. When the dial returns to normal and the L1 relay reoperates after dialing 6, 7, 8, or 9, relay RA releases connecting ground to RV, A, and CL brushes. Relay R operates from ground through the CL arc. Relay RV operates from ground through the RV arc if the selector stops in position 8 or 0. Relay P Fig. D or E and Y wiring operates from ground through arc A if selector stops in positions 9 or 0.

PREPARATION FROM "TOUCH-TONE" STATION

6.02 When a ringing digit 6, 7, 8, or 9 is keyed, the TOUCH-TONE receiver detects the frequencies of the keyed digit and delivers a signal to operate a relay in the frequency test circuit corresponding to the digit dialed. The operated relay in the tone test circuit operates one of the following: RPl for digit 6 and TP1 for digit 7. The operated TP1 relay operates relay RV. The ringing digits are keyed after all tone testing. However, if ring test only is required, with no frequency test, the ringing digits can be keyed in directly after receipt of dial tone from the test circuit.

6.03 When the switchhook is flashed, the L relay releases momentarily. The released L relay opens the circuit to relay SR and relay L1 in series and operates relay PH and stepping magnet P. Relay PH releases when the stepping magnet P operates. The released L1 relay operates relay RA. The operated RA relay operates relay CO. Relay CO operated releases the TOUCH-TONE frequency test circuit by removing ground from the H lead. When relay L reoperates and relay PH releases, stepping magnet P is released, advancing selector P to position 2. The operated L relay reoperates the L1 relay which releases the RA relay. The released RA relay connects ground to the RV, CL, and A brushes. Relay R operates from ground through the CL arc position 2 and the operated RPl or TP1 relay. Relay R operated, transfers the pulsing lead on the back contact of relay L from the stepping magnet P to relay SS, closes an auxiliary holding circuit for relay SR under control of relay SS, and closes in part an operating circuit for relays DS and R1. With W and ZH wiring

tone is connected to the line to prevent fraudulent use. This function is special for New York Telephone Company.

PARTY TEST (FIG. 5 AND OPTION ZB)

6.04 When digit 6 or 7 is dialed, selector P stops in position 7 or 8 and the operation of relay R, operates relays PTL and RAL. When digit 6 or 7 is keyed relay RP1 or TP1 operates and when the switchhook flash advances the P selector to position 2, relay R operates, operating the PTL and RAL relays. Relay PTL operated, connects a local ground to hold relay L operated, removes relay L from the subscribers loop, connects relay PT to the tip and ring conductors to the subscribers station and operates relays PT2 and PT3. Relay PT2 operated, locks to ground at relay R, removes dial tone and connects high tone to the tertiary winding of repeat coil DT of Fig. H or the secondary winding of repeat coil DT of Fig. G.

A. Test of a Tip 2-Party Line

6.05 When the station under test is a tip 2-party line, relay PT operates to ground at the station ringer. Relay PT operated, operates relay PTA and PTB. Relay PTB operated closes a ground to interrupter RI and a locking path for relay PTL. The first closure of interrupter RI operates relay W1. Relay W1 operated, releases relay PT. The first open of interrupter RI operates relay Z1, which operates relay W2. With relays W1, Z1, W2 operated and relay Z2 released, coin return potential is applied to the tip and ring conductors of the subscribers line returning the coin if the station under test is a coin line. The second closure of interrupter RI releases relay W1. With relays Z1, W2 operated and relay W1 released, the 1000-ohm ground at resistor CD is closed through to the tip and ring conductors to discharge the cable.

B. Earth Potential Test

6.06 The second open of interrupter RI releases relay Z1 and operates relay Z2. With relays W2 and Z2 operated and relay W1 released, transistors A and B and their associated relays EP+ and EP- are connected to the tip and ring conductors of the station under test and to the ground at the station ringer. If the earth potential at the station ground is greater than +3 volts, sufficient current flows through transistor A to operate relay EP+, operating relay P+. If the earth potential at the

station ground is greater than -3 volts, relay EP- operates, operating relay P-. If the earth potential at the station ground is between +2.5 volts and -2.5 volts neither EP+ nor EP- relay operate and P+ and P- relays remain normal. Relay P-operated connects CC+ to relay R11. Relay P+ operated connects CC- to RI2. Relays R+ and P- released connects CC- to relay RI3.

C. Ringer Identification

6.07 The third closure of interrupter RI operates relay W1 which releases relay EP+ or EP- if operated. With relays W1 and W2 operated and relay Z1 released, one side of the windings of all three relays R11, RI2, and RI3 are connected to the tip and ring conductors of the station under test. The operated or released condition of relays P+ and P- connects the other side of the winding of one of the relays R11, RI2, or RI3 to coin battery.

6.08 The R11, RI2, and RI3 relays with its winding connected to coin battery operates if the station under test is wired for a 1000-ohm ground and stays normal if the station is wired for a 2650-ohm ground. An RI- relay operated, operates relay LR which transmits a 60-IPM high tone to the station under test, a signaling that the station is wired for a 1000-ohm ringer.

6.09 The third open of interrupter RI operates relay Z1 and releases relay W2. The operation of relay Z1 releases any operated RI- relay. With relays W1, Z1, and Z2 operated and relay W2 released, relay HR operates if relay LR is not operated. Relay HR operated, closes a path to transmit 120-IPM high tone to the station under test as an indication that the station is wired for a 2650-ohm ringer.

6.10 The fourth closure of interrupter RI releases relay W1. With relays Z1 and Z2 operated and relay W1 released, relay EC operates, releasing relays Z1 and Z2. The operation of relay EC prevents the reoperation of the W1, Z1, W2, and Z2 relays on the subsequent ground removal test and releases relay PTL, which releases relay PTB. Relay PTL released connects ground to the tip of the line and battery through the winding of relay L to the ring of the line.

6.11 When testing coin lines, coin ground operates relays PT, PTA, and PTB, causing the circuit to return a 60-IPM high tone signal the first time the 2-party test

is made. The coin is returned but the 60-IPM signal persists since relays PTA and PTB remain operated. On subsequent tests, relays PT, PTA, and PTB do not operate because no coin ground is present (the coin was returned during the first test). The circuit returns a steady high tone signal in this condition.

6.12 When testing 4-party lines, the circuit returns a steady high tone signal when digit 6 or 7 is dialed and dial tone signal when digit 8 or digit 9 is dialed.

TEST FOR BELL TAP

6.13 Relay R operated, transfers the pulsing lead on the back contact of relay L from stepping magnet P to relay SS, closes an auxiliary holding circuit for relays SR and L1 under control of relay SS and opens the circuit of RA relay. Battery through the winding of relay L is connected to the ring of the line and ground is connected to the tip: the ringer may be tested to determine if it taps the bell on dial pulses. Any number of digits may be dialed. The L relay follows the dial pulses. The slow-operate SS relay does not operate on the momentary releases of the L relay, preventing the release of the circuit by maintaining the operate path of the SR relay. When W or ZC wiring is used, tone is connected to the line to prevent fraudulent use.

GROUND REMOVAL TEST (FIG. 5 AND OPTION ZB)

6.14 When the station under test disconnects, relay L releases and operates relay SS. Relay SS operated, releases relay RAL and operates relay GT. Relay GT releases relays PT2, which releases PTA and PTB and operates relay GT1. Relay GT1 operates relay EC and releases relay GT which operates relay PTL. Relay GT releases slowly to allow time for relays PT2, PTA, and PTB to release. Relay PTL operated, operates relays PT2 and PT3 and connects relay PT to the ring of the station under test. If the ground of the station under test is removed with the receiver on-hook, relay PT operates, operating relays PTA and PTB. Relay PT2 operated releases relay PTL. Relay PTL releases slowly to allow time for relay PT2 to operate. Relay PTL released, releases relay PT3 which releases PT relay.

The PT3 relay releases relay L1 and relay SR which releases relay ST1, which releases relay SS, which operates relay RAL. The released SR relay connects ground to the RT brush of selector P operating relay R1 when testing noncoin lines. When Fig. A or C is used and the call is from a coin line, relay CN1 is operated and ground on the RT brush is connected through relay R operated to the winding of relay CN2 causing it to operate. Relay CN2 operated prepares a locking circuit for relay CN1 and an operate circuit for relay R1 and closes ground from relay RN normal to the CN interrupter. When the B contact of the CN interrupter is closed relay W operates and relay Z is shunted. When the B contact opens relay Z operates and locks through relay W to ground on the L1 lead. With relays W and Z operated, ground from relay RS normal over lead G3 is closed to operate relay CN1. Relay CN1 operated locks in parallel with relay CN2, prepares a path to operate relay R1 and transfers the tip and ring leads of the test line to coin return potential through relays Z and W. The B contact of the CN interrupter is open approximately 0.525 seconds, during which time the coin return potential is connected to the tip and ring of the line. When the B contact recloses, relay W is shunted down, opening the coin potential. When the B contact opens, relay Z releases, closing ground from relay W normal, if Fig. A is used, through relays CN1 and R operated to the winding of relay R1, operating it. If Fig. C is used, the circuit waits for the next closure of the CN interrupter, which operates relay W; which operates relay PRL. When the CN interrupter breaks, relay Z operates, operating relay R1 through relays PRL, CN2, and R operated.

A. Ground Removal Test and ZM Option (Coin Service Improvements)

6.15 The "coin service improvements" feature requires that a negative coin potential of -115 volts to -135 volts be used for coin return function, and that this potential be applied only to the tip lead. Circuit relay sequence for this feature remains the same as specified in 6.13. Option ZM provides a means to open the ring lead when relay Z1 operates prior to the operation of relay W2. (Coin return potential applied.) The ring lead is then

closed by the operation of relay Z2 which is operated after loop discharge. A code change in the PT relay along with a +48 volt operate voltage is required to insure coin station operation.

7. RINGING TEST (FIG. 5 AND OPTION ZB PROVIDED)

NONCOIN LINES

7.01 Relay R1 operated, locks through relay R2 normal and relay R operated and reoperates relays SR and L1. Relay SR operated operates relay RS and relay ST1, which operates relay SS. Relay RS operated, prepares the path to operate the RN relay when ringing is tripped. If coin lines are provided, relay SR operated also releases relays CN1 and CN2, closing through the tip and ring conductors to the subscribers bell. The subscribers bell rings, or when no coin lines are provided, the ringing starts immediately after the operation of the R1 relay. If the PTA relay was operated during the ground removal test, the machine ringing is interrupted at a 60-IPM rate as a signal that a false ground is present with the receiver on hook. If the PTA relay is normal, the ringing is normal.

COIN LINES

7.02 When the handset is placed on the switchhook, relay L releases, relay SS operates and relay SR releases releasing relay ST1 and connecting ground to the RT brush operating relay R1 either directly through Fig. B or through relay CN normal (Fig. A or C on noncoin lines). Relay ST1 released, releases relay SS. When Fig. A or C are used and the call is from a coin line relay CN is operated and the ground on the RT brush is connected through relay R operated to the winding of relay CN2, operating it. Relay CN2 operated opens ground from relay ZA used to cause a disconnect on a time out, prepares a lock circuit for relay CN1 and the operate circuit for relay R1 and closes ground from relay RN normal to the CN interrupter. When the B contact of the CN interrupter is closed relay W operates and relay Z is shunted. When the B contact opens relay Z operates and locks through relay W to ground on the L1 lead. With relays W and Z operated ground from relay RS normal over lead G3 is closed to operate relay CN1. Relay CN1 operated locks in parallel with relay CN2, prepares a path

to operate relay R1, Fig. 1, and transfers the tip and ring leads of the test line to the coin return potential is connected to the tip and ring of the line. When the B contact is again closed relay W is shunted down thus opening the coin potential from the line to allow the coin magnet at the subscribers station to release. When the B contact opens relay Z releases to close ground from relay W normal if Fig. A is used through relays CN1 and R operated to the winding of relay R1 causing it to operate. If Fig. C is used instead of Fig. A this circuit is not used and the circuit waits for the next closure of the CN interrupter which causes relay W to reoperate and close ground through relay Z operated to operate relay R1 through relays CN1, CN2, and R operated. Relay R1 operated locks through relay R2 normal and reoperates relays L1 and SR. Relay SR operated releases relays CN1 and CN2 Fig. A or C and operates relay RS. Relay CN1 released closed the tip and ring of the line to the R1 relay, ringing the subscribers bell and opens the operate circuit of relay R1. Relay RS operated locks to relay G operated, and prepares the path to operate relay RN after ringing is tripped. On noncoin operation relay R1 operated locks through its make-contact, break-contact of relay R2 and make-contact of relay R, reoperates relay SR, and closes the ringing lead to relay R2. Relay SR operated, reoperates relay ST1 in turn reoperating relay SS, and operates relay RS which locks to the off-normal ground.

RINGING SELECTIONS - DIAL STATION

7.03 When 6 or 8 (Y wiring) is dialed, the selector steps to position 7 or 9 (Y wiring) and relay RV is not operated and ringing current is connected to the ring and ringing ground to the tip for testing bridged ringers or ringers on the ring side of the line.

7.04 When 7 or 9 (Y wiring) is dialed the selector steps to position 8 or 0 (Y wiring) at relay RV is operated at ringing current is connected to the tip and ringing ground to the ring, for testing ringers on the tip side of the line.

RINGING SELECTIONS - "TOUCH-TONE" STATION

7.05 If a ringing digit 6 is keyed, relay R1 operates and relay RV is not operated. Ringing current is connected to the ring and ringing ground to the tip for testing bridged ringers or ringers on the ring side of the line.

7.06 If a ringing digit of 7 is keyed, relay TP1 operates and relay RV operates. Ringing current will be connected to the tip and ringing ground to the ring, for testing ringings on the tip side of the line.

8. TRIPPING

DIAL STATION

8.01 When the receiver at the station under test is removed from the switchhook, the increased flow of current through the winding of relay R2 operates it, releasing relay RL. When relay RL releases, it breaks the ringing current to the line and operates relay RN. Relay RN operated, opens the circuit to relay PH, opens the pulsing circuit, removes ground from RV, A, and CL brushes releasing relay R, releases the W and Z relays (Fig. A or C) on coin operation and connects ground from RN arc to stepping magnet P through its own break-contacts. Relay R released, releases relays SS, PT2, and GT1. Relay PT2 released, releases relays PTA and PTB. Relay PTE released releases relay LR or HR if operated. Selector P steps to the normal position. With relay RL released, relay L is again connected to the line and operated over the subscriber loop, holding relay SR operated. With the selector in the normal position relay G releases, releasing relays RS and ST1. Relay RS released, releases relay RN. The circuit for relay G1 is transferred from the make-contact of relay G to the break-contact of relay G and the make-contacts of relays ST and SR. It remains operated, holding relay CT and relay CTL operated. The release of relay RN closes a circuit from ground on RN brush and normal terminal through make-contacts of relay SR and break-contacts of relay RN stepping selector P from normal to position 1. With the switch off-normal, relay G is operated from ground on RN arc, reclosing the circuit through its make-contact to relay G1 and operating relay ST1. In position 1 the dial tone circuit is again closed and the circuit is in the same condition as it was before dialing started. The ringer tests may be repeated or connection may be made with the dial tester by dialing the proper code.

"TOUCH-TONE" STATION

8.02 The circuit functions as described under dial stations. In addition to the above functions, the released G relay releases the operated RP1 to TP1 relay and the operated RN relay releases the CO and SP relays. The released SP relay connects ground from the operated SR relay to the ST lead as a signal for the TOUCH-TONE frequency connector circuit to connect a TOUCH-TONE frequency test circuit to this circuit for retesting the TOUCH-TONE station. The seizure of the test circuit is described in 3.

9. STATION DISCONNECTION AFTER RINGER TEST OR ABANDONED CALL - GENERAL

9.01 When 0 is dialed, the selector advances to the next normal position. Since relay SR does not release, the selector immediately advances to position 1. If the station under test disconnects with this circuit in position 1 before dialing is started or after making a ringer test, relay L releases. Relay RA operates, removing ground from RV, A, and CL brushes and relay SR releases, releasing relay ST1 and connects ground to RT brush, operating relay DS on noncoin operation.

COIN OPERATION

9.02 In case of coin operation, (Fig. A or C are equipped) the operation of the DS relay is delayed until the coin has been returned. On coin operation the ground through arc RT is connected to the ST lead Fig. A or C through relay CN operated to the CN interrupter. When the B contact of the interrupter is closed relay W operates and locks under control of relay RN normal. When the B contact opens relay Z operates and locks in parallel with relay W. With relays W and Z operated ground from relay RS normal over lead G3 is closed to operate relay CN1. Relay CN1 operated locks to the ground on the ST lead, prepares the path to operate the DS relay and closes the tip and ring leads of the test line through relay SC1 normal if Fig. C is used through the Z and W relays operated and relay PRL normal to the coin return potential to attempt to return the coin at the subscribers station. The coin potential is maintained during the time the B contact of the CN interrupter is

open or approximately 0.525 second. When the B contact is again closed relay W releases opening the coin return potential from the line to allow the coin magnet at the subscribers station to release. When the B contact is opened relay Z releases and closes the tip and ring leads to the winding of the LT relay if Fig. C is used. If Fig. A is used the release of relay Z under this condition closes ground through relay CN operated to operate relay DS to cause disconnection to occur at once. Assuming Fig. C is used and the coin has not been returned or if there is a false ground on the tip or ring of the line, relay LT will operate. The contacts of relay LT are ineffective at this time due to the possibility that it may operate falsely from line surges on party coin lines. When the interrupter is again closed relay W operates and closes ground through relay Z normal and through relay CN1 operated to the winding of relay PRL, causing it to operate. Relay PRL operated locks to relay CN operated, prepares the circuit for release and supplies ground to relay LT. Relay LT operated operates relay OP. Relay OP operated locks to the CN relay operated, opens the circuit to the Z relay winding, opens the circuit to the DS relay winding prepares the LC lead to and lights the (station ringer test) lamp at the sender monitor operator position or the sender make-busy frame and closes ground through contacts of relay SCL normal to the CA lead to bring in an alarm to notify the attendant at the sender make-busy frame of a stuck coin condition. Under this condition the coin attendant plugs in the (station ringer test) jack which causes relays SC and SCL to operate. Relay SC operated opens ground from the G and G1 leads to prevent bringing in an alarm should the time-out feature function at this time and extinguishes the (station ringer test) lamp. Relay SCL operated locks to the OP relay, opens the circuit to the CA lead to silence the alarm when V wiring is used and connects the line tip and ring leads to the coin attendant. The coin attendant monitors on the circuit and tries to return or collect the coin. If the attendant successfully returns or collects the coin, the plug in the (station ringer test) jack is removed and inserted in the (RELEASE) jack which operates relay TLR. Relay SC released when the plug was removed from the (station ringer test) jack but relay SCL is locked in. The (station ringer test) lamp is relighted under this condition until the circuit disconnects. Relay TLR operated closes ground over the DS lead to operate relay DS. In case relay LT did not operate the next open of contact B of the CN interrupter will cause relay Z to operate and close ground to the DS lead to operate relay DS to cause the circuit to disconnect.

A. Figure A or Fig. C and ZM Option (Coin Service Improvements)

9.03 The "coin service improvements" feature requires that a negative coin potential of -115 volts to -135 volts be used for coin return function, and that this potential be applied only to the tip lead. Circuit relay sequence for this feature remains the same as specified in 9.02. Option ZM provides a means to open the ring lead when relay Z operates prior to the operation of relay CN1, (coin return potential applied) and again closes the ring lead after relay Z releases after the coin return potential was removed by the release of relay W.

B. Figures C and ZM Option (Coin Service Improvements)

9.04 In addition to 9.03, if the coin is not returned or if there is a false ground on the tip or ring lead and the coin attendant monitors on the circuit and tries to return the coin, relay ORL operates which opens the ring lead. A +48 volt operate voltage of the LT relay and the addition of CSI resistor is required to insure coin station operation.

DISCONNECT COIN OR NONCOIN OPERATION

9.05 Relay DS locks under control of relays CT and G1, opens the tip, ring, and sleeve leads, releasing the district circuit connects ground to leads S1 and TL, operates relay PH, connects ground from RN are to the stepping magnet P through its own break-contact and releases the W and Z relays Fig. A or C.

9.06 Selector P steps to the normal position. When in the normal position relay G releases, in turn releasing relays CT and CT1. The release of relay CT removes ground from the off-normal ground leads, releasing relays CN, CN1, (Fig. A or C), ST, and DS in turn releasing relay RN and the circuit is normal. Relay DS is held operated until after the district circuit is released to prevent interfering with the breaking down of the connection, in case this circuit should be seized before it has returned to normal.

10. CALIBRATION OF EARTH POTENTIAL TEST CIRCUIT

10.01 When Fig. 5 is furnished, it must be calibrated as indicated below. A volt-milliammeter with a minimum of 1000 ohms per volt sensitivity and a cord and plug will be required for calibration. Connect the positive terminal on the meter to the tip of a 310 plug and the negative terminal of the meter to the ring of a 310 plug.

- (a) Step:
- (1) Insert meter plug into jack EP.
 - (2) Operate key CAL EP+.
 - (3) Set potentiometer CAL-EP for 3 volts at jack EP
 - (4) Release key CAL EP+.
 - (5) Insert meter plug into jack VM+.
 - (6) Operate key CAL EP+.
 - (7) Set potentiometer P1 for 8 volts at jack VM+.
 - (8) Release CAL EP+.
 - (9) Insert plug into jack I+ and set meter for milliampere readings.
 - (10) Operate key CAL EP+.
 - (11) Set the potentiometer CAL+ for 1.4 milliamperes at jack I+.
 - (12) Release key CAL EP+.
 - (13) Return to Step 5 and repeat Steps 5 through 12, if required, to obtain proper settings.
 - (14) Reverse leads to meter and set meter to read volts. Insert meter plug into jack EP.
 - (15) Operate key CAL EP-.
 - (16) Reset potentiometer CAL-EP for 3 volts at jack EP.
 - (17) Release key CAL EP-.
 - (18) Reverse meter leads.
 - (19) Insert meter plug into jack VM-.
 - (20) Operate key CAL EP-.
 - (21) Set potentiometer P2 for 8 volts at jack VM-.
 - (22) Release key CAL EP-.
 - (23) Insert meter plug into jack I-. Set meter to read milliamperes.
 - (24) Operate key CAL EP-.
 - (25) Set potentiometer CAL- for 1.4 milliamperes at jack I-.
 - (26) Release key CAL EP-.

(27) Reset meter to read volts and return to Step 19. Repeat Steps 19 to 26 if required, to obtain proper settings.

11. BATTERY FAILURE

11.01 If the battery supply is cut off from the circuit, all the relays release. Ground is removed from the S lead, releasing the associated district circuit and the associated 51-type dial tester circuit. When the battery supply is again connected relays G, G1, and CT operate. On noncoin operation relay DS operates through arc RT if the switch is in any off-normal position except 7 or 8 and 9 or 0 position with Y wiring. If in position 7 or 8 and 9 or 0 with Y wiring, relay R operates through the CL arc and since relay ST is released, ground through its break-contact and the make-contact of relay R operates relay DS. Relay DS operated, restores the circuit to normal as described before. On coin operation with Fig. A or C, an attempt is made as explained in 9.02 to return the coin before operating relay DS.

12. AUTOMATIC RELEASE AND STUCK ALARM

12.01 When relay CT operates, it connects ground to the common lead INT, closes through lead A to relay ZA and lead B to relay ZB and supplies battery for locking relays ZA and ZB. Ground on lead INT causes the timing circuit, shown as Fig. 3 or on the 51-type dial tester circuit to function. A selector in the timing circuit advances under control of a slow interrupter. In certain positions of this selector, battery is connected to lead A and in certain other positions, battery is connected to lead B. As long as lead INT, is grounded, battery is thus connected first to one lead then after a definite interval of time to the other lead then after the same interval of time to the first lead and so forth. The lead to which battery is first connected, lead A or lead B, depends upon the position in which this selector was standing when relay CT operated. Assume that battery is connected to lead B first. This operates relay ZB, which locks under control of relay CT. A definite length of time after battery is connected to lead B battery is connected to lead A, operating relay ZA. Relay ZA locks, and as relay ZB is operated, ground is connected to TA lead and on noncoin operation relay DS operates, restoring the circuit to normal and releasing all the operated relays. The district circuit restores. The maximum time of the automatic disconnect function is approximately twice the minimum time. If, due to some trouble, this circuit fails to restore to normal within a definite length of time after both relays ZA and ZB are

operated, battery is connected to lead C, operating relay AL. Relay AL locks under control of relay ZB, lights lamp TL, closes a common alarm circuit, indicating that a ringer test circuit is stuck, and removes ground through contacts of ZA and ZB relays from the winding of TA relay, Fig. 2. (This alarm feature is under control of relay SC if Fig. C is used to prevent interference while the coin attendant is connected.) If the ZA and ZB relays operate at the time the RS relay is operated under the ringing test conditions the disconnect functions as follows: Relay RI if operated releases and relay RN operates to return the P selector switch to normal. With the P switch normal relay G releases and releases relay RS. Assuming the subscribers line is still closed relay L reoperates as soon as relay RI releases to hold the LL and SR relay, in turn causing relay GI to hold through relay G normal and relay ST operated. When relay RS releases relay RN releases (relay RN reoperates when relay RI released) and closes ground to step P switch off-normal again and closes ground through relays ZA and ZB operated to operate relay DS which reoperates relay RN and causes the circuit to disconnect as previously explained. When Fig. A or C are used, the above operation must also wait for the release of relay CN2 which is somewhat slow to release. The ground on the G2 lead through ZA and ZB relays operated is connected over the ST lead to the CN interrupter to function the W and Z relays to return the coin and check for coin in the box before operating relay DS.

13. TIMING CIRCUIT (FIG. 3)

13.01 When INT lead is grounded by a ringer test or dial tester circuit, the common timing circuit shown as Fig. 3 functions in the following manner. When F contact of AL interrupter closes, relay C operates. When B contact of AL interrupter closes, relay SA operates, holding ground on INT lead and operating the AL stepping magnet. When B contact opens relay SA releases, releasing the AL stepping magnet advancing AL selector switch one step. The AL selector switch will advance in this manner as long as INT lead is grounded. When AL switch steps on to a terminal where brush "1" is connected to ground relay SA will operate through the break-contact of AL selector. The SA relay operated, operates the AL stepping magnet, thus advancing the AL selector switch independently of the interrupter. When AL selector switch is on terminal 1 or 11, battery is connected to the A lead while relay C is operated.

Similarly, when the AL selector switch is on terminal 6 or 16, battery is connected to the B lead while relay C is operated, and when the AL selector switch is on terminal 2, 7, 12, or 17, battery is connected to the C lead while relay C is operated. Battery is thus connected to the A lead for a short interval and then after a definite length of time, battery is connected to B lead for a short interval, then after the same definite length of time battery is connected to A lead and so forth. Battery is connected to C lead for a short interval, a definite length of time after it is connected to A lead and a definite length of time after it is connected to B lead. The interval between the time when battery is connected to A lead, and the time when battery is connected to B lead, depends upon the connections of A and B straps, as shown in the table under Circuit Notes.

13.02 The timing circuit is common to the group of ringer test and dial tester circuits and is so arranged that when the circuits are held for more than the allowed time, the ringer test circuit is automatically disconnected. This time varies between a definite minimum and maximum depending upon the position of AL selector when the call is started.

14. REGISTER CIRCUIT (FIG. 2)

14.01 The operation of the DS relay of any of the ringer test circuits connects ground to the common TL lead, operating TL relay. The TL relay locks to the back contact of the TL message register. The locking circuit for TL relay is broken when TL message register operates. The grounding of the common TA lead by any of the ringer test circuits, causes relay TA and the TA message register to operate in the same manner as described for the TL relay and TL message register.

15. TEST JACK

15.01 The plug of a dial hand test telephone set may be inserted into T jack, if it is desired to test the operation of the circuit. This arrangement only allows for operation on a noncoin basis. Coin operation can be functioned by operating the CN relay by hand. Ground through the local contact of the jack holds the circuit busy. The bridged transmitter and receiver of the hand set starts the receiver functioning, as if seized in the regular manner, and the dial may be used to set up ringing or dial test conditions.

16. THE L JACK

16.01 The L jack is provided to test and readjust the L relay.

17. THE +9 VOLT FUSE ALARM

17.01 When the +9 volt fuse of Fig. 6 should operate, it operates relay FA which lights the local lamp +9 volt and grounds lead FA to the fuse alarm circuit, lighting the aisle pilot and sounding the audible fuse alarm.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

	10 PPS Dials		20 PPS Dials		2-Party	TOUCH-TONE
	<u>Subs Line</u>	<u>PBX Ext Lines</u>	<u>Operators Trunks</u>	<u>Coin Test</u>	<u>Test</u>	<u>Stations</u>
Max. Ext Ckt Loop	1500Ω	1500Ω	1500Ω	1500Ω	1500Ω	1500
Max. Trk Conductor Res			1400Ω			
Allowable Rated Bridged Cap. at Sub Sets	4 mf	3 mf				
Min Ins Res	10,000Ω	10,000Ω	15,000Ω	10,000Ω	10,000Ω	10,000Ω
Earth Potential				+ 20 V	+ 10 V	

Max. Ext Ckt loop for trunk guard test 2749Ω

2. FUNCTIONAL DESIGNATIONS

	<u>Designation</u>	<u>Meaning</u>
2.01 The functions of the selector switches and relays are as follows:	D1	Dial Test Auxiliary
	DS	Disconnect
2.02 <u>Switches</u>	EC	End of Cycle
<u>Designation</u>	<u>Meaning</u>	
AL	Alarm and Release Timing	EP+
P	Pulse Counter	EP-
		FA
2.03 <u>Relays</u>		G
<u>Designation</u>	<u>Meaning</u>	
A	Readjust Signal to Dial Tester	G1
AL	Alarm	GT
C	Control Battery	GT1
CN	Coin Class	H
CN1	Coin Potential Cut-In	HR
CN2	Coin Disconnect	L
CO	Cut-Off	L1
CT	Common Timing Start	L2
CT1	Completed Trunk Test	L3
D	Dial Test	LR

<u>Designation</u>	<u>Meaning</u>	<u>Designation</u>	<u>Meaning</u>
LT	Line Test	TA	Time Alarm
OP	Operator	TG	Trunk Guard Timing Start
P	Party Ringing Selection	TG1	Trunk Guard Timing Auxiliary
P+	Plus Polarity	TL	Line Tested
P-	Minus Polarity	TLR	Trouble Release
PH	Pulse Help	TP1	Tip Party 1
PRL	After Line Test	W	Sequence Control Coin Test
PT	Party Test	W1	Sequence Control Party Test
PT1	Party Test Auxiliary	W2	Sequence Control Party Test
PT2	Party Test Auxiliary	Z	Sequence Control Coin
PT3	Party Test Auxiliary	Z1	Sequence Control Party Test
PTA	Party Detected	Z2	Sequence Control Party Test
PTB	Party Detected Auxiliary	ZA	Timed Release Relay A
PU	Pick-Up	ZB	Timed Release Relay B
RA	Release After Dialing	<u>3. FUNCTIONS</u>	
RA1	Release After Party Test	3.01 Arranged to be seized by maintenance employees on installer at the subscribers station by dialing or keying a code.	
RI1	Ringer Identification 1	3.02 Selector P is used as a pulse or register switch controlled by dial pulses. It controls the type of test as two normal positions, one being opposite the feeder terminals.	
RI2	Ringer Identification 2	3.03 Relay SS is provided to absorb dial pulses so that any number of digits may be dialed to test the ringer for bell tap.	
RI3	Ringer Identification 3	3.04 Arranged to apply machine ringing to the tip or ring of the line by dialing or keying a certain number for each condition from the subscribers station.	
RN	Restore Normal	3.05 Arranged to seize a 51-type dial test circuit.	
RP1	Ring Party 1	3.06 Arranged for coin or noncoin operation in crossbar offices. In panel offices, coin and noncoin lines are handled on a noncoin basis.	
RS	Ringing Started	3.07 Arranged to return the coin on coin lines immediately after the first disconnect.	
RV	Reversed Ringing		
SA	Step AL		
SC	Stuck Coin		
SC1	Stuck Coin Auxiliary		
SP	Stop Selection		
SR	Slow-Release		
SS	Simulate Stepper		
ST	Start Test		
ST1	Start Test Auxiliary		

- 3.08 Arranged to return the coin on coin lines and test for a coin in the box before final disconnect.
- 3.09 Signals the sender monitor operator or coin attendant at the sender make-busy frame if a coin is not returned.
- 3.10 Arranged so that ringing test may be repeated or one dial test may be made.
- 3.11 Arranged to automatically disconnect after it has been held a certain length of time.
- 3.12 Message register TL scores one each time a circuit is seized.
- 3.13 Message register TA scores one each time a circuit is held until the auto-disconnect functions.
- 3.14 When a circuit is stuck off-normal the individual lamp TL lights.
- 3.15 The T jack is provided for testing the circuit.
- 3.16 Arranged to keep ground and battery across the tip and ring of the district circuit. A timed delay for cutting through is arranged to allow the sender to disconnect and to prevent premature dial tone from the ringer test circuit.
- 3.17 Arranged to ring individual, 2-party, 4-party semiselective, or 4-party selective subscribers stations.
- 3.18 Arranged to make a party test of 2-party subscriber lines.
- 3.19 Arranged to determine whether a 2-party subscriber station is wired for 1000-ohm or 2650-ohm ringer.
- 3.20 Arranged to test for a false ground on the tip or ring on the subscribers loop with receiver on hook.

3.21 Arranged to connect to a TOUCH-TONE frequency test circuit for testing the frequencies and amplitudes of tones from a TOUCH-TONE station, or automatic card dialer.

3.22 Arranged to provide both audible and visual alarms if the +9 volt fuse of Fig. 6 is operated.

4. CONNECTING CIRCUITS

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

- (a) Office Link and Connector Circuit (Crossbar) - SD-25033-01.
- (b) District of Office Selector (Panel) - SD-21630-01.
- (c) 51-Type Dial Test Circuit - SD-21385-01.
- (d) Subscriber Sender Circuit - SD-25012-01.
- (e) Miscellaneous and Auxiliary Alarm Circuit for Floor Alarm Frame - SD-25047-01.
- (f) Coin Control Supply Circuit.
- (g) Interrupter Frame Circuit - SD-25062-01.
- (h) "A" Cord Circuit at Sender Monitor Position or Sender Make-Busy Frame.
- (i) Floor Alarm Frame Fuse and Time Alarm Circuit - SD-25046-01.
- (j) TOUCH-TONE Frequency Test Connector Circuit - SD-94814-01.
- (k) TOUCH-TONE Frequency Test Circuit - SD-94813-01.

SECTION IV - REASONS FOR REISSUE

D. Description of Changes

D.1 No circuit change is made with this issue.

D.2 A change is made in the procedure of testing TOUCH-TONE stations. As of CD Issue 8D, the ringing digits 6, 7, 8, 9, and 0 are no longer referred to as preliminary digits, and are to be keyed after TOUCH-TONE frequency testing.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5243-RMC-ABVL

WE DEPT 367-RMC-EER-JF