CROSSBAR SYSTEMS
NO. 5
INCOMING TRUNK
TEST LINE CIRCUIT

CHANGES

B. CHANGES IN APPARATUS

B.1 Superseded

Resistors N 818,000 ohms, P 136,000 ohms, R 747,000 ohms, and S 44,300 ohms 140A

Superseded by

Resistors N 818,000 ohms, P 136,000 ohms, R 747,000 ohms, and S 44,300 ohms 144E

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The code of the N, P, R and S resistors 140A is rated Manufacture Discontinued replaced by the 144E to agree with present manufacturing information for these resistors.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2311-JMA-JWD-HD

Printed in U.S.A.

CROSSBAR SYSTEMS
NO. 5
INCOMING TRUNK
TEST LINE CIRCUIT

CHANGES

B. CHANGES IN APPARATUS

B.1

Superseded	Superseded By
L Res. "T" Opt. 18DA	L Res. "S" Opt. 19TJ
M Res. "T" Opt. 18FN	M Res. "S" Opt. 19UP

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The values of the L and M resistors are changed in order to apply the supervisory relay release test current as required by trunks such as Incoming By-Link Trunk SD-26077-01.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2311-RVK-JWD-FR

Printed in U. S. A.

CROSSBAR SYSTEMS
NO. 5
INCOMING TRUNK
TEST LINE CIRCUIT

CHANGES

B. CHANGES IN APPARATUS

B.1

Superseded	Superseded By
F Resistance 19GN Z Option	F Resistance 19TR Y Option
G Resistance 19CC Z Option	G Resistance 18GF Y Option
H Resistance 18GH Z Option	H Resistance 19NU Y Option

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Resistors F, G, and H are changed by Option Y to provide for testing the AJ47 ringing trip relay.

D.2 Option X is used with Option Y to provide proper trip resistance for testing 114KA trip relays adjusted to standard current flow requirements.

D.3 Option W is used with Option Y to provide proper trip resistance for testing 114KA trip relays adjusted to an alternate current flow requirement.

D.4 Option V is used with Option Y to provide proper trip resistance for testing wire spring trip relays where any are standard AJ25 relays.

D.5 The terminal strip was changed to permit use of solderless wrap connections.

All other headings no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2311-RVK-JWD-EV

CROSSBAR SYSTEMS
NO. 5
INCOMING TRUNK
TEST LINE CIRCUIT

CHANGES

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO ADDED OR REMOVED APPARATUS

C.1 The information under block or insulate in the circuit requirements table for the B selector switch formerly 4B-58 (F) in error, is changed to 4B-5B (F1).

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 2311-JMA-JWD-AK

Printed in U.S.A.

CROSSBAR SYSTEMS
NO. 5
INCOMING TRUNK
TEST LINE CIRCUIT

CHANGES

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO ADDED OR REMOVED APPARATUS

C.1 Insulate 2T (TS) and 2T (T) have been added under circuit preparation for the (A) magnet.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Additions to the circuit requirements table have been made to insure smooth operation of the (A) magnet while undergoing running tests.

All other headings under Changes, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3340-CRM-FAK-GA

CROSSBAR SYSTEMS
NO. 5
INCOMING TRUNK
TEST LINE CIRCUIT

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The connecting information for lead "AC-DC AUD" to "Continuous Ringing Supply" has been changed to show "to Continuous Ringing Supply or to Power, Ringing and Tone Distribution Circuit".

D.2 The (T1) lamp has been specified on a one per circuit basis instead of one per RR frame.

D.3 A multiple strap has been added showing the AC-DC AUD lead multiplied "to other circuits in some frame".

D.4 Circuit note 101 has been changed to show the ringing supply fused "one per RR frame" instead of "one per ckt."

D.5 In note 102 the connections to the (A) and (B) contact protecting networks were formerly shown as the "black wire" to Grd. and the yellow wire to F(A) or F(B).

D.6 Cross connection figure 52 formerly a part of figure 51 has been added on this issue and rated Mfr.Disc.

D.7 Cross connection figure 51 has been changed to show connection from terminals 21, 29 and 31 to the fuse panel on Power, Ringing and Tone Distribution frame, and to show connection from terminal 23 to fuse panel on RR frame.

D.8 Equipment note 202 has been added on this issue.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3340-CRM-FAK-ES

CROSSBAR SYSTEMS
NO. 5
INCOMING TRUNK
TEST LINE CIRCUIT

CHANGES

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO ADDED OR REMOVED APPARATUS

C.1 The test set preparation for the (RB) UA-4 relay was B/G prior to this issue.

C.2 The test clip data for this relay showed battery connected to B(RB) and ground to T(RB).

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The terminal designations of the (RB) relay are changed from B and T to TR and TF.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3330-MHK-AJB-KM

CROSSBAR SYSTEMS
NO. 5
INCOMING TRUNK
TEST LINE CIRCUIT

CHANGES

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO ADDED OR REMOVED APPARATUS

C.1 The timing requirements shown in Test Note 1 for the F relay and C tube have been changed as follows:

Removed Time Rec. Mil. Min.	Removed Time Rec. Mil. Max.	Replaced By Time Rec. Mil. Min.	Replaced By Time Rec. Mil. Max.
145	225	130	265
2250	2700	2025	3225
400	550	380	650
2450	2950	2200	3525

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The connection between 1B (S) and 5B (T) has been removed and a new connection has been added between 5B (T) and 3B (T).

D.2 The connection between 1T (TC1) and 5T (RB) has been removed. A new connection has been added between 5T (RB) and ground. The connection between 3T (TN) and 1B (RB) has been removed and a new connection has been added between 1B (RB) and 1T (TC1).

D.3 The strap between 1B (F1) and 7T (F1) has been removed. The connection between ground and the normally made contact on the ring spring of jack (B) has been removed and a new connection has been added between this normally made contact on the ring spring of jack (B) and 1B (F1).

D.4 The connection between 2B-5B (F1) and the normally made contact on the tip spring of jack (B) has been removed and a new connection has been added between this normally made contact and the tip spring of jack (B) and 7T (F1). A new connection has also been added between 2B-5B (F1) and ground.

D.5 Test Note 1, page 2, is removed. It formerly read "Adjacent relays shall not be energized. See BSP".

All other headings under Changes, no change.

1. PURPOSE OF CIRCUIT

1.1 This circuit is designed to test the tripping and supervisory relays of incoming trunks in No. 5 Crossbar Offices. It is used in conjunction with outgoing trunk test frames, portable and automatic incoming test circuits. It may also be used in connection with the test of incoming trunks from manual and toll switchboards.

1.2 This circuit is arranged to make the following tests:

1.21 To make a pretrip test of the tripping relay of incoming trunks during the silent battery period following the first ringing period.

1.22 To make a trip test of the tripping relay during the silent battery period following the second ringing period.

1.23 To test the supervisory relay for operate, release, sticking and chatter.

1.24 To test to determine if the polarity of the battery and ground on the tip and ring conductors of the incoming trunk is correct.

1.25 To check for ringing current on the ring conductor of the trunk and ring ground on the tip conductor.

1.3 This circuit is connected to terminals of the line and line link connector circuit. When it is desired to test the incoming trunk circuit, the incoming circuit is directed to the line terminals to which this line is connected. When this test line is seized under this condition it will be stepped automatically from one test to another, provided the incoming trunk circuit functions satisfactorily. When the test of the incoming circuit is completed, this test line circuit will advance and give a distinctive "test complete" signal and wait for disconnection at the originating end. In case of failure of the incoming relay circuit to function properly this circuit will block and prevent the incoming test circuit from giving an okay signal under certain test conditions. The circuit will return to normal automatically at any time from any point, when released by the incoming trunk circuit and it will hold busy until it is normal. A make busy key is provided which will make the circuit

busy but will not interfer with the test in progress.

The line terminals to which this circuit is connected are arranged to call for Code 1 ringing by the incoming trunk circuit and they are associated with a terminal hunting number within the number group circuit. The associated line circuit is arranged for terminating service only.

1.4 This circuit is arranged so that in case the tripping relay fails on the pretrip test, the test line circuit blocks and passes a rapidly interrupted ringing tone signal over the tip of the trunk to the distant test attendant so that he can determine the cause of the failure. Failure to trip is indicated to the attendant by the continued presence of normal ringing induction tone. "Tick Tock" tone is sent to the distant test attendant as a test complete signal.

2. WORKING LIMITS

2.1 None.

3. FUNCTIONS

3.01 To test for ringing current on the ring lead and ring ground on the tip lead of the trunk.

3.02 To make a pretrip and trip test of the tripping relay in the incoming trunk circuit during the silent period of the machine ringing interrupter.

3.03 The circuit is arranged to time approximately six seconds with the (R) relay connected to the ring of the trunk following the trip test to determine if the ringing is tripped before proceeding with the supervisory tests.

3.04 To test the supervisory relay in the incoming trunk circuit for "Operate" and "Release".

3.05 To make a test for continuity and for polarity of the talking battery, in the incoming trunk relay circuit.

3.06 A check of the pretrip and release test resistance is made in conjunction with the check of the ring lead supervisory circuit.

3.07 This circuit is arranged to give long and short closures to the incoming trunk circuit so as to synchronize with the operation of an automatic incoming test circuit. During the test of the supervisory relay, a long closure with soak current is made in order to synchronize with the automatic test circuit. The test line will then make two separate short closures with a soak current on the supervisory relay. Each of these closures and the synchronizing closure will be followed by the release test of the supervisory relay. The test line circuit is arranged to make a second long synchronizing closure with operate current in the supervisory relay to indicate that the release test is completed. After the second synchronizing closure, the test line circuit will make two closures for the operate test. The second synchronizing closure and the two operate test closures are each followed by open circuit release tests.

3.08 When this circuit is operating with the portable incoming test, the outgoing test circuit or a manual or toll switchboard, the synchronizing closure, soak, release and operate test closures will cause the supervisory lamp to flash. The number and the regularity of these flashes should be observed by the test attendant in order to determine whether the supervisory relay is responding correctly to the pulses from the test line.

3.09 Tone signals are provided so that in case of certain failures or on completed tests the distant test attendant may determine the point where the test stopped.

3.10 A make busy key is provided so that the test line may be taken out of service.

3.11 The pretrip and trip test conditions are timed by the open period of the 60 ipm interrupter circuit (.442 to .593 second).

3.12 This circuit is arranged to return to normal from any point after disconnection by the incoming circuit.

3.13 The 206 type selector (A) is used to steer the circuit from one test to another, to count the test pulses and in conjunction with the 120 ipm interrupter circuit to measure the length of the synchronizing pulses.

3.14 The 120 ipm interrupter circuit is used to give the proper open and close periods for the test pulses to the incoming supervisory relay, to step selector (A) when the synchronizing closures are made and to send interrupted ringing and "Tick tock tone" signals to the distant test attendant. The 206 selector (B) is used in conjunction with the 313CC vacuum tube to time the period required for the operate check of

the trip relay, (minimum period approximately 5.8 seconds - maximum period approximately 7.2 seconds).

3.15 This circuit is arranged so that the (S) relay will operate from the "S" lead to the line link and connector circuit in parallel with the line hold magnet of the line link circuit and so that the (SB) relay will open the sleeve lead to the number group and connector circuit to make this circuit busy to other incoming calls until this circuit restores to normal.

3.16 This circuit is arranged to function on a short ring by locking the (SR) relay until the (T) relay operates.

4. CONNECTING CIRCUITS

When this circuit is listed on a keysheet the connecting information thereon is to be followed:

4.1 Line and Line Link Connector Circuit - SD-25548-01.

4.2 Number Group and Connector Circuit - SD-25556-01.

4.3 Miscellaneous Circuit - Miscellaneous Relay Rack - SD-25781-01.

4.4 Interrupter Circuit - SD-25742-01.

DESCRIPTION OF OPERATION

5. CIRCUIT OPERATION

5.01 Seizure

When this circuit is seized in a crossbar office, the (S) relay operates over the "S" lead in parallel with the line hold magnet. The (S) relay opens the (A) selector "return-to-normal" ground, closes ground for locking (T) when it operates, and closes the tip conductor through relays (TC) and (T) normal, through the varistor (R) and relay (R), through condenser (R) and through relays (TS2), (TS2) and (TC1) normal to the ring of the trunk. The circuit waits in this condition for the first ring. The (R) relay operates on the first ring and operates relay (SR). Relay (SR) locks through contacts of relay (T) normal to ground on the ring and closes ground to operate (TS). Relay (TS) operated closes ground through arc 2 (A) selector normal to operate relay (T) and closes in part a ground through arc 3 (A) selector normal for moving the (A) selector to terminal (1). Relay (T) operated locks through relays (TC1) and (TC) normal to ground on relay (S) operated, substitutes a local ground for the ground on the tip of the trunk to the (R) relay, completes the path from arc 3 (A) selector through relay (TS) operated to step selector (A) off-normal and supplies ground to the trip and pretrip test resistances. Relay (SB) operates when the brush of arc 4 (A) selector reaches terminal (1) to prepare the circuit for return to normal on an abandoned test and to open the "S" lead to the number group circuit to make this circuit busy to other incoming trunks.

5.02 Pretrip Test

When selector (A) steps to terminal (1) when relay (T) is operated, relay (TS) locks to ground on arc 2 (A) selector on terminals (1) and (2) and prepares the operate circuit for relay (TS1) through arc 6 (A) selector terminal (2), relay (TC) normal, relay (TP) normal and relay (ST1) operated. At the end of the ringing period the (R) and (SR) relays will release. Relay (SR) is made slow release to hold over the open period of the machine ringing interrupter. The release of relay (SR) will close ground through arc 1 (A) selector and through relay (TS) operated to relay (ST1); causing it to operate and ground the "3TB" lead to start the 60 ipm interrupter. Relay (ST1) also closes ground from the 60 ipm interrupter to relay (TP) thus causing relay (TP) to follow the 60 ipm interrupter. Ground from (ST1) through the operated (TP) relay and through arc 5 (A) selector terminal (1) will energize the (A) selector magnet. Relay (TP) releases on the open period of the 60 ipm interrupter and causes the (A) selector to step to terminal (2). Ground from the back contact of relay (TP) through arc 6 (A) selector operates relay (TS1). Relay (TS1) operated closes the ring lead through (TC1) released, through the pretrip test resistances, through (T) operated, (TC) released and (S) operated to the tip lead. Relay (TS1) operated also closes ground through R5 (A) selector terminal 2 to energize the (A) selector magnet. When relay (TP) reoperates relay (ST1) releases, opens the pretrip test resistance and allows the (A) selector to step to terminal (3). When the (A) selector steps off terminal (2), relay (TS) releases and closes ground from arc 3 (A) selector term. (3) to step selector (a) to terminal (4). The (TN) relay operates from ground on terminal (4), arc 2 of the (A) selector to connect interrupted audible ringing tone to the tip of the trunk for use in notifying the test attendant as to the nature of the trouble in case the circuit blocks due to a false operation of the incoming tripping relay. This operation is as follows: The (TN) relay closes audible ringing tone through relay (SR1) normal, through the contacts of the (P) relay operated, through arc 6 (A) selector terminal (4), through

the (D) resistance and (TT) condenser through (TN) operated, through (TC) normal and through (S) operated to the tip of the trunk. Relay (P) operates from closures of the 120 ipm interrupter after relay (ST) has operated and started the interrupter by grounding lead "STO". Relay (ST) is operated from ground through arc 1 terminal (4) from relay (SR) released.

5.03 Trip Test

Assuming a satisfactory pretrip test the (R) relay will operate on the second application of ringing current over the ring of the test line to ground on relay (T) operated. The operation of relay (R) operates relay (SR) which operates relay (TS). Relay (TS) operated closes ground from arc 3 terminal (4) through relay (T) operated, to step the (A) selector to terminal (5). Relay (TS) remains operated and locks on terminals (5) and (6) arc 2. At the end of the ringing cycle, relays (R) and (SR) release and ground is closed through arc 1 terminal (5), through the (TS) relay operated, to the (ST1) relay. Relay (ST1) in operating, starts the 60 ipm interrupter by connecting ground to lead "STB", connects relay (TP) to lead "LB" to the 60 ipm interrupter so that relay (TP) will follow the interruptions and provides ground to the contacts of relay (TP). When relay (TP) operates, this ground through arc 5 terminal (5) energizes the (A) selector magnet. When relay (TP) releases, the (A) selector steps to terminal (6). Ground through the back contact of the (TP) relay through arc 6 terminal (6) operates relay (TS2). Relay (TS2) operated, closes the ring lead through (TC1) and (TS1) released through the trip test resistances, through (T) operated, (TC) released and (S) operated to the tip lead to test the tripping relay. Relay (TS2) operated, also closes ground through arc 5 terminal (6) to energize the (A) selector magnet. When relay (TP) operates, relay (TS2) releases and opens the trip test resistance circuit, allowing the (A) selector to step to terminal (7). Relay (ST1) releases and opens the circuit from the 60 ipm interrupter to relay (TP) allowing it to release.

5.04 Trip Test Check

Ground from the contacts of relay (SR) normal is closed to relay (ST2) through terms. (7) and (8) arc 1, (A) selector. Relay (ST2) in operating closes ground from the normal term. arc 1, (B) selector through normal contacts of (F1), through normal contacts of the tip and ring springs of jack B, through the normal contacts of B selector to the winding of relay (F1). Relay (F1) in operating closes a circuit from ground to the winding of B selector magnet, closes a holding circuit from ground to the winding of (F1) through the normal contacts of B selector and the normal springs of jack B, and opens its own operating path. When the B selector magnet operates, the holding circuit for (F1) is opened causing it to release and remove ground from the winding of the B selector magnet. The B selector steps to terminal 1, opens the release of the B selector magnet. Ground from terminal (1), arc 1, (B) selector thru the (ST2) operated, to the winding of the TC relay operates (TC). (TC) locks to arc 2, (A) selector terminals (7) and (8) and also (a) closes a circuit from arc 1 (B) selector terminal 3, through arc 6 (A) selector terminal 7 and through (TC) operated to the (TN) relay, in preparation for the operation of the (TN) relay, (b) supplies a locking ground for relays (TC1) and (SR), (c) prepares the circuit for operating relay (TC1) through terminal (8) arc 6 (A) selector, (d) opens the tip lead to the (TN) relay to prevent passing interrupted tone to the tip of the line when relay (TN) operates under this condition, (e) transfers the (T) relay locking circuit to ground on arc 3 selector (A) and (f) prepares the circuit for checking the supervisory ground on the tip of the line when the (A) selector switch advances to terminal (8). When the (B) selector moves from normal to terminal (1), positive 130 volt battery is connected thru resistance (T), contacts of (F1) releases, the (B) selector arc 3 terminal (1) to the anode of the (C) vacuum tube and thru the (S) resistance and arc 2 terminal (1) to the starter anode of tube (C) and to the (C) condenser. The (C) condenser charges in about 2 tenths of a second to a voltage which causes the (C) tube to operate. The (F) relay is connected between ground and the cathode of the (C) tube and operates when (C) tube operates. Relay (F), in operating, short-circuits the (C) condenser and connects ground to the winding of the (F1) relay. Relay (F1) in operating, (a) locks operated from ground on its own contacts thru the B jack and contacts of the B selector, (b) connects ground to the winding of the B selector magnet and (c) opens the circuit to the positive 135 volt battery. The (C) tube deionizes and the (F) relay releases when the positive battery is removed. The (B) selector magnet operates and removes ground from winding of the (F1) relay. The (B) selector in releasing, steps to terminal (2). Brush 3 selector (B), in stepping from terminal (1) to terminal (2) also

opens the positive 130 battery circuit momentarily. The (B) selector remains on step 1 approximately 0.2 seconds and ground from brush 1 thru arc 1 terminal (1) of the (B) selector operates relay (TC). The 0.2 second period is to permit relay (CT) to operate and establish a locking path for relay (SR) in case a third ringing period causes this relay to operate on a failure to trip. Positive battery thru resistance (T), relay (F1) released, terminal (2) arc 3 resistance (R) and terminal (2) arc 2 causes the (C) condenser to charge and operate tube (C). When tube (C) operates, relay (F) and (F1) operate and energize the (B) selector magnet. The (B) selector magnet in operating opens the operating ground for (F1) which releases and opens the operating ground for the B selector magnet. The B selector magnet in releasing steps the brushes to terminal (3) in approximately 2 seconds. The (B) selector in advancing to terminal (3) connects ground from arc 1 (B) selector through the operated (ST2) relay and through arc (6) (A) selector terminal (7) to cause the operation of the (TN) relay. The (TN) relay in operating energizes the (A) selector through the (T) relay operated, through the (TN) relay operated and through terminal (7) arc (6) of the (A) selector to ground on arc 1 (B) selector terminal (3). The (B) selector remains on terminal (3) until the (C) condenser has charged again through resistance (P) to cause the (C) tube to operate and step the selector to terminal (4). This interval is approximately 1/2 second. When selector (B) steps to terminal (4) ground is removed from the (TN) relay allowing it to release and the (A) selector steps to terminal (8). The (B) selector remains on terminal (4) for approximately 2-1/2 seconds and then steps to terminal (5). Ground from arc 1 (B) selector terminal (5) through arc 6 (A) selector terminal (8) will cause the operation of relay (TC1). Relay (TC1) in operating will operate relay (SKR). Relay (SKR) in operating will operate relay (T1). When the (B) selector has remained on terminal (5) for approximately 1/2 second, to insure the operation and locking of the (TC1) relay, it steps to terminal (6). This is an interrupter position which insures the advance of the (B) selector to terminal (7) which is a normal position of the (B) selector.

5.05 Tip and Ring Lead and Test Resistance Check

In the interval between the time the (A) selector leaves terminal (7) and the operation of relay (TC1), the (T) relay is locked to the tip lead through the 1600 ohm (E) resistance to check the continuity of the tip lead through the incoming trunk supervisory relay to ground. Should this circuit be open the (T) relay will release and block the (A) switch in position 8. If relay (T) remains operated, relay (TC1) locks to relay (TC), transfers the (T) relay locking circuit from the tip of the trunk to ground on arc 2 (A) selector relay (T) is slow enough in releasing to hold over this transfer. Relays (SKR) and (TS1) are operated to establish a circuit from ground through the winding of relay (RB) through (TC1) operated, (TS1) operated pretrips resistances through T operated, (TN) normal, (SKR) operated through the supervisory relay test operate and release resistances and through (SKR) relay operated to the ring side to the trunk. Under this condition the (RB) relay operates to the battery on the ring side of the incoming trunk under test. Relay (RB) operated closes ground from terminal (8) arc 3 (A) selector through relay (T) operated to step the (A) selector to terminal (9). Relay (TC1) holds to ground on arc 3 terminal (8) (A) selector to insure that relay (T) releases as the switch leaves terminal (8). Terminal (9) is a pass-by position awaiting the release of the (T) relay which is somewhat slow release. Relays (TC) and (ST2) release as the selector leaves terminal (8) and relay (TC1) releases as the selector leaves terminal (9). Terminal (10) is a pass-by position via the open contacts of the (P) relay and is necessary to insure having a full time period on the first synchronizing pulse.

5.06 First Synchronizing Closure

In order to get the automatic incoming trunk test circuit in synchronism with the test line, the test line circuit sends a synchronizing closure of approximately 1.3 seconds duration before starting the supervisory relay test. Relay (SKR) is operated by relay (TC1) when the (A) selector reaches terminal (8) and relay (SKR) holds until the (A) selector leaves terminal (18), arc 1 (A) selector. This is in order to prepare the circuit for the soak pulses. Relay (SKR) holds the (TS1) relay operated to removes the ringing bridge during supervisory pulsing and to provide ground for the operation of relay (ST). Relay (ST) supplies ground to lead "STO" to start the 120 ipm interrupter. The winding of relay (P) is connected to the interrupter lead through relay (ST) and therefore relay (P) follows the 120 ipm interruptions. When the (A) selector reaches terminal (11) arc (6), relay (SP) operates and locks to ground on terminals (11), (12), and (13) arc 3 (A) selector. The (SP)

closes a circuit to the (A) selector magnet through arc 6 (A) selector terminals (11), (12) and (13), through the contacts of relay (P) operated, from ground on arc 2 (A) selector for measuring the time of the synchronizing closure. (SP) also closes a short circuit across the tip and ring of the trunk to give a soak to the supervisory relay and to start the first synchronizing pulse closure. The (P) relay is driven directly from the 120 ipm interrupter. Under this condition the (A) selector is stepped under control of the 120 interrupter to terminal (14). When the brush of arc 3 (A) selector leaves terminal (13) the (SP) relay releases and opens the stepping circuit. The release of relay (SP) also opens the soak bridge, thus terminating the first synchronizing pulse. Under this condition the release bridge is left connected across the tip and ring leads through (SKR) operated and relays (TN) and (TC) normal and relay (S1) operated.

5.07 Supervisory Relay Release Test

The circuit is arranged to give two release pulses at this point to test the supervisory relay in the incoming trunk for release. On the next operation of the (P) relay, ground from arc 2 through terminal (14) arc 6 of the (A) selector operates relay (PC). Relay (PC) operated closes the short circuit across the tip and ring of the trunk and energizes the magnet of the (A) selector through arc 5. When relay (P) releases, relay (PC) releases and substitutes the release network for the short circuit across the trunk. The release of relay (PC) also allows the (A) selector to step to terminal (15). The next operation of relay (P) reoperates the (PC) relay over the same circuit. Relay (PC) operated again closes the short circuit and energized the (A) selector magnet. When the (P) relay releases, relay (PC) releases allowing the (A) selector to step to terminal 16 and again substituting the release network for the short circuit. When the brush of (A) selector arc 3 reaches terminal (16) a circuit is closed to operate relay (SPO) which prepares the tip and ring bridge circuit for sending the operate value of current for the second synchronizing pulse. Relay (SPO) operated holds through terminal (17) and (18) arc 3 (A) selector.

5.08 Second Synchronizing Closure

A second synchronizing closure of approximately 1.3 seconds is provided to indicate to the incoming test circuit that the release pulse tests are complete. In position 16 arc 6 of the (A) selector a circuit is closed from ground on arc 2 terminal 16 through the operated (P) relay to operate the (SP) relay through its continuity contacts. Relay (SP) operated locks to ground on the operated (SPO) relay, closes the operate bridge across the tip and ring of the trunk to start the second synchronizing closure and closes the same ground from arc 2 (A) selector through the contacts of the (P) relay, through arc 6 terminals (16), (17) and (18) to the (A) selector magnet for driving the (A) selector. When the (P) relay releases the (A) selector is stepped to terminal (17). Under the above condition the (A) selector is stepped successively to terminals (18) and (19) by the operations of the (P) relay in following the 120 ipm interrupter. When the selector leaves terminal (18) relay (SPO) releases, causing the release of SP which opens the bridge and the stepping circuit for the (A) selector. The (SKR) relay also releases when the (A) selector leaves terminal (18) to prepare the circuit for the open circuit pulses used between the operate pulses.

5.09 Supervisory "Operate" Test

This circuit is arranged to apply two alternate open circuit and two operate current pulses to the tip and ring of the trunk after the second synchronizing pulse. The open periods between the operate current pulses will allow the supervisory relays to release on open circuit to set up the worst condition for supervisory relay chatter. In position 19 of the (A) selector the (PC) relay is again operated from ground on arc 2 through the operated (P) relay and arc 6 of the (A) selector. Relay (PC) operated closes the tip and ring leads through the (SKR) relay normal, through the operate test resistance network to the incoming trunk supervisory relay. Relay (PC) also by-passes the tip lead around the normal (SKR) relay. When the (P) relay releases, relay (PC) releases. The release of (PC) opens the test operate bridge across the tip and ring of the incoming trunk and allows the (A) selector to step to terminal (20). On the next operation of the (P) relay, relay (PC) will again operate to close the test operate network across the tip and ring leads and to energize the (A) selector magnet. When the (P) relay releases, relay (PC) will release opening the test operate network and causing the (A) selector to step to terminal (21).

5.10 Test Complete Signal and Disconnect

When the (A) selector is in position 21, relay (TN) is operated from ground on arc 2. Relay (SKR) is also operated from ground on relay (SR) normal through arc 1 of the (A) selector,

to provide battery through resistance (M) and interrupted ground through resistance (D), for supplying the "tick-tock" tone used as a test complete signal. Relay (TN) operated transfers the tip of the trunk to the "tick-tock" tone circuit. When the test attendant hears the O.K. signal he will disconnect causing relay (S) to release. Relay (S) released closes a circuit through relay (SB) operated, to advance the (A) selector to normal. When the (A) selector leaves terminal (21), relays (SB), (TS1), (TN) and (SKR) release, restoring the circuit to normal and removing the busy indication from the test line.

5.11 Tone Signals

There are three tone signals, two of which are supplied by the test line circuit and one which is supplied by the incoming trunk circuit. The first tone signal consists of ringing induction interrupted by the operation and release of the (P) relay in following 120 ipm interruptions. This tone is connected to the tip of the trunk in position 4 (A) selector and indicates to the test attendant that the test line circuit has been blocked due to the tripping relay in the incoming trunk operating on the pretrip test. The second tone is regular ringing induction from the incoming trunk and, if received for a period longer than should elapse for the tripping test to take place, indicates that the ringing was not tripped during the trip test interval. The third tone is a "tick-tock" tone effect produced by the (TP) relay following 120 ipm interruption and is connected to the tip of the trunk in position 21 of the (A) selector to indicate that the test line has completed all tests and is awaiting disconnection.

5.12 Test Line Guard and Return to Normal on Wipe Out

Relay (SB) is operated from arc 4 terminals 1 to 21 (A) selector. When (S) relay releases due to disconnection before a test is complete, as for instance, when the test circuit blocks to indicate trouble, a circuit is closed from ground of arc 4 terminals 1 to 21 (A) selector to drive the (A) selector magnet to its normal position. Relay (SB) operated also holds the "S" lead open to the number group circuit to prevent this circuit from being seized.

5.13 Make Busy

This circuit is made busy by operating the (MB) switch to open the sleeve circuit to the number group and to provide ground for lighting the make busy lamp at the make busy circuit for miscellaneous relay racks.

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