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COMMON SYSTEMS
TRUNK TEST SET CIRCUIT
FOR USE IN STEP-BY-STEP OFFICES IN TESTING
SUBSCRIBER RECORDING COMPLETING TRUNKS
OUTGOING TRUNKS FROM SELECTOR EQUIPMENT
COIN TRUNK CIRCUITS, LINE AND TRUNK FINDERS
SELECTORS, CONNECTORS, AND
OUTGOING REPEATERS AND ROTARY OUT
TRUNK SWITCHES AND IN TOLL
OFFICES FOR TESTING
3-WIRE SUBSCRIBER RECORDING COMPLETING
TRUNKS FROM STEP-BY-STEP OFFICES

CHANGES

D. Description of Changes

- D.1 A caution is added to Section II, part 10,
Tests of Line and Trunk Finders
- D.2 Notes 109 and 302 are revised.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-LCB
WECO DEPT 5152-RTO-WEA

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CHANGES

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

C.1 The test requirements for the RCK relay operate and nonoperate conditions are revised to provide the correct information.

D. Description of Changes

D.1 The information in the Test and Readjust columns for the RCK relay was changed from "5.3, 5.1 - 4.4, 4.6" to read "53., 51. - 44., 46."

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5223-WCB-MR

COMMON SYSTEMS
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SUBSCRIBER RECORDING COMPLETING TRUNKS
OUTGOING TRUNKS FROM SELECTOR EQUIPMENT
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OFFICES FOR TESTING
3-WIRE SUBSCRIBER RECORDING COMPLETING
TRUNKS FROM STEP-BY-STEP OFFICES

CHANGES

A. Changed and Added Functions

A.1 A change is made in this circuit to omit the operation of the CTCK lamp when tests are performed on circuits associated with coin first operation.

D. Description of Changes

D.1 To correct a drafting error made on issue 17D, the CC and CCl diodes have been redrawn to indicate proper polarity.

D.2 The CC relay was not shown as being part of ZJ option which was added on issue 17D.

D.3 Option ZK is added to omit the operation of the CTCK lamp when tests are performed on circuits associated with coin first operation. Option ZK replaces existing wiring designated ZM. Existing spare contacts on the RCK key are used to implement this change.

D.4 Supporting information has been added to Notes 104 and 302.

D.5 Note 109 is revised to include the ZK option.

F. Changes in Description of Operation

F.1 Under 6.15 change subtitle 6.152 that now reads "With option ZH:" to read "With options ZH and ZK."

F.2 Under 6.152, line 8, delete from the sentence: "... and the (CTCK) relay to operate thereby lighting the (CTCK) lamp."

F.3 Under 6.152, line 19, delete "... and (CTCK) lamp..." from the sentence.

F.4 Under 6.152, lines 37 and 38, delete "... as described above" from the sentence.

F.5 Under 6.152, line 41, after the words "... the (RCK) relay will..." replace the remainder of the sentence with: "flutter causing the (CR) and (CC) lamps to alternately flash."

F.6 Under 7.7, line 6, after "... operate the (CA) relay" change "[or (CTCK) relay and (CTCK) lamp when ZH option is used]" to read "[or (CTCK) relay when ZH and ZK options are used]."

F.7 Under 19, change the title to read: "AUXILIARY COIN TRUNKS - ASSOCIATED WITH COIN LINES ARRANGED FOR LOOP OPERATION - ZH AND ZK OPTIONS."

F.8 Under 19.1, replace the first three sentences preceding "If the (LK) key..." with the following:

"Test for a busy condition by operating the MB key on the auxiliary coin trunk. If the trunk is idle the MB lamp will light. With the trunk idle, connect a cord (Fig. 4) from the T jack of the test set to the TST jack of the auxiliary coin trunk. For the following tests the MI key must be in the nonoperated position and the LO key must be in the LO position.

F.9 Under 19.2, replace the first three sentences preceding "The operation of the (CN) key..." with the following:

"With the DL ST key operated, hold FL key operated and operate the RCK and CN keys. The FL key operated opens the bridge to the induction coil and places a 10,000-ohm leak resistance across the trunk which prevents a false pulse from being generated when the RCK key is operated. After the RCK and CN keys are operated the FL key is restored to its normal position. The SL lamp will light. The RCK key operated prepares a path for operation of the CTCK lamp and connects the RCK relay through the S relay winding shunted by the F resistor to the ring side of the line.

The CN key operated connects ground through the CTCK relay, the AF resistor and one half of the A resistor to the tip side of the line."

F.10 Under 19.3, line 3, change the word "established" to "completed".

F.11 Under 19.3, line 4, following "... gives a battery reversal" insert the following: "(If it is desired to talk to the called end, the TRS key is operated and the RCK key is restored to normal. When conversation is completed the RCK key is reoperated.)"

F.12 Under 19.3, line 8, following "... and ring." change the beginning of the succeeding sentence to read "After the called end disconnects, the bridge is removed....!"

F.13 Under 19.3, remove the last sentence beginning with "If battery was also..." and add the following:

"If coin battery was also applied to the ring side of the line, the RCK relay would flutter causing the CR and CC lamps to alternately flash."

F.14 Under 19.4, line 3, change the word "established" to "completed".

F.15 Under 19.4, line 4, preceding the sentence "At this time..." insert the following: "(If it is desired to talk to the called end, the TRS key is operated

and the RCK key is restored to normal. When conversation is completed the RCK key is reoperated.)"

F.16 Under 19.4, line 8, change the beginning of the sentence "By holding the (FL)..." to read "After the called end disconnects, by holding...."

F.17 Under 19.4 remove the last sentence beginning with "If battery was..." and add the following:

"If coin battery was also applied to the ring side of the line, the RCK relay would flutter causing the CR and CC lamps to alternately flash."

F.18 Under "19. AUXILIARY COIN TRUNKS - ASSOCIATED WITH COIN LINES ARRANGED FOR LOOP OPERATION - ZH OPTION" add a new subtitle to read as follows:

19.5 Disconnect

When all tests have been completed, the DL ST key is restored to normal and the FL key is held operated to open the loop. When the FL key is released, and depending on the type test call made, the coin trunk will apply positive or negative coin battery causing the CC lamp, or the CR and CTCK lamps to light, respectively. The (RCK) key is restored to its nonoperated position followed by the restoral of the CN key. The BSY lamp may flash and the SL, CC, or CR lamps will extinguish.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5823-CRH-MR

COMMON SYSTEMS
 TRUNK TEST SET CIRCUIT
 FOR USE IN STEP-BY-STEP OFFICES IN TESTING
 SUBSCRIBER RECORDING COMPLETING TRUNKS
 OUTGOING TRUNKS FROM SELECTOR EQUIPMENT
 COIN TRUNK CIRCUITS, LINE AND TRUNK FINDERS,
 SELECTORS, CONNECTORS, AND
 OUTGOING REPEATERS AND ROTARY OUT
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 3-WIRE SUBSCRIBER RECORDING COMPLETING
 TRUNKS FROM STEP-BY-STEP OFFICES

CHANGES

A. Changed and Added Functions

- A.1 Changes are made in this circuit to provide a test that will verify the application of coin potentials to the tip side of the line, and, also positively detect that the ring side of the line is held open during the application of these potentials.
- A.2 The changes also permit testing for the presence of the coin present relay (CNP) in the new Auxiliary Coin Trunk - SD-32538-01.

B. Changes in Apparatus

B.1 Added

Fig. 1 - ZH option;
 1 - 552A Key (RCK)
 1 - 2Y Lamp (CTCK)

B.2 Removed

Fig. 1 - ZJ option;
 CA Relay S-39

Replaced By

Fig. 1 - ZH option;
 RCK Relay S-65

B.3 Superseded

Fig. 1 - ZJ option;
 CC Relay 280J
 CR Lamp 2Y
 CC Lamp 2Y

Superseded By

Fig. 1 - ZH option;
 CTCK Relay 280J
 CR Lamp NE2D
 CC Lamp NE2D
 CC and CR Diodes -
 446F
 CC1 and CR1
 Diodes - 459E
 CN Resistor -
 KS-16645 L2 -
 10,000 ohms

52A Head Tel Set - Fig. 2 52S Head Tel Set - Fig. 2

D. Description of Changes

- D.1 Option ZH has been added to provide a test for verifying that coin collect and coin return potentials are being applied

to the tip side of the line, and that the ring side of the line is open during the application of these potentials when testing an auxiliary coin trunk. Option ZH replaces existing wiring and apparatus designated option ZJ.

D.2 Option ZH also provides a CTCK lamp to test for the presence of the potential from the coin present relay (CNP) in the auxiliary coin trunk.

D.3 To implement the above, minor wiring changes are made to accommodate the addition of one key (RCK), a switchboard type lamp (CTCK), one resistor (CN), and four diodes (CR, CR1, CC, and CC1). One relay (RCK) is added in place of the existing (CA) relay. The (CC) relay is redesignated (CTCK). The (CC) and (CR) switchboard type lamps are replaced with neon lamps.

D.4 Supporting information has been added to Notes 104 and 302.

D.5 Note 109 has been added.

D.6 In Fig. 2, the 52A head telephone set has been rated Mfr Disc. replaced by the 52S head telephone set.

F. Changes in Description of Operation

F.1 In TABLE OF CONTENTS add:
 "19. AUXILIARY COIN TRUNKS."

F.2 In paragraph 1.1, fourth line after "coins trunks," add "auxiliary coin trunks."

F.3 Under "3. FUNCTIONS" add the following:

3.16 Tests on Auxiliary Coin Trunks

3.161 When a suitable patching cord is connected to the test jack of the auxiliary coin trunk, the test set is arranged to connect through an auxiliary coin trunk via a coin trunk to a first

selector and associated switches. By the operation of a key, a loop is established to prepare the trunk for dialing.

3.162 The test is arranged to operate a relay over the sleeve circuit and light a lamp if the set is connected to a busy trunk.

3.163 The test is arranged to indicate either coin return or collect potential, as applied by the coin box trunk or recording completing trunk over the tip side of the line, by lighting a corresponding lamp in the test set.

3.164 The test is arranged to monitor the ring side of the line during the application of coin potentials to detect that it is open during this function.

F.4 Under "4. CONNECTING CIRCUITS" add the following:

4.23 Auxiliary Coin Trunk - SD-32538-01

F.5 Under "6.14 Test for the Operation of Trunk Relay - Coin Trunks" add the following subtitle:

6.141 With ZJ option:

F.6 Under 6.14, at the end of the paragraph, add a new subtitle to read as follows:

6.142 With ZH option:

After having made the busy test as described in 6.11 the (CN) key is operated followed by the operation of the (DL ST) key. The (CN) key operated connects the (CTCK) relay and a resistance to the tip side of the line for coin operation. The (DL ST) key operated completes the loop across the tip and ring of the trunk causing the trunk relay to operate. The trunk relay operated signals the operator by lighting a trunk lamp at the switchboard and also returns a ground on the sleeve which operates the (SA) relay as described in 5.2. Audible ringing may be heard. It will be discontinued when the operator answers. The operator upon answering will cause a reversal of battery and ground supplied through the trunk relay which will operate the S relay and light the (REV) lamp.

F.7 Under 6.15, "Test for the Application of Coin Current" add the following subtitle:

6.151 With ZJ option:

F.8 Under 6.15, line 3 of the paragraph, change "paragraph 6.14" to read "paragraph 6.141."

F.9 Under 6.15, at the end of the paragraph add a new subtitle to read as follows:

6.152 With option ZH:

With the (CN) and (DL ST) keys operated as described in 6.142, the operator having answered caused negative coin current to be applied to the trunk for automatically returning the coin. This coin current will forward bias the (CR) diode, cause the (CR1) diode to conduct causing the (CR) neon lamp to glow and the (CTCK) relay to operate thereby lighting the (CTCK) lamp. The (REV) lamp will also be extinguished momentarily. The coin current applied for subsequent collection or return of coins may be checked at any time with the assistance of the operator. When the operator applies coin collect current to the trunk, the (CC) and (CC1) diodes will conduct causing the (CC) neon lamp to glow. When return current is applied, the (CR) lamp and (CTCK) lamp will light as described above. The proper polarity is indicated by lighting the (CC) or (CR) lamp. The application of negative coin current will release the (S) relay and extinguish the (REV) lamp and positive coin current may flash the (REV) lamp. If the trunk under test is arranged to apply coin potentials on the tip side of the line with the ring side open an additional test operation is made to verify this feature. After the operator has answered, the testman should request the operator to apply coin return and coin collect potentials. Prior to the application of the coin potentials the (RCK) key is operated. The proper polarity is indicated by lighting the (CR), and (CTCK), or (CC) lamps as described above. However, if the ring side of the line is closed through in the trunk during the application of coin potential the (RCK) relay will operate preventing either (CR) or (CC) lamps from lighting.

F.10 Under 7.2, line 5, after "... (CC) and (CA) relays" add the following: "(or with option ZH, the CTCK relay)"

F.11 Under 7.4, line 15, after "... and light the (CC) lamp." add the following: "With option ZH only the (CC) lamp will light."

F.12 Under 7.5, line 8, after "... (CA) relay only," add the following: "(with option ZH, the (CTCK) relay only)"

F.13 Under 7.7, line 6, after "... operate the (CA) relay" insert "(or (CTCK) relay and (CTCK) lamp when ZH option is used)"

F.14 Under 7.721, line 5, after "... (CA) and (CC) relays" add the following: "(or (CTCK) relay when ZH option is used)." Line 9 after "... (CA) and (CC)" add the following: "(or (CTCK) - ZH option)"

F.15 Add the following:

19. AUXILIARY COIN TRUNKS - ASSOCIATED WITH COIN LINES ARRANGED FOR LOOP OPERATION - ZH OPTION.

19.1 Preliminary Operation

For this test, the (T) jack of the test set is connected to the test jack of the auxiliary coin trunk by a cord in Fig. 4. If the trunk is busy, the (BSY) lamp will light as described in 5.2. If not busy when the cord is inserted, the (DL ST) key is operated. If the (LK) key is used in any of the following tests of auxiliary coin trunks, it should not be operated until after the (CN) key is operated. With the (DL ST) key operated, the operating path of the (SB) relay is opened and relay (S) shunted by resistance (F) is connected in series with the secondary winding of the induction coil and dial across the trunk. This bridge causes a ground to be returned on the sleeve which operates the (SA) relay as described in 5.2. Dial tone will be heard at this time.

19.2 Test for Presence of Coin

After receiving dial tone the (CN) and (RCK) keys are operated. The (CN) key operated connects ground through the (CTCK) relay, the (AF) resistor and one half of the (A) resistor to the tip side of the line. The (RCK) key operated connects the (RCK) relay through the (S) relay winding shunted by (F) resistor to the ring side of the line. The operation of the (CN) key also removes a short-circuit from a resistance to provide a 20,000-ohm leak when the leak test is applied. A "charge" type number should now be dialed. After the third digit of the number is dialed a coin test is made in the auxiliary coin trunk which momentarily places negative 48 volts on the tip side of the line and at the same time opens the ring side of the line. Battery on the tip will cause the (CTCK) relay to operate lighting the (CTCK) lamp. If the (CTCK) lamp does not momentarily light during this test, two possible trouble

conditions can exist (short of the CTCK lamp being burned out): (a) that battery was not placed on the tip of the line, or (b) that the ring side of the line was not opened and battery was placed on it. The latter condition will cause the ring check relay (RCK) to operate and thereby prevent the (CTCK) lamp from lighting. If the call was to a "free" number ie, a "nocharge" type call, the coin test would be disabled in the auxiliary coin trunk and consequently the (CTCK) relay and corresponding lamp would not operate.

19.3 Test Condition for "Charge" Call

With the (DL ST), (CN), and (RCK) keys operated as in 19.1 and 19.2, a connection is established to a connector which gives a battery reversal. At this time the coin trunk is set to apply positive current for collecting a coin when the bridge is removed from the tip and ring. The bridge is removed by operating the (FL) key which will cause positive current to be applied only to the tip side of the line by the coin trunk and through the auxiliary coin trunk. Positive current will forward bias the (CC) diode, cause the (CC1) zener diode to conduct, and break down the (CC) neon lamp causing it to glow. If battery was also applied to the ring side of the line the (RCK) relay would operate preventing the (CC) lamp from lighting.

19.4 Test Condition for "Noncharge" Call

With the (DL ST), (CN), and (RCK) keys operated as described in 19.1 and 19.2, a connection is established to a "nonreversing" line. At this time the coin trunk is set to apply negative current for returning a coin when the bridge is removed from the tip and ring. By holding the (FL) key operated the bridge is removed causing negative coin current to be applied only to the tip side of the line by the coin trunk and through the auxiliary coin trunk. Negative current will forward bias the (CR) diode, cause the (CR1) diode to conduct, and break down the (CR) neon lamp causing it to glow. The (CTCK) relay and (CTCK) lamp will also follow the application of the negative coin current. If battery was also applied to the ring side of the line, the (RCK) relay would operate preventing the (CR) and (CTCK) lamps from operating.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5823-CRH-MR

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CHANGES

B. Changes in Apparatus

B.1 ADDED

Fig. 1 -
 1 - KS-14603, L3C
 412-ohm Resistor,
 ZG Option

B.2 SUPERSEDED

Fig. B
 1 - 111B 1000-ohm
 X and Y Resistors

SUPERSEDED BY

Fig. B
 1 - 227A 1000-ohm
 X and Y Resistors

D. Description of Changes

D.1 ZG option has been added to improve the P1 relay release test. This option replaces existing wiring shown as ZF option. The test will release the relay by interrupting a higher holding current. The added M resistor (ZG option) supplies this current.

D.2 The code of the X and Y resistors in Fig. B has been changed.

D.3 ZE option has been changed to ZD option to conform to WECC drawings.

D.4 Notes 104 and 302 have been modified.

F. Changes in Description of Operation

F.1 Under 7.8 the sentence, "Operate and hold the nonlocking C key." should be added to the beginning of the second paragraph. "Release the C key." should be added as the second sentence of the second paragraph.

F.2 Under 14.11, line 17 of the first paragraph, after "...finder should release" add the following: "To test CAMA and SAMA trunk finders from the test line, connect the test set T jack to test line A jack using a cord per Fig. 10. Then connect the LF jack to the test and make busy jack of the finder to be tested. The finder should select the test terminal and then release."

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-MPC-RJJ

COMMON SYSTEMS
TRUNK TEST SET CIRCUIT
FOR USE IN STEP-BY-STEP OFFICES IN TESTING
SUBSCRIBER RECORDING COMPLETING TRUNKS
OUTGOING TRUNKS FROM SELECTOR EQUIPMENT
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3-WIRE SUBSCRIBER RECORDING COMPLETING
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F. CHANGES IN DESCRIPTION OF OPERATION		18. TEN PARTY TERMINAL PER STATION CONNECTORS ARRANGED FOR REVERTING CALLS - REVERTING CALL FEATURE TESTS - 350A AND 360A OFFICES ONLY	21
F.1 Paragraph 16.8 is revised.			
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1. PURPOSE OF CIRCUIT	1	1. PURPOSE OF CIRCUIT	
2. WORKING LIMITS	1	1.1 This circuit is for use in testing subscribers recording completing trunks, outgoing repeaters, line and trunk finders, selectors, coin trunks, rotary out trunk switches arranged for preselection and miscellaneous outgoing trunks in step-by-step offices, connectors and reverting call selectors in 350A or 360A dial offices; and three-wire subscriber recording completing trunks in toll offices. The connections to the various circuits under test are made by means of patching cords. Connection is also made to a test line circuit for controlling ringing, pretrip, trip, talking and release connections, when testing connectors and reverting call selectors. The various test conditions are indicated by lamps, subsets or an operator's telephone set.	
3. FUNCTIONS	1	2. WORKING LIMITS	
4. CONNECTING CIRCUITS	4	2.1 None.	
5. DESCRIPTION OF OPERATION - GENERAL	5	3. FUNCTIONS	
6. TESTS OF RECORDING COMPLETING TRUNKS AND ROTARY OUT TRUNK SWITCHES	5	3.01 To provide means for making operating and talking tests of various trunks between switches, trunks to operators and desks, and to other step-by-step, manual and toll offices.	
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- 3.0201 Arranged to light a lamp over the sleeve circuit when the test set is connected to a busy circuit.
- 3.0202 Arranged to open both sides of the test circuit when a busy circuit is encountered to prevent placing a bridge across it.
- 3.021 Recording completing trunks.
- 3.0211 Arranged to signal the toll operator by operating a key to place a bridge across the trunk.
- 3.0212 On trunks equipped for coin control, this circuit is arranged to light a lamp to indicate a battery reversal when the toll operator answers
- 3.0213 Arranged to test the operation and release of the trunk line relay (A).
- 3.0214 Arranged to light a lamp to indicate when ringing current is applied to those trunks arranged for recalling the originating subscriber.
- 3.0215 Arranged to test for the application of coin current for the automatic return of coins, subsequent collection or return of coins and light a lamp to check the proper polarity of current.
- 3.0216 Arranged to flash the toll operator's signal when testing the release of the trunk line relay (A).
- 3.0217 Arranged to open the receiver circuit when testing the ringing used for recalling the subscriber.
- 3.0218 Arranged to connect the secondary winding of the induction coil in series with a loop test resistance for operating the trunk line relay (A) for both coin and noncoin trunks.
- 3.0219 Arranged to test for sleeve continuity.
- 3.022 Rotary out trunk switches arranged for preselection.
- 3.0221 Arranged to test for operation of the cut through relay.
- 3.0222 Arranged to test the stepping action of the switch.
- 3.0223 Arranged to stop stepping action on previous test at any trunk found reversed or with open T, R or S lead.
- 3.0224 Arranged to select for test any trunk reached through a rotary out trunk switch.
- 3.0225 Arranged to test code leads of auto-ticketing trunks.
- 3.0226 Arranged to receive lamp signals to indicate open or crossed code leads in test of R.O.T. switches used to reach Automatic Ticketing Trunks.
- 3.0227 Arranged to test for an open sleeve lead in 4 or 6 wire R.O.T. switch.
- 3.03 Coin trunk tests.
- 3.031 When a suitable patching cord is connected to the test jack of the trunk, the test set is arranged to connect through a coin trunk to a first selector and associated switches. By means of a key, ground through a circuit simulating the coin magnet is connected to the tip of the trunk to prepare it for dialing.
- 3.032 The test is arranged to operate a relay over the sleeve circuit and light a lamp if the set is connected to a busy trunk.
- 3.033 Arranged to indicate the polarity of coin current applied by the coin trunk by lighting a corresponding lamp in the test set.
- 3.034 Arranged to apply "loop" and "lead" tests under normal operating conditions by the operation of corresponding keys.
- 3.035 Arranged to test for a stuck coin condition, controlled by a key.
- 3.036 Arranged to apply an operate and non-operate test to the (BT) relay in the coin trunk circuit.
- 3.037 Arranged to test for sleeve continuity.
- 3.038 Arranged to test the (Pl) relay of prepay coin trunks ("V" option).
- 3.04 Tests of outgoing trunks and repeaters to other step-by-step and manual offices.
- 3.041 Arranged to light a lamp over the sleeve circuit if the trunk is busy.
- 3.042 Arranged to operate a polarized relay on battery reversal and light a supervisory lamp.
- 3.043 Arranged for dialing a test line which provides a momentary tone and flashes the (REV) lamp.
- 3.044 Arranged to apply "loop" and "leak" resistances for dialing.
- 3.045 Arranged to test for sleeve continuity.
- 3.05 Outgoing trunks to manual offices - call indicator office.

- 3.051 Arranged to dial and test, (a) for busy trunk, (b) reversed battery and (c) for sleeve continuity.
- 3.052 Arranged for dialing a test line in the distant office which is answered by an operator and supplies tone and gives a flashing supervisory signal, indicating the operation of the reversing feature of the trunk.
- 3.053 Arranged to apply "loop" and "leak" resistances for dialing.
- 3.054 Arranged to test for sleeve continuity.
- 3.06 Line and trunk finder tests.
- 3.061 To provide a rapid test for the operation of line finders.
- 3.062 To observe the vertical and rotary action of line finders and that they cut in on the proper terminal.
- 3.063 To test for reversed battery.
- 3.064 To provide for testing the hunting and cut through features of line finders.
- 3.065 Call alternating arrangement tests.
- 3.07 Selector tests.
- 3.071 Local Selector tests.
- 3.0711 To observe the vertical and rotary action of selectors, when selecting an idle terminal.
- 3.0712 To light a busy lamp in the test set when the selector is busy.
- 3.0713 To test for reversed battery.
- 3.0714 To check for overstepping of the brushes.
- 3.0715 Arranged to test for sleeve continuity.
- 3.072 Reverting Call Selector tests.
- 3.0721 To test the vertical and rotary action of selectors under loop and leak conditions.
- 3.0722 To light a busy lamp in the test set and prevent connection of the test circuit when the selector is busy.
- 3.0723 To indicate by lamp signals in the test set the parties which would be rung by the selector.
- 3.0724 To test the trip relay for operation and pretrip.
- 3.0725 To test for sleeve continuity.
- 3.08 Toll transmission selector tests.
- 3.081 To observe the vertical and rotary action of the selectors when selecting an idle terminal.
- 3.082 To check for overstepping of the brushes.
- 3.083 To light a busy lamp in the test circuit when the selector is busy.
- 3.084 To test the rering feature.
- 3.085 To test for reversed battery.
- 3.086 To test for a busy flash.
- 3.087 Arranged to test for sleeve continuity.
- 3.09 Connector tests.
- 3.0901 To test the pulsing conditions.
- 3.0902 To test ringing conditions.
- 3.0903 To test talking conditions.
- 3.0904 To test all release conditions.
- 3.0905 To test for reversed battery.
- 3.0906 To test for busy.
- 3.0907 To test the sensitive and marginal relays of 8 party semi-selective connectors.
- 3.0908 To test toll and combination local and toll connectors for ringing, talking, sleeve busy and provide for control of the "C" lead.
- 3.0909 Arranged to test for sleeve continuity.
- 3.0911 To test 200 point connector directing that connector to the upper or lower group of lines.
- 3.0912 To test rotary feature of rotary hunting connectors.
- 3.0913 To test that the connector calls in Machine Intercept.
- 3.10 By-pass selector tests.
- 3.101 Test for the ability of the selector to select an idle trunk.
- 3.102 To light the busy lamp when the selector is busy.
- 3.103 To test for reversed battery.

- 3.104 Arranged to test for sleeve continuity.
- 3.11 Tests on Special Service and intercepting trunks to "A" board. Special service trunks with test jack.
 - 3.111 Test for sleeve busy.
 - 3.112 Test for reversed battery.
 - 3.113 Test audible ringing tone.
 - 3.114 Test the operation and release of the trunk relay.
 - 3.115 Test for coin application.
 - 3.116 Test for the ring-back feature.
 - 3.117 Test supervision to the "A" operator.
- 3.12 Tests on intercepting trunks from trunk finders.
 - 3.121 Intercepting trunks lighting line lamp on seizure.
 - 3.1211 To test for the tripping ground on either side of the trunk applied when the operator answers.
 - 3.1212 Arranged to apply ringing current or 48 volt battery to either side of the trunk to signal the operator.
 - 3.1213 To test for sleeve busy.
 - 3.122 All intercepting trunks.
 - 3.1221 Arranged to provide a signal when the intercepting operator operates a flashing key.
 - 3.1222 Arranged to test for sleeve continuity.
- 3.13 Tests on trunks to test desks and information operator.
 - 3.131 Test for battery reversals.
 - 3.132 Test for sleeve busy.
 - 3.133 To check the various lamp conditions with operator or test man.
 - 3.134 Arranged to test for sleeve continuity.
- 3.14 Miscellaneous tests.

This test set is arranged to connect the secondary winding of the induction coil in series with the dial and the various loop keys when testing all circuits which require dialing to complete the connection. This serves as part of the holding bridge for those circuits requiring it and forms part of the talking circuit.

3.141 The (DL ST) key operated, transfers the sleeve from the (SB) relay to the (SA) relay for sleeve supervision and when operated alone connects the secondary winding of the induction coil in series with the dial and the (S) relay and is used when testing all circuits requiring dialing to complete the connection and for testing recording completing trunks and rotary out trunk switches arranged for preselection. When used in conjunction with the various loop keys, (300), (600), (LP), (LK) and (CBT LP), the (DL ST) key should be operated after the particular loop or class key is operated. The (SA) relay operating closes a circuit around contacts of the (DL ST) key for holding the loop closed, and the (DL ST) key should be restored to normal after the (SL) lamp lights. Should the sleeve be opened the (SA) relay releases, opening the loop to the circuit under test and extinguishing the (SL) lamp. During dialing, the secondary winding of the induction coil is short-circuited by the off-normal contacts of the dial. In tests where it is desired to have the loop closure under control of the (DL ST) key only, the sleeve may be connected to lamp (BSY) by operating key (SW) or may be opened (Q option only) by a plug in jack (C) and operating key (LK). In these cases the loop is closed only as long as key (DL ST) is operated.

3.15 When testing intercepting trunks from trunk finders and also toll connectors requiring battery and ground supply, the (S) condenser is placed in series with the induction coil to prevent closing a direct current bridge across the (CT) relay when the (CT) key is operated.

4. CONNECTING CIRCUITS

When this circuit is listed on a key-sheet, the connecting information thereon is to be followed. The circuits listed below are typical connecting circuits - no attempt has been made to include all circuits of each class listed.

- 4.01 Recording completing trunk two-wire, coin SD-32168-01, non-coin SD-32136-01, three-wire SD-62441-01, coin, non-coin SD-31888-01.
- 4.02 Outgoing trunk circuits to "DSA" switchboard, coin SD-31315-01, non-coin SD-31375-01.
- 4.03 Rotary out trunk switches arranged for preselection. For step-by-step offices SD-30868-01, for automatic ticketing SD-30891-01.
- 4.04 Outgoing trunk circuits to other step-by-step and manual offices, SD-30645-01.
- 4.05 Trunk circuits to test desk 12C and 14, SD-31245-01.

- 4.06 Trunk circuits to information desks, SD-32170-01.
- 4.07 Prepay coin trunk circuits, SD-31592-02 and SD-31900-01.
- 4.08 Coin Control Trunk Circuits, SD-32288-01, SD-32298-01.
- 4.09 Outgoing repeater circuits step-by-step and manual offices, SD-31779-01.
- 4.10 Line and trunk finder circuits, SD-33013-01, SD-31580-01, SD-31781-01, SD-33014-01, SD-31953-01.
- 4.11 Selector circuits: local SD-30200-01, toll intermediate SD-31744-01, toll transmission SD-31745-01, SD-31841-01, AB toll transmission SD-31723-01. By-pass SD-31134-01.
- 4.12 Reverting Call Selectors SD-31647-01, SD-31556-01, SD-30978-01.
- 4.13 Connector circuits - local, SD-31737-01, toll SD-31171-01, combination SD-30228-01. Ten party local terminal per station SD-31526-01. 200 point local connectors SD-33005-01, SD-33006-01, SD-33007-01, SD-33008-01 and 200 point combination connectors SD-33009-01, SD-33010-01.
- 4.14 Connector test line circuit, SD-32198-01.
- 4.15 Trunk to magneto switchboard, SD-31449-01.
- 4.16 Trunk to rural operator, SD-31540-01.
- 4.17 Test trunk for use with intercepting trunks requiring ringing, SD-32090-01.
- 4.18 Battery and ground supply circuit, SD-32153-01, SD-31333-01, SD-90122-01, and for offices with repeated dialing toll trains ES-241640.
- 4.19 Misc. Circuit at R.O.T. Switch Frame-Automatic Ticketing SD-32112-01.
- 4.20 Aux. Test Set SD-32173-01.
- 4.21 Timed Ringing Circuit SD-32196-01.
- 4.22 Group and alarm relay circuit, SD-32194-01.

*Typical circuit

DESCRIPTION OF OPERATION

5. GENERAL

5.1 Test Set Preparation

For all tests, battery and ground are connected to the test set by patching the

test set (BAT-G) jack to a 48 volt battery supply jack, with a cord per Fig. 16, or to ground and a battery fuse, or to the battery supply circuit SD-90122-01 with a cord per Fig. 7. For tests requiring the application of ringing current by the test set, ringing current and ringing ground are connected to the test set by patching the test set (GEN) jack to a ringing current supply jack with a cord per Fig. 4. In offices with repeated dialing toll trains a special cord is required; see BSP 252.102. For all tests on which the test man is required to listen over the test connection, an operator's telephone set, per Fig. 2, is connected to (TEL) jacks. In addition, when the test man is required to talk over the test connection, (TRS) key is operated. The 552E (J-No: J-0; H-0) Key shall be in its normal position (J-0) for all tests except when otherwise specified.

For tests which require a plug in jack (C), the (LK) key operated opens the sleeve circuit of jack (T). Hence, this key should not be operated for pulsing tests when a plug is in jack (C) and the test for sleeve continuity per 5.2 below is required.

5.2 Busy Test and Test for Sleeve Continuity

When connecting test set jack (T) to a circuit under test if the latter is busy ground from its sleeve will operate relay (SB), opening the tip and ring to prevent interference with service in case other keys in the test set are operated. (SB) also lights lamp (BSY) as a busy indication and locks to the sleeve as long as the connecting circuit remains busy. Usually, the tester may hold the circuit until it becomes idle, or he may disconnect and proceed with tests of other circuits.

If the circuit is idle key (DL ST) is operated when the tester is ready to start the test. This usually causes the circuit under test to return ground over the sleeve lead operating relay (SA) which locks to the sleeve ground, lights lamp (SL), opens the lead to relay (SB) and short-circuits the springs of key (DL ST), which key is then restored to normal. If the continuity of the sleeve circuit is interrupted at any time during the test relay (SA) will release, extinguishing lamp (SL) and opening the tip and ring to the circuit under test.

6. TESTS OF RECORDING COMPLETING TRUNKS AND ROTARY OUT TRUNK SWITCHES

6.1 Recording Completing Trunk Tests

6.1.1 The (T) jack of the test set is connected to the test jack of a particular trunk to be tested with a cord in Fig. 4. When testing trunks not equipped with test jacks a cord in Fig. 3 is connected to a selector having access to these

trunks, and the trunks in the same level may be tested in the same manner by dialing the selector to the proper level, and then stepping the selector connector with the test set to the successive contacts of the level by opening and closing the off normal springs on the selector through which the test is being made. On tests through the test jack lamp (BSY) will light as described in paragraph 5.2 if the trunk is busy.

6.12 Test for the Operation of the Trunk Relay, Non-Coin Trunks

If the trunk is not busy the (LP), (600) and (DL ST) keys are operated. The (LP) and (600) keys connect the (J) and (K) resistances in series with the secondary windings of the induction coil and relay (S) and resistance (F) in parallel to provide a maximum loop for operating the relay in the trunk. When the trunk relay operates, a ground is applied to the sleeve of the (T) jack which operates the relay (SA) as described in paragraph 5.2. The trunk relay in operating, signals the operator by lighting a trunk lamp at the switchboard. Audible ringing may be heard. It will be discontinued when the operator answers. If the (REV) lamp lights during tests of these trunks, it indicates reverse polarity of the trunk.

6.13 Test for the Release of the Trunk Relay, Non-Coin Trunks

With the (FL) key operated, the bridge circuit through the induction coil is opened and a 10,000 ohm leak resistance is connected across the trunk. This should give the operator a disconnect or flashing signal as desired. A flashing signal will be produced by operating and restoring the (FL) key. When giving the operator a flashing signal the (SL) lamp will remain steadily lighted indicating that the sleeve holding ground is not removed by this condition, and keeping the (SA) relay operated. When the operator disconnects ground will be removed from the sleeve. With the (DL ST) key restored to normal, and the (FL) key operated, this will release the (SA) relay and extinguish the (SL) lamp.

6.14 Test for the Operation of Trunk Relay - Coin Trunks

After having made the busy test as described in paragraph 6.11 the (300) (CN) and (CBT LP) keys, then the (DL ST) keys are operated. The (CN) and (CBT LP) keys operated remove a short circuit from part of the leak resistance. The (CN) key also connects the (CC) and (CA) relays and a resistance to the tip side of the line for coin operation. The (CBT LP) key operated also connects the (A) and (B) resistances in the loop circuit. The (DL ST) key is operated to complete the loop across the

tip and ring of the trunk. The trunk relay operating signals the operator by lighting a trunk lamp at the switchboard and also returns a ground on the sleeve which operates the (SA) relay as described in paragraph 5.2. Audible ringing may be heard. It will be discontinued when the operator answers. The operator answering will cause a reversal of battery and ground supplied through the trunk relay which will operate the (S) relay and light the (REV) lamp. Since the distant end of the trunk reverses battery and ground when the operator answers the battery on the tip meets ground through key (CN), and may prevent release of the trunk relay when operating key (FL). Hence whenever it is desired to signal the operator, key (CN) should be restored to normal.

6.15 Test for the Application of Coin Current

After having operated the (300), (CN), (CBT LP) and (DL ST) keys as described in paragraph 6.14, the operator answering causes negative coin current to be applied to the trunk for automatically returning the coin. This coin current will cause the (CA) relay to operate and light the (CR) lamp. The (REV) lamp may also be extinguished momentarily. The coin current applied for the subsequent collection or return of coins may be checked at any time with the assistance of the operator. In some cases, such as where the coin control is through a coin control selector, it may be necessary to operate the (ID) key also in order to insure sufficient current flow for this and the associated circuits. When the operator applies collect current to the trunk, the (CC) and (CA) relays operate. When return current is applied, the (CA) relay only operates. The proper polarity is indicated by lighting the (CC) or (CR) lamp. The application of negative coin current will release the (S) relay and extinguish the (REV) lamp and positive coin current may flash the (REV) lamp.

6.16 Testing Ringing Current Used for Recalling a Subscriber

In trunks arranged for recalling the subscriber, the operator may be requested to ring back on the trunks under test, in which case the (RR) key is operated to connect the (R) relay to the ring side of the (T) jack; the other side of the (R) relay and the (R) condenser being permanently connected to the tip side. With the (RR) key to prevent possibility of ringing in the ear. The (R) relay operated lights the (RR) lamp. The (S) relay may respond to ringing current and cause the (REV) lamp to flicker, but this may be disregarded.

6.17 Test for the Release of the Trunk Relay - Coin Trunks

This test is made in the same manner as described in paragraph 6.13, except that

the (300) and (CN) keys should be restored to normal. When the operator disconnects, and with the (DL ST) key restored to normal, the (S) and (SA) relays release, extinguishing the (REV) and (SL) lamps.

6.18 Disconnect

When all tests have been completed the (FL) key is held operated to open the loop and give the operator a disconnect signal. When the cord has been removed from the trunk jack at the switchboard, the (SL) and (REV) lamps will be extinguished. The test cord should then be removed from the test jack at the frame to restore the trunk to normal.

6.2 Test of Rotary Out Trunk Switches Arranged for Preselection (Fig. D)

6.21 Preliminary Operation

When testing switches associated with trunks to a call indicator office, to insure testing all trunks, release any call indicator positions which may be busied out at the time of making the tests.

The (T) jack of the test circuit is patched to the (TS) jack of the rotary out trunk switch by means of a patching cord per Fig. 4. This splits the sleeve of the rotary out trunk switch, grounding the sleeve toward the selector bank and connecting the sleeve of the switch circuit to the sleeve of jack (T). If the trunk is busy the (BSY) lamp will light as described in paragraph 5.2. In this case the plug should be immediately disconnected from the trunk.

6.22 Test of Cut Through Relay of Trunk

If the rotary out trunk switch circuit is found idle its (SL) relay is tested for speed of operation by operating key (SL) which supplies ground to the primary winding. Relay (SL) should operate and open its break contact in time to prevent relay (ST) of the switch circuit from operating and in turn stepping the switch. Restore key (SL). When Q option is used, a plug should be inserted in jack C. This connects the 100 ohm resistor (AG) in the sleeve lead for a marginal test of the (SL) relay of the R.O.T. switch.

6.23 Test for Stepping, and Tip, Ring, Sleeve and "A" Lead Continuity

When testing 3-wire R.O.T. switches, the test set connections are as described in 6.21. For 4-wire R.O.T. switches the (T) jack of the test set is patched to the (IN) jack of the R.O.T. Switch Circuit (4-wire test relay) and the (OUT) jack is patched to the (TS) jack. The (A) jack is connected to the "A" lead at the R.O.T.S. unit terminal strip. This tests "A" lead continuity, but can only be made where the associated trunk circuit has battery through

a relay winding connected to the A lead while the trunk is idle. The (ROTS) key should be operated and then the (DL ST) key, to test the tip, ring, sleeve and "A" conductors of the rotary out trunk switch and the trunk beyond. This connects a bridge including varistor (B) across the trunk to operate the (A) relay of the trunk. This in turn will operate the (B) relay returning ground over the sleeve provided the current received from the trunk is of the normal polarity. If the trunk is reversed the varistor is so poled as to reduce the trunk current to a value insufficient to operate the (A) relay and hence no ground will be returned over the sleeve. If ground is received over the sleeve then relay (S) will operate and the (ST) relay of the switch circuit will operate causing the switch to step to the next trunk. The resistance of the (S) relay and its associated (AH) resistance and (J) retard coil is sufficient to prevent the (SL) relay of the switch circuit from operating. The operation of the (S) relay opens the tip and ring of the trunk in order to prevent interference with service on the next trunk, in case it should be busy when the switch steps to it. If the trunk is reversed or if the tip or ring conductor is open on either side of the rotary out trunk switch, ground will not be received over the sleeve, and the switch will not step to the next trunk. On older type R.O.T. switches (SD-31122-01 or SD-31951-01) the switch will not step if the sleeve is open. The switch will step over any trunks which may be busy and hence this test should be made at a period of light load in order to test as many of the trunks associated with the switch as possible. When all trunks have been tested restore the (DL ST) key, and then the (ROTS) key, and remove the patching cord. Push out any call indicator positions which may have been released while testing.

6.24 When making the test described in test 6.23, all idle switches will step with the switch used in the test, and if a reversed or open trunk is found, this switch and all idle switches will remain on the trunk in trouble. To step the idle switches off this trunk, the tester should at once restore the (DL ST) key and then the (ROTS) key, and then operate the (SL) key. This will hold the switch used in the test on the defective trunk, and step the idle switches to the next idle trunk.

6.25 Test of the Particular Trunk

To test a particular trunk the (ROTS) and (DL ST) keys are operated as described in 6.23 to initiate trunk hunting. When the switch nears the desired trunk, the (DL ST) key is restored to normal, thus stopping the switch. If it stops before reaching the desired trunk the (DL ST) should be operated momentarily to advance the switch one step, this being repeated until the desired trunk

is reached. Operate key (SL) to hold the trunk and to move the other switches off the same terminal. Then restore key (ROTS) and operate key (DL ST). Restore keys (SL) and after lamp (SL) lights, key (DL ST). The test set is now connected to the trunk beyond the rotary out trunk switch and this trunk may be tested as described in other paragraphs of this circuit description.

6.26 Test of Code Leads of Rotary Out Trunk Switches Used with Automatic Ticketing or Automatic Message Accounting

Patch the test set (C) jack to the (C) jack of the switch frame to establish a connection to the common number and class circuit and insert a dummy plug in jack TL when J Option is used. Connect the telephone set to the test set (TEL) jacks. Patch the test set (T) jack to the (TST) jack of the rotary out trunk switch. In offices arranged for automatic message accounting, in order to make the test for crossed code leads, a short circuiting plug should be inserted in the (IH) jack at the trouble recorder frame. If the switch is busy this will be indicated as described in paragraph 5.2. If idle advance the switch to the trunk to be tested as described in 6.25 (unless it is resting on the terminals or this trunk). When "Q" and "X" options are used, operate Key (T).

Dial a trunk test line in a distant office. If the usual signals are received from the test line, it indicates that the code leads are continuous through the out trunk switch. If the code lead is open, lamp (RR) will light. If the code lead is crossed with another, lamp (C) will light. Release the connections by operating key (SW).

6.27 Test for Open Sleeve Lead - R.O.T. Switch Circuits SD-30868-01 and SD-30891-01 and Similar Circuits Having a Separate Bank for Control of Stepping

Set the switch on the trunk to be tested as described in 6.25, first inserting a dummy plug in Jack C, and operate key SL. If the outgoing sleeve is continuous, the SL relay of the switch will operate. Operate the DL ST key and restore the SL key. If the sleeve lead is not open, lamp SL will light, since relay SA will operate on sleeve ground from the trunk. If the sleeve is open, the SL relay of the trunk will release and the ST will operate, causing the switch to step. Restore key DL ST to release the switch and trunk, and then, to advance the switch for a similar test of the next trunk, momentarily operate key DL ST.

6.28 Test of Alarm Feature of Rotary Out Trunk Switches

Some R.O.T. switch groups are arranged to give an alarm in case a switch should remain on terminal 22 with its (SL) relay operated, in which case it must be stepped off this terminal manually. All R.O.T. switch circuits should bring in an alarm on continuous stepping or if the (ST) relay remains steadily operated.

6.281 Test of Alarm for Operated (SL) and (ST) relays ("Q" Option)

There should be a plug in jack (C) (either the plug of the patch cord mentioned in 6.26 or a dummy plug.)

Step the switch to terminal 21 as described in 6.25 but do not restore key (SL). Manually move the switch to terminal 22, operate key (LK) to open the sleeve. Restore keys (DL ST) and (SL). The alarm should function after the usual delay interval. This checks alarm for an operated (SL) relay. After the alarm functions operate key (DL ST) to close the loop and thus operate the (ST) relay of the R.O.T. switch, and then depress key (A) of the R.O.T. switch to release its (SL) relay. The alarm should continue to sound. This checks the alarm for a ring ground or a tip-ring cross. Restore the (DL ST) key. The switch should step to the next idle terminal.

6.282 Test for Alarm for an Operated (ST) Relay Where No Alarm for an Operated (SL) Relay Is Provided

When Q option is used, there should be a plug in jack (C) - (either the plug of the patching cord mentioned in 6.26 or a dummy plug). Step the switch to terminal 21 as described in 6.25, restoring key (DL ST) after lamp (SL) lights. Operate key (LK) to open the sleeve. This releases relay (SA) opening the tip and ring and extinguishing lamp (SL). After a short interval to allow the trunk or repeater (B) relay and the ROT switch (SL) relay time to release, operate key (DL ST) to close the loop, and thus re-operate the trunk or repeater (B) relay, which will return ground on the sleeve, causing the switch to step to terminal 22. The (ST) relay of the switch should operate and after the usual delay interval, should sound the alarm. On restoring key (DL ST) and then (LK), the switch should step to the next idle trunk.

Where R option is used step the switch to terminal 21 as described in 6.25, and remove the cord from the (TST) jack of the R.O.T. switch and insert a 262B plug (600

ohms across tip and ring) in that jack. This will cause the trunk or repeater to return ground on the sleeve stepping the switch to terminal 22 and operating the R.O.T. switch (ST) relay. After the usual delay interval, the alarm should sound. On removing the 262B plug, the switch should step to the next idle trunk.

7. COIN TRUNKS

7.1 Preliminary Operation

For this test, the (T) jack of the test set is connected to the test jack of the trunk by a cord in Fig. 4. If the trunk is busy, the (BSY) lamp will light as described in paragraph 5.2. If not busy when the cord is inserted, the (CBT LP) and (DL ST) keys are operated. If the (LK) key is used in any of the following tests of coin trunks it should not be operated until after the (CN) or (CBT LP) key has been operated. With all the above keys operated, the operating path of the (SB) relay is opened and resistances (A) and (B) and relay (S) shunted by resistance (F) are connected in series with the secondary winding of the induction coil and dial across the trunk. This bridge causes a ground which operates the (SA) relay as described in paragraph 5.2. Dial tone may or may not be heard at this time, depending on the use of optional wiring in the coin trunk controlling this function. In one case, the tone will be heard before operating the (CN) key and in the other case, the dial tone will be heard after operating this key. In either case, however, dialing will not be effective until the key is operated, which simulates depositing a coin.

7.2 Test for the Condition of a Coin in the Box

After receiving dial tone, if the circuit is so arranged, an attempt to dial will be unsuccessful as it will be necessary to operate the (CN) key to connect ground through (AF) resistance and (CC) and (CA) relays in order to complete dialing. The operation of either the (CBT LP) or the (CN) key also removes a short-circuit from a resistance to provide a 20,000 ohm leak when the leak test is applied.

7.3 Dialing

When the dial is moved off-normal the off-normal contacts short-circuit the secondary winding of the induction coil during pulsing, and with the proper keys operated, pulses are transmitted from a relay in the coin trunk to the first selector causing it to step.

7.4 Test Condition for "Charge" Call

If a connection is established to a test line through a connector which gives

a battery reversal, the trunk is set to apply positive current for collecting a coin when the bridge is removed from the tip and ring. If the (REV) lamp flashes momentarily, it should be disregarded. If it flashes slowly or lights steady, it indicates faulty functioning of the P, P1, J, K, or K1 relays. With the (DL ST) key restored to normal, the (CBT LP) and (CN) keys operated, and the (FL) key held operated, positive current will operate the (CC) and (CA) relays and light the (CC) lamp. Releasing the (CN) key extinguishes the (SL) and (CC) lamps. The (FL) key operated substitutes the (C) resistance for the (AF) resistance to permit sufficient coin control current to flow.

Where coin trunks are arranged for delayed charging, that feature may be tested as follows.

Connect the head telephone set to jacks (TEL), and dial the test line number. Several short spurts of tone will be received, followed by tone for 5 seconds, silence for two seconds. The loop is closed while tone is received.

To check that a collect condition is not registered prematurely, operate the FL key after the first or second spurt of tone. Coin Return current should be applied lighting the CR lamp.

To check that a collect condition is properly registered, operate the FL key after the first 5 second tone is received. Coin collect current should be applied lighting the CC lamp.

7.5 Test Condition for "Non-Charge" Call

If any incomplete number is dialed the trunk is in the condition to apply negative current for returning a coin when the bridge is removed from the tip and ring. With the (DL ST) key restored and the (CBT LP) and (CN) keys operated, and the (FL) key held operated, negative current will operate the (CA) relay only, lighting the (CR) lamp. To check that coin current is sent out over the ring as well as the tip operate the (REV) key. (CR) lamp should continue to flash. Releasing the (CN) key extinguishes the (SL) and (CR) lamps.

7.6 Test for Stuck Coin Condition

After each test as described in paragraphs 7.4 and 7.5, the (CN) key should be restored, but if the stuck coin condition is to be checked the (CN) and (CBT LP) keys remaining operated will cause the coin trunk to bring in an alarm. When the (CN) key is restored to normal the trunk will be restored to normal and the test cord should be removed from the jack.

7.7 Test for the Return of Coin If the Subscriber Replaces Receiver on the Hook before Dialing

For this test, operate the (CBT LP), (CN) and (DL ST) keys, and without operating the dial, restore the (DL ST) key to normal and hold the (FL) key operated. This will cause negative coin current to be sent back which will operate the (CA) relay lighting the (CR) lamp. The (CN) key should then be restored. The trunk will cause ground to be removed from the sleeve and this will release the (SA) relay and extinguish the (SL) lamp. Release the (FL) key.

7.71 Operate Test of (BT) Relay

Operate the (TP BT) and the (CBT LP) keys and then operate the (DL ST) key. The (SL) lamp should light and dial tone should be heard when trunks are arranged for dial tone before coin deposit. Restore the (DL ST) key and operate the (CN) key. The trunk circuit (BT) relay should operate and on trunks not modified to prevent line finder showering, the (L) relay should release, dial tone if previously heard should cease, and the (SL) lamp should be extinguished. This test checks that the (BT) relay breaks its back contact so that the trunk circuit (S) relay does not operate. On trunks arranged to prevent line finder showering, the (BT) relay will operate and lock to the sleeve and the (L) relay will not release. Dial tone if previously heard will continue. Dial digit zero. Dial tone if previously heard should still be heard and the operator should not be called in. Restore the (CN) and (TP BT) keys, and operate key (FL) until lamp (S) is extinguished.

7.72 Non-Operate Test of (BT) Relay

7.721 Trunks Arranged for Dial Tone after Coin Deposit.

With the (CBT LP) key normal, operate the (ID) key and then the (DL ST) key. The (SL) lamp should light. Restore the (DL ST) key, and operate the (CN) key. Ground through the (CA) and (CC) relays and half of resistance (A) is connected to the ring of the trunk through relay (S) with its shunting resistance (F), and ground through relays (CA) and (CC) and half of resistance (A), all shunted by resistance (AE) is connected to the tip of the trunk through resistance (B) and the induction coil. The trunk circuit (BT) relay with its windings connected differentially, should not operate, and the trunk circuit (S) relay should operate through the back contacts of the trunk circuit (BT) relay. Dial tone should be heard and the (SL) lamp should remain lit.

7.722 Trunks Arranged for Dial Tone before Coin Deposit

Proceed as in paragraph 7.721 except that the (CN) key should be operated and then released. Dial tone will be heard when the (DL ST) key is first operated. The (SL) lamp should remain lit. If the (BT) relay breaks its back contact, but does not make its front contact, the lamp indications may be as in 7.721. On trunks arranged to prevent line finder showering the (SL) lamp will remain lit whether the (BT) relay operates or not. In both these cases, to determine whether or not the (BT) relay has met its non-operate test, dial a connector test line or an operator. If the number dialed cannot be reached, it indicates that the (BT) relay did not meet its non-operate test. In this event, restore the (SW) key to restore the circuit to normal.

7.8 Release Test of (Pl) Relay - "V" Option Only

To test the (Pl) relay of the coin trunk for its ability to release an open circuit proceed as follows: connect jack (T) of the test set to jack (T) of the trunk. If the busy lamp does not light, operate and restore the (DL ST) key. Lamp (SL) should light. Operate the (CBT LP) key, and then the (DN) key. Dial tone should be heard. Dial the connector multiple test line, and then operate the (TP BT) key. Connect the cord per Fig. 4 to jack (CL) of the test set, and during a closed interval of the test line (indicated by receipt of tone) plug the other end of this cord into jack (TT) of the trunk. Lamp (C) should light and tone will no longer be heard. (Note - the plug should be inserted into the jack quickly to prevent opening the circuit long enough to release the connection. This test is based on the use of a 240 type jack - "B" option in the trunk. If a 239 type jack - A option - is provided connect ground to 2T (C) before plugging into the jack).

Operate key (SW) which releases relay (SA) thus opening the circuit of relay (Pl) which should release. Lamps (SL) and (C) should be extinguished and (BY) should light. Operate key (RR) which reverses battery and ground to relays (P) and (Pl) of the trunk. With (Pl) released and (P) operated (J) is shunted down, and (Pl) is thus connected to the ring of the trunk. As the ring is open at the contacts of relay (SA) of the test set, lamp (C) should not light. If however, (Pl) did not release, (J) will not be shunted down when key (RR) is operated and hence lamp (C) will light, indicating the

failure of (Pl) to release, or possibly of (J) to release.

Restore key (RR), remove the cord from jack (TT) of the trunk, restore all keys of the test set to normal, and disconnect from jack (T) of the trunk.

7.9 Coin Trunk Circuits Arranged for Overtime Charging

7.91 Charge Call - Additional Coin Deposit for Overtime

Originate a call to the trunk test line in a reversing connector group as described in 7.1 to 7.4 except that jack (TL) of the test set should be patched to jack (TL) of the test line at the coin trunk relay rack. The (REV) key should be operated and the (CN) key should be left operated instead of being only momentarily operated. When connection to the test line is established and ringing is tripped the timer will start. After continuous flashing is received from the test line as indicated by momentary flashing, extinguishment of the (REV) lamp and reception of tone at a rate of tone 5 sec., silence 2 sec., operate the (T) key of the test set to cause the test line to maintain a loop closed condition and to remove tone, and to cause the trunk finder to seize the coin trunk and collect the coin as described in the circuit description of the timing circuit. The (CC) lamp should light, the coin collect tone should be heard, and the no loud click should be heard.

7.92 With the (CN) key still operated cause the coin collect and monitor circuit to test for a coin as described in the circuit description for that circuit. Again listen to determine that loud clicks are not caused. Operate and hold the (FL) key. The (CC) lamp should flash. After its first or second flash, restore the (CN) key. The (CC) and (SL) lamps should be extinguished, restoring the circuit to normal. Release the (PL) key.

7.93 Charge Call - No additional Coin Deposit for Overtime

Proceed as in 7.81 and then restore the (CN) key and cause the coin collect and monitor circuit to test for a coin as described in its circuit description. As the (CN) key is not operated, the coin control and monitor circuit should call in an operator. While advising her that a test is being made, restore the test set (T) key and operate the (ID) key to cause the test line to maintain an open loop condition. Then ask the operator to disconnect. The trunk should release, the coin collect and monitor circuit functioning to open the connection between the coin trunk and the first selector until all three circuits release extinguishing the (SL) lamp. Failure to

release should result in recalling the operator and probably indicates a reversal of the tip and ring between the first selector and the coin trunk or between the coin trunk and the coin control and monitor circuit.

7.94 Charge Call - Additional Coin Deposited - Disconnected before Talking Overtime

Proceed as in 7.91. With the (CN) key still operated, operate and hold the (FL) key. The (CR) lamp should flash. After its first or second flash restore the (CN) key. The (CR) or (SL) lamp should be extinguished restoring the circuit to normal. Release the (FL) key.

8. OUTGOING REPEATERS

The plug of a cord per Fig. 3 or 4 as required is inserted in the (T) jack of the test set and the other plug is connected to the test jack of the repeater to be tested. If the trunk is busy the (BSY) lamp will light as described in 5.2. If not busy, the (LP) or (LK) and then the (DL ST) keys are operated placing the dial in series with the secondary winding of the induction coil. If the (LP) key is operated, a 1200 ohm loop is closed across the trunk with the (S) relay in series and a test line is dialed. The loop causes ground to be returned on the sleeve which operates the (SA) relay and lights the (SL) lamp. After the (SL) lamp lights the (DL ST) key should be restored to normal to test for sleeve continuity as described in 5.2. Dial a test line in the distant office through a connector which gives reverse battery. The (REV) lamp will flash and intermittent tone will be heard. When the (LP) or (LK) key is restored and the (FL) key is held operated the trunk releases and the (REV) and (SL) lamps will be extinguished.

9. TEST OF TRUNK TO MAGNETO MANUAL OFFICES, "A" SWITCHBOARD AND RURAL OPERATOR

These trunks will be tested in a manner similar to that described under paragraph 8 except that audible ringing tone may be heard as soon as the bridge is placed across the trunk. In testing those trunks not equipped with test jacks a cord in Fig. 3 is connected to a selector having access to these trunks, and to the (T) jack of the test set and the selector is advanced from trunk to trunk as described in 6.11 for recording completing trunks. When the proper code is dialed for these trunks, a signal will be given to the operator. When the operator answers, the (S) relay will operate and light the (REV) lamp. When the (LP) or (LK) key is restored to normal and the (FL) key held operated to open the loop and operator disconnects. The (REV) and (SL) lamps will be extinguished. In testing trunks to the "A" switchboard, the (S) relay may or

may not operate, depending on optional wiring used in the trunk for controlling battery reversals.

10. TRUNKS TO TRAFFIC AND MAINTENANCE DESKS

A cord in Fig. 3 is connected to the (T) jack of the test set and to a selector having access to these trunks. Operate the (LP) or (LK) and (DL ST) keys. After the (SL) lamp lights the (DL ST) key should be restored to normal to test for sleeve continuity as described in paragraph 5.2. Dial the selector to the level on which the particular trunks appear. If a trunk is idle, a signal will be given to the desk operator and audible ringing will be heard. The (REV) lamp in the test set should not light during the test of any trunk, and if it does light, it indicates a reversed trunk. When the desk operator answers, the talking condition is established and the various lamp conditions may be checked at the desk by the assistance of the desk operator. When the (LP) or (LK) key is restored to normal and the (FL) key held operated to open the loop, the desk operator disconnects and the trunk will be restored to normal. The other trunks in the same group may be tested in the same manner by stepping the selector connected with the test set to the successive contacts of the level by opening and closing the off-normal springs on the selector through which the test is being made. Desk trunks equipped with holding keys or jacks may be tested in consecutive order by operating the hold key or leaving a cord in the trunk jack to make the trunk busy and then dial the number of the next trunk. This procedure may be followed until all trunks on the bank have been tested.

11. OUTGOING TRUNK CIRCUITS TO SPECIAL SERVICE OPERATOR AT CENTRAL "A" SWITCHBOARD

11.1 Non-Coin Trunks

These trunks may be tested in a manner similar to that for testing non-coin recording completing trunks as covered in paragraph 6.1, except that if the charge feature is provided, the operation of the charge key will reverse the polarity over the trunk causing relay (S) to operate and light lamp (REV).

11.2 Coin Trunks

These trunks may be tested in a manner similar to that for testing coin recording completing trunks as covered in paragraph 6.1, except that coin return current is not automatically connected to the trunk when the operator answers.

12. TRUNKS TO CENTRAL "A" SWITCHBOARD FOR INTERCEPTING AND VERIFICATION REQUEST SERVICE

12.1 Trunk Lighting the Line Lamp on Seizure

12.1.1 Operation over Ring Conductor

A cord in Fig. 4 is connected to the (T) jack of the test set and test jack of the trunk. If no test jack is provided, a cord per Fig. 13 or Fig. 18 is used to connect to the T, R and S leads of the trunk under test at the trunk finder frame. If the trunk is busy, the (BSY) lamp lights as described in paragraph 5.2. If the trunk is not busy, the (SW) key is operated to open the operating path of the (SB) relay and connect the sleeve to the (BSY) lamp. The (SW) key should remain operated during these tests. The operation of the (RING) key, with (REV) key normal, connects ringing current to the ring of the trunk which operates a relay in the ring side of the trunk. A ground will be returned on the sleeve which will light the (BSY) lamp indicating that the relay in the ring side of the trunk was operated. Operate key (CT) and proceed as in 12.13.

To test the trunk with central office battery operate the (CT) key instead of the (RING) key, with the (REV) key normal. This connects central office battery to the ring of the trunk and operates a relay in the ring side. A ground will be returned on the sleeve which will light the (BSY) lamp. The operation of the (CT) key also removes the short circuit from the (S) condenser and places it in series with the secondary of the induction coil across the trunk. A signal will also be given to the operator at the distant "A" switchboard and when the operator answers a tripping ground will be connected to the ring conductor which will operate the (CT) relay and light the (C) lamp.

12.1.2 Operation over Tip Conductor

With the (REV) key operated, the test conditions are similar to paragraph 12.1.1 except a relay in the tip side of the trunk is operated which locks in the signal to the distant operator.

12.1.3 Trunks Closed through for Talking and Supervision

When the tripping ground is removed, the tip and ring of the trunk are closed through for talking. The trunk may be arranged to furnish toll identification tone.

Removal of tone may be controlled by operation of a tone removal key or of the flash key. The trunk may be arranged to give supervision on toll calls immediately, or after key operation for tone removal, and it may be arranged for flashing on all calls, or on toll calls only. When supervision is given (CT) is operated, lighting the (C) lamp. Flashing causes the momentary release or operate of (CT) and momentary extinguishing or lighting of the (C) lamp depending on whether supervision is given or not.

12.14 Disconnection

When the (CT) key is restored to normal the supervisory lamp at the intercepting position lights and when the operator disconnects, ground is removed from the sleeve lead which restores the trunk to normal and extinguishes the (BSY) lamp. (SW) key is then restored to normal.

12.2 Trunks Requiring Machine Ringing

A test trunk circuit for use with intercepting trunks requiring machine ringing is used in conjunction with this circuit for these tests. The (T) and (TL) jacks of the test set are patched to corresponding jacks of the test trunk, and the (TK) jack of the test trunk circuit is patched to the test jack of the trunk. When patched to a busy trunk, (SB) operates lighting the (BSY) lamp. When patched to an idle trunk, the (CT) and then the (T) keys are operated to initiate a call. The test trunk circuit supplies machine ringing causing the trunk lamp to light at the switchboard at the first ringing interval following a silent interval, and ringing is tripped in the test trunk at this time. With the (REV) key normal the call will simulate a toll call, and with it operated, a local call. From this point to disconnect, the operation is as described in paragraph 12.13 after the tip and ring are cut through. The (T) key is restored to normal to disconnect. If the operator has not disconnected, (SB) operates, lighting the (BSY) lamp until the operator does disconnect, which will restore the circuit to normal.

13. TRUNKS FROM VACANT LEVELS

13.1 Preliminary Operation

The (T) jack of the test set is connected by means of a cord in Fig. 3, to a selector having access to these trunks. If the selector is busy, the (SB) relay operated from ground on the sleeve, locks and lights the (BSY) lamp.

13.2 Operation Test

Operate the (LP) or (LK) and (DL ST) keys. After the (SL) lamp lights the (DL ST) key should be restored to normal to test

for sleeve continuity as described in paragraph 5.2. Dial the selector to the level on which the particular trunks appear. After the selector cuts through to the vacant level tone signal circuit, vacant level tone will be received. The (REV) lamp in the test set should not light during the test of any trunk and if it does light it indicates a reversed trunk.

13.3 Release

When the (LP) or (LK) key is restored to normal and the (FL) key is operated to open the loop, the test set, selector and vacant level tone signal circuit are restored to normal. As an alternative procedure, the other trunks on the same level may be tested in the same manner by stepping the selector connected to the test set to the successive contacts of the level by momentarily opening the off-normal springs on the selector through which the test is being made.

14. LINE AND TRUNK FINDERS

14.1 Line and Tandem Trunk Finders Not Associated with Prepayment Coin Trunks

14.11 Rapid Operation Test

To test the finders from the test line, operate the (LK) and (REV) keys and connect the (T) jack to the (A) or (B) test line jack using a cord per Fig. 4 for all except 200 point 4-wire finders, for which a cord per Fig. 10 should be used. Then connect the (LF) jack to the test and make busy jack associated with the idle finder to be tested, when testing finders on frames equipped with test and make busy jacks. When testing finders on frames not equipped with test and make busy, jacks connect jack (LF) of the test set to the (test) jack on the finder switch under test with the cord per Fig. 17. The finder should select the test terminal, the (REV) lamp should light momentarily and the finder should release. The cord associated with the finder commutator should be removed at once to permit other finders in the same group or subgroup to advance if necessary to levels above the level associated with the test terminal.

This test can be repeated on this or other finders by reconnecting the (LF) jack to the test and make busy jack or the test jack associated with the desired finder.

14.12 Test of Rotary Hunting and Cut Through Relays

14.121 Test Set Preparation

- (a) Using cord per Fig. 14 to test the hold and release adjustment of the line or trunk finder hunting relay and the non-operate adjustment of the cut

through relays, connect the test set jacks, by means of the cords shown in the figures referred to under "Line or Trunk Finders" as indicated in the following Table:

Test Set Jack	Jack at L.F. Bay	Line or Trunk Finder Wire	100 point	200 point
T	A	3W or 4W	Fig. 4	
T	A(or B)	3W	Fig. 4	
TL	B(or A)	3W	Fig. 4	
T	A(or B))			
TL	B(or A))	4W	Fig. 11	
C	-		Fig. 14*	
C	-		Fig. 9	Fig. 9**

*When "J" or "X" option is furnished.
 **When "J" or "X" option is not furnished.

Operate the (REV) key so that operation of relay (S) and lighting of lamp (REV) will indicate that the finder has cut through to the Test Line. For 200 point finders, operate keys T and ID to connect ground to the Ring and Tip of the test line in the other bank as a partial test for crosses between wipers. (When "X" option is used, operate key ID, only, as operation of key (T) will hold the line finder on the intermediate terminal mentioned later.) The ring cord clip of the cord connected to jack (C) is used to test the sleeve terminal at the line or trunk terminal strip, for an idle line in the same level as the test line. A busy line will cause lamp (BSY) to light. When an idle line is found, if the resistance of the sleeve to battery is 1150 or 1200 ohms or if the line and cut-off relays are not on the finder frame the ring cord clip is attached to sleeve terminal at the bay terminal strip, and the tip cord clip is attached to the sleeve of the corresponding line in the other bank of 200 point finders. If the resistance of the sleeve to battery is other than 1200 ohms, as on message rate lines and intercepting trunks, or if the line and cut-off relays are not on the finder frame, "J" or "X" option is required. Where relays with a sleeve resistance other than 1200 ohms are on the line finder frame, key (LP) is operated and the ring cord clip is connected to a spring of the line or cut-off relay electrically connected to the line finder sleeve of the idle line found as described above, and the tip cord clip is connected in like manner to the corresponding line in the other bank of 200 point finders. With X option, momentarily operate key T or with J option, momentarily release key T. Lighting of lamp (C) indicates that the "mate" line is busy, and the test should be deferred, or another pair of lines selected. If no line and cut-off relays are provided on the frame, then connection is made at the bay terminal strip and key (LP) is operated. The above procedure results in the sleeve of the intermediate line (when key

BF NO is operated) being connected to battery through 1200 ohms, (furnished by the cut-off relay or the test set) and to ground through 320 ohms in the test set. One end of a cord per Fig. 4 if finders equipped with make busy jacks are under test or per Fig. 17 if an (MB) key is mounted on the switch, is connected to the (LF) jack of the test set.

(b) Using "J" option and the Cord per Fig. 15

Connect the T and TL jacks of the test set to the A and B jacks of the test line as per the table of (a) above, connect the cord of Fig. 15 to the C jack of the test set and operate key REV and for 200 point finders, key ID. Insert the 620A tool into the finder bank level in which the test line occurs, inserting the tool from the left for 50 point and 100 point 3-wire finders, and for test of the B relay of 200 point finders and from the right for tests of the 50 and 100 point 4-wire finders and of the F relay of 200 point finders. Select an idle line near the middle of the bank by moving the tool until a line, or for 200 point finders, a pair of lines, is found where neither the (C) or (BSY) lamps light. The (BSY) lamp lit indicates that the intermediate line used in the test is busy. The (C) lamp lit indicates that the mate line is busy, and another pair of lines should be selected, or the test deferred until both lines are idle. Operate key (T).

Note: The 620A toll should be inserted in the bank of a finder other than that to be tested, with the associated finder made busy, or in a bank with which no finder is associated, provided local routines provide for periodic cleaning of such banks. When inserting the tool from the left select a bank where the test line is in some level between 4 and 9 inclusive, to avoid interference between the 620A tool and the commutator or designations card.

14.122 Method of Testing

To test each finder operate the (DL ST) and (BF NO) keys and connect the cord in jack (LF) immediately thereafter to the (TST) jack of the finder under test. The finder should stop on the marked terminal indicating that the hunting relay meets its hold requirements. Operate key (C) momentarily. The finder should hunt to the test line and the (REV) lamp should light. Resumption of hunting indicates the hunting relay meets its release requirement and the cut through relay meets its non-operate requirements. Lighting of the (REV) lamp indicates that the cut through relay meets its operate requirement. Immediately remove the plug from the line finder test jack when the finders are arranged with "test and make busy" jacks or remove the battery, grd.

supply cord from the battery jack when "test and make busy" jacks are not provided, to remove resistance grd. from the commutator segment associated with the test line, and restore the (BF NO) key to avoid delay to other calls. Tests of the circuits beyond may now be made as described in 14.4 and 14.5. If such tests are not to be made, restore key (DL ST) to release the finder. If the finder failed to stop or, after stopping, failed to hunt when key (C) was operated, it may indicate either failure of the B, C, or F relays to meet their requirements, or that the marked line or its mate has become busy. Restoring key (BF NO) and removing the plug from jack (LF) tests the marked line. If the marked line is busy, relay (SB) will operate and light lamp (BSY). Operating key (T) when "X" option is furnished or releasing this key when "J" option is used, tests the mate line, which, if busy, will cause lamp (C) to light.

14.123 The test of rotary hunting and cut through relays of 200 point finders arranged for operation over high sleeve resistance is made with the aid of the auxiliary line finder test circuit SD-32173-01 as described in the CD for that circuit.

14.2 Line Finders Associated with Pre-payment Coin Trunks

14.211 Rapid Operation Test

To test the line finders from the test line, operate the (DL ST) and (REV) keys and connect the (T) jack to the (A) or (B) jack of the line finder circuit with a cord per Fig. 4 for all finders except 200 point 4-wire, for which a cord per Fig. 10 should be used. Then connect the (LF) jack to the "test and make busy" jack or "test" jack associated with the idle line finder to be tested. The line finder should select the test terminal and the (REV) lamp should light. The cord associated with the line finder jack should be removed at once to permit other line finders in the same group or subgroup to advance if necessary to levels above the level associated with the test terminal. If the cord is removed from the (LF) jack of the test set first, (SA) operates from ground on the sleeve, lighting the (SL) lamp.

14.212 To release the line finder, remove the cord associated with the (T) jack. This test can be repeated on this or other line finders by reconnecting the (T) jack to the (A) or (B) jack of the test line and then reconnecting the (LF) jack to the jack associated with the desired line finder.

14.22 Test of Rotary Hunting and Cut Through Relays

The test setup and procedure is as described in paragraph 14.12 with the exception that when the test line terminals are reached, the operation and procedure is as described in paragraphs 14.211 and 14.212.

14.3 Particular Line Test

The line finder can be tested from a particular line finder terminal by using the cord of Fig. 13 or Fig. 18 in the (T) jack to connect to the T, R and S terminals of the line. If the line is busy, the (SB) relay operates, lighting the (BSY) lamp. If the line is idle, the (DL ST) key is operated which should cause the line finder to find the line and the associated selector to return ground on the sleeve operating the (SA) relay, in turn lighting the (SL) lamp. For ten cent coin lines the CN and ID Keys should be operated before operating the (DL ST) Key, since these lines are arranged for ring start. The (DL ST) key is then released. The line finder is released by holding the (FL) key operated which should cause the associated selector to remove ground from the sleeve lead, releasing the (SA) relay and extinguishing the (SL) lamp. If the polarity of the battery and ground supply is incorrect, the (REV) lamp will light during this test. If there is a pre-payment coin trunk circuit between the line finder and the first selector, the (CN) key should be operated momentarily, (or restored if already operated) before the (FL) key is operated in order to remove the (L) relay of the trunk circuit from the ring. This relay might not release on the leak imposed by the test circuit with the (FL) key operated.

14.31 Test of Finder Alternating Feature in Unit Equipment Not Arranged with "Test and Make Busy" Jacks

With the test set arranged as described in paragraph 14.3 successive calls on the same line should be served by different finders provided no other calls are originated during the test. That is, if the first choice finder operates on the first call, the second choice finder will operate on the second call, the first choice finder will operate on the third or odd calls and the second choice finder will operate on the even calls provided no other call is originated during the test. If the first choice finder is busy, the second choice finder will operate on successive calls. If the second choice finder is busy, successive calls will alternate

between the first choice finder and the next successive idle finder.

14.4 Operation Test of Line Finder and Circuits Beyond

For 50 or 100 point finders, proceed as in 14.211. For 200 point finders, also patch jack (TL) of the test set to jack (B) or (A) of the test line and operate key (TP BT). For 3-wire finders, use a cord per Fig. 4. For 4-wire finders, use a cord per Fig. 11 to patch jacks (T) and (TL) of the test set to jacks (A) and (B) or (B) and (A) of the test line, and then proceed as in 14.211. Connection to jack (T) establishes the worst circuit condition for stopping the line finder on the test line.

Dial tone should now be heard (except on coin trunks arranged for dial tone after deposit) and the (REV) lamp should light. Failure to light usually indicates a reversal of the tip and ring. For coin trunks only, restore the (TP BT) key and momentarily operate the (CN) key. Further tests may now be made by dialing a test line and observing that the usual signals are received. When Q option is used, if it is desired to dial the circuit beyond using the (LK) key, it will be necessary to remove the plug from jack C before operating key (LK).

14.5 Trunk Finders Associated with Intercepting Trunks which Return Ground on the Sleeve

This circuit can be used to test the trunk finders associated with intercepting trunks where the intercepting circuit will return ground on the sleeve through control over the tip and ring. In this case, the (CT) key is operated, the (T) jack is connected to the (A) or (B) jack of the trunk finder circuit, and then the (LF) jack is connected to the "test and make busy" or "test" jack on the desired finder circuit. The finder should find the test terminal and an operator should answer the call. The (CT) relay may operate lighting the (C) lamp. The cord associated with the finder jack or the battery grd. jack when testing finders equipped with the test jack on the switch, should be removed at once to permit other finders in the same group or subgroup to advance if necessary to levels above the level associated with the test terminal. The finder may be released either by releasing the (CT) key or removing the cord associated with the (T) jack.

15. SELECTORS

15.1 Local Sectors

15.11 Preliminary Operation

The (T) jack of the test set is connected to the test jack of the selector

with a cord in Fig. 3 and the plug of the telephone set is inserted in the (TEL) jack. If the selector is busy, the (SB) relay operates from ground on the sleeve of the test jack, locks, and lights the (BSY) lamp.

15.12 Test of Rotary Action to Detect Over-stepping

If not busy, the (LP) and (DL ST) keys are operated. With these keys operated, the operating path of the (SB) relay is opened and the loop closed across the tip and ring of the selector. This bridge causes the selector to return a ground on the sleeve which lights a lamp (SL) as described in paragraph 5.2. After the (SL) lamp lights, the (DL ST) key should be restored to normal to test for sleeve continuity, as described in paragraph 5.2. The switch is dialed to the proper level and the selector should then rotate and stop on the first idle terminal.

15.13 Operators' Incoming Selectors in No. 360A Offices Arranged to Return Busy Flash or Operator's Supervisory Signal

In addition to the connections established in 15.11, the C jack of the test set is connected to jack 17 of the switch under test with a cord per Fig. 13, connecting the sleeve, (red) conductor to the jack to which lead F is connected. Connect the ring (blue) conductor to the sleeve wiper. Dial the switch to any level. It should rotate to the 11th rotary step. Immediately remove the clip from the sleeve wiper to stop further operation of the rotary magnet. Lamp (RR) should flash, indicating proper functioning of the busy flash feature.

15.14 Release

At the termination of each test to restore the circuit under test to normal the (PL) key is held operated until the (SL) lamp is extinguished.

15.2 Toll Intermediate Selectors

15.21 Preliminary Operation

The (TT) jacks are connected to the test jack of the selector under test with a cord in Fig. 5, after first operating the (SL) key. If the selector is busy, the (BSY) and (C) lamps will light from ground on the sleeve.

15.22 Test of Rotary Action to Detect Over-Stepping

The (LP) or (LK) and (DL ST) keys are operated and the (BSY) lamp lights from ground from the selector over the sleeve lead and the (C) lamp lights from ground on the "C" lead. The (SL) key is then released

to hold the selector after it cuts through, whereupon the (BSY) lamp is extinguished. The switch is then dialed to the proper level. The selector should rotate and stop on the first idle terminal. If all trunks on the level dialed are busy, the (C) lamp will be extinguished.

15.23 Release

After each test of a selector, the (DL ST) key is released and the (SL) key is operated to restore the apparatus to normal.

15.3 Toll Transmission Selectors and AB Toll Transmission Selectors

15.31 Preliminary Operations

15.311 AB Toll Transmission Selectors
Toll Transmission Selectors
Arranged for DC Simplex Ringing.
Toll Transmission Selectors
Arranged for AC Start of Ringing
Where Timed Ringing Circuit Is Not Available

For selectors arranged for AC start of ringing, patch the GEN jack of the test set to the generator supply jack. For AB toll transmission selectors and for toll transmission selectors arranged for DC simplex ringing operate the REV key. For all selectors patch the T jack of the test set to the test jack of the selector under test. If the selector is busy the (SB) relay operates and locks to the sleeve lighting lamp (BSY).

15.312 Toll Transmission Selectors
Arranged for AC Start of Ringing
Where Timed Ringing Circuit Is Available

Patch the GEN jack of the test set to the generator supply jack. Patch the T and TL jacks of the test set to the T and TL jacks of the timed ringing circuit. Patch the SEL jack of the timed ringing circuit to the selector test jack. If the selector is busy, the (SB) relay will operate and lock to the sleeve, lighting lamp (BSY).

15.32 Operation Test

For this test, the (H), (J) and (K) resistances are provided for compensating the various loop conditions of the selector. With all keys normal the test circuit connects no compensating resistance to the selector for dialing since the secondary winding of the induction coil is short-circuited by the off-normal contacts of the dial. The operation of the (300), (600), and (LP) keys inserts from 300 to 2100 ohms in 300 ohm steps in the loop as follows:

Res.	Keys Operated
300	(300)
600	(600)
900	(300) (600)
1200	(LP)
1500	(LP) (300)
1800	(LP) (600)
2100	(LP) (300) (600)

The proper resistance value to be used is the one which most nearly represents the external pulsing loop over which the selector operates in service. With the (LK) key operated, a leak resistance is connected across the tip and ring. The operation of (DL ST) key applies a loop or bridge to a non-busy selector, and ground is returned over the sleeve lighting the (SL) lamp as described in paragraph 5.2. After the (SL) lamp lights the (DL ST) key should be restored to normal to test for sleeve continuity. When the (REV) key has been operated per 15.31, the (REV) lamp lights at this time. Dial the trunk test line number. When testing toll transmission selectors using AC for ringing the subscriber the (S) relay will operate and light the (REV) lamp when the test line is seized. For toll transmission selectors, operate the RING key after the REV lamp lights unless the timed ringing circuit is used, in which case operate the ID key. The RING key should be operated for 3/10 seconds, as nearly as can be judged. The ID key should be operated for at least one second. AB toll transmission selectors do not require operation of the RING or ID key. After a short interval, the test line will open and close the loop causing the selector under test to return reverse battery or wet dry supervision to the test set, in either case releasing and reoperating the (S) relay which will flash the (REV) lamp.

15.33 Release

At the termination of each test, to restore the circuit under test to normal, the (FL) key is held operated until the (SL) lamp is extinguished.

15.4 By-Pass Selectors

15.41 Preliminary Operation

The (T) jack is connected to the circuit under test with the cord in Fig. 4, and if the circuit is busy, the (SB) relay operates, locks and lights the (BSY) lamp.

15.42 Operation Test

If the circuit is not busy, the (LP) or (LK) and (DL ST) keys are operated. Operating the (DL ST) key places a bridge across the tip and ring causing ground to

be connected to the sleeve lighting the (SL) lamp as described in paragraph 5.2. After the (SL) lamp lights, the (DL ST) key should be restored to normal to test for sleeve continuity. A local number is dialed. When the tip and ring are reversed on cut through, the (S) relay will operate and light the (REV) lamp. If the (FL) key is operated, and released and the (DL ST) key again operated, the (E) relay of the selector blocked non-operated and a local number again dialed, a busy tone will be heard in the telephone set.

15.43 Disconnection

At the termination of each test to restore the circuit under test to normal, the (FL) key should be operated until the (SL) lamp is extinguished.

15.5 Reverting Call Selectors (350A and 360A Offices Only)

15.51 Preparation

Connect jacks TL or TL2, C or C1, and GEN of the test line SD-32198-01 to jacks TL, C, and GEN of the test set and jack T of the test set to the reverting call selector test jack. Operate key ID.

15.52 Ringing Test

Operate the LP and DL ST key of the test set. Lamp SL should light. Restore key DL ST to test for sleeve continuity. Dial the code required to cause the selector to ring the codes to be tested. Hold the RING key of the test set operated steadily until the end of the test. This removes the pulsing bridge and connects the test jack of the switch to the test line. The (C) and (RR) lamps of the test set will indicate the type of ringing received. For semiselective and 10 party ringing, and for negative superimposed ringing, the RR lamp will follow the code for the ring stations and the C lamp will follow the code for tip stations. For 4 party selective and 8 party semiselective superimposed positive ringing the indications are similar, except that the lamps will follow the code, flashing at 120 I.P.M., i.e. for a one ring code the lamps will flash for about 1-1/2 sec. and for a 2 ring code, there will be two series of 120 I.P.M. flashes each ringing cycle. If the ringing code dialed gives a 1-1/2 second or longer ring, the pretrip and trip tests may be made without releasing the switch. Otherwise, operate key T momentarily to release the switch.

15.53 Pretrip Test

Pretrip tests should be made in the ringing interval. After the ringing test, (with the (RING) key still operated) restore and reoperate key ID during a ringing interval, indicated by lamps RR or C being lit.

If the switch releases when key ID is reoperated, it indicates that the trip relay operated falsely. Ten party T.P.L. reverting call selector with two trip relays should be tested for pretrip on both tip and ring codes.

15.54 Trip Test

Trip tests should be made in both ringing and silent periods. With the RING key still operated, operate the TP-BT key and restore it to the ID position in the ringing interval. The selector should release on reoperation of the ID key if the trip relay operated. Ten party T.P.L. reverting call selectors with two trip relays should be tested for both tip and ring codes.

Restore the RING key and dial a code which will give a 1-1/2 sec. or longer ring on the ring. Reoperate the RING key. During the silent interval operate the TP-BT key and restore it to its ID position. The switch should release.

15.55 Readjust Values for Tripping Relays

To apply readjust values of trip and pretrip resistances, after connecting to the test line jacks per 15.51, operate key T and then release and reoperate key ID. Release key T. This operates and locks a relay in the test line which substitutes readjust resistance values for the test values. The pretrip and trip tests are then made as described above in 15.53 and 15.54.

16. LOCAL CONNECTORS AND LOCAL FEATURES OF COMBINATION CONNECTORS - 350 AND 360 OFFICES ONLY

16.1 Preliminary Operation

In offices equipped with 100 point connectors only, option ZC is furnished and when testing connectors, the (T) jack of the test set is connected to the test jack of the connector under test with the cord in Fig. 3. In offices equipped with both 100 and 200 point connectors, options ZD and ZE are furnished. When testing 200 point connectors, the (T) and (FR) jacks of the test set are connected to the test jack of the connector under test with the cord in Fig. 19. If the upper part of the 200 point connector switch is to be tested, key LO-UP in test set is operated. The (TL) jack is connected to the jack of the test line circuit with a cord in Fig. 4. If the connector is busy, the (BSY) lamp lights as described in paragraph 5.2. If not busy the (LP) or (LK) and (DL ST) keys are operated. Operating the (DL ST) key closes the loop across the tip and ring operating a relay in the connector which places ground on the sleeve lighting the (SL) lamp as described in paragraph 5.2.

In 360A offices where the local connectors are arranged to return busy flash on calls from operators and a test is to be made of this feature, the (T) jack of the test set is connected to the test jack of the connector under test with a cord in Fig. 101 (Mfr. Disc.) or Fig. 19 (Standard). The red shell plug is connected to the (T) jack of the test set and the black shell plug is connected to the (R) jack.

16.2 Busy Test

The test line number is dialed. The test line being normally busy, the test man will receive a busy tone indication. Where connectors are arranged to return busy flashes over the F lead, the C lamp of the test set should flash at 60 I.P.M.

If testing level hunting connectors, a 240A plug is inserted in the sleeve cut-off jack of the switch and for connectors serving only one PBX group, any digit is dialed. For connectors serving more than one PBX group, the digit which will direct the connector to the ninth level is dialed (unless some other level is specified locally).

16.3 Test Line Idle

Where the test line is arranged to give visual ringing signals, jack C of the test set is connected to jack C or C1 of the test line. The connector is released by holding the (FL) key operated until the (SL) lamp is extinguished. The (ID) and (LP) keys are operated, the (DL ST) key again operated and released after the (SL) lamp lights as described above and the test line number dialed. If testing 10 party terminal per line connectors, it will be necessary to dial an additional digit to set the ringing.

16.4 Ringing Tests

15.41 Test Lines Arranged to Test Ringing and Pretrip Separately (Except 8 Party TPS)

The (ID) key is left operated for testing ringing with this type of test line. When the test line is seized by the connector, the bell in the subset should ring or the RR or C lamp in the test set should light, following the ringing code.

16.42 Test Lines Arranged to Test Ringing and Pretrip Simultaneously

After the test line has been seized by the connector, the (ID) key should be released to test the ringing with this type of test line. Releasing the (ID) key releases a relay in the test line circuit which connects the subset to test the ringing and should cause the bell in the subset to ring. The continuation of ringing

indicates the satisfactory pretrip adjustment of the tripping relay.

16.43 Test Lines Arranged to Test Ringing and Pretrip Separately (8 Party TPS Connectors - G Option)

The 552E key controls the test resistances in the test line which test the "H" and "J" relays of 8 party connectors. Patch jack C of the test set to jack C of the test line. With the 552E key operated to H-OP the circuit from ground on the sleeve of jack T to the relay of the test line is open and the test operate current will be applied for the H relay of the connector when ringing is started. With the 552E key operated to J-NO, the relay of the test line is operated to close its preliminary make springs only, and the non-operate current for the J relay is applied. With the 552E key normal (J-O position) the relay in the test line is fully operated, applying the operate test to the J relay. Lamps C and RR are connected to the test line to indicate the type of ringing, C indicating sup.+, and RR, sup.-.

Note: In some connectors the relays which control ringing may have other designations. Relay (J) indicates that relay which operates to apply sup.+ ringing current instead of sup.- and relay (H) indicates the relay which transfers from silent interval battery to ringing current.

In all other respects, the ringing tests of these connectors are made as described in Section 16.41.

16.5 Premature Tripping Test. Test Line Arranged to Test Ringing and Pretrip Separately

After the ringing has been tested, the (ID) key is released and reoperated during the silent period to apply the pretrip test to the tripping relay in the connectors. In offices with relay subsets, or where a test line other than SD-32198-01 is used, this test should be made in the ringing interval. The ringing should not trip and the bell in the subset should ring or the lamp light when the (ID) key is reoperated.

16.6 Tripping Test

If the ringing did not trip, the (TP-BT) key should be operated and restored to its (ID) position during the silent period. In offices having superimposed ringing arranged to ring relay type subsets (TP-BT) key should be operated and restored to its (ID) position during the ringing period. The tripping relay in the connector should operate and the bell in the subset should not ring when reconnected to the line nor should the lamps light.

16.7 Talking Position Test

If the tripping relay has functioned correctly, the (T) key is operated and except when using some of the older test lines the (ID) key should be operated. The (T) key operated causes the test line to connect tone to the tip and ring as an indication that the connector is in the talking position. With the (LO-UP) key normal, low tone is received. With the (LO-UP) key operated to UP position, high tone is received. Except when testing non-reversing connectors, with the connector in this position, the (S) relay is operated which lights the (REV) lamp.

16.8 Release

16.81 With and Without Automatic Disconnect

16.811 To release connectors not arranged for automatic disconnect with calling party control, hold FL key operated until (SL) and (REV) lamps are extinguished. The connector should release. If arranged for joint control, (BSY) lamp should light, the connector will not release until T key is released.

16.812 To release connectors arranged for automatic-disconnect with calling party control, release T key. The test line loop is opened (called party); tone is removed, a relay in the connector releases, the timed disconnect feature is activated and after a specified time the connector circuit restores. The (SL) and (REV) lamps extinguish and the connector should release.

16.813 A further test should be made in conjunction with this test. Using a handset, connect to a connector in the same hundreds group and dial an intercept trunk associated with this connector group. Seizure of the intercept trunk disables the disconnect feature to the connector under test. If the switch under test releases within the specified time a false ground is indicated on the automatic-disconnect lead. Only one test for false grounds per shelf need be made.

16.9 Readjust Values for Trip and Pretrip Tests (when Test Line SD-32198-01 Is Used)

To apply readjust values for pretrip or trip tests, after dialing the test line and releasing the (ID) key, momentarily operate the T key. This operates a relay in the test line which locks to ground over the connector sleeve. The readjust trip and pretrip resistance values are then applied as described in 16.5 and 16.6 above.

16.10 Connection to Machine Intercept

When testing 200 point connectors, to test that the connector calls in the Machine

Intercept, operate the (MI) key in the test set in addition to the (ID) key. The (MI) key operated places a resistance ground on the sleeve lead to operate a relay in the test line. The latter opens the sleeve to the connector multiple. When the test line is dialed and the connector seizes the line finding an open sleeve it calls in the machine intercept. When the connector is connected to the machine intercept equipment, the recorded message is heard in the receiver connected to the (TEL) jack.

17. TOLL CONNECTORS AND TOLL FEATURES OF COMBINATION CONNECTORS - 350A AND 360A OFFICES ONLY

17.1 Preliminary Operation

Connect the (TL) jack of the test set to the jack of the test line circuit and operate the (SL) key of the test set. Connect the (TT) jacks of the test set to the test jack of the connector with a cord per Fig. 5 when testing toll connectors. In offices equipped with 100 point connectors only option ZC is provided. When testing toll features of 100 point combination connectors, connect the (TT) jacks of the test set to the test jack of the connector with a cord per Fig. 6. In offices equipped with both 100 and 200 point connectors, option ZD is provided. When testing toll features of 200 point combination connectors, connect the (TT) and (FR) jacks of the test set to the test jack of the connector with a cord per Fig. 20. If the upper part of the 200 point connector switch is to be tested, key LO-UP in test set is operated to UP position. When the connection is made between the connector and the jacks (TT), if the circuit is busy, the (BSY) lamp will light. If the connector is not busy the (SL) key is released. Releasing the (SL) key connects ground to the sleeve of the circuit under test and at this time, ground on the "C" lead causes the (C) lamp to light.

17.2 Busy Test

The (LP) and (LK) and (DL ST) keys are operated and the test line number dialed. After the number is dialed and the test line tests busy, a relay operates in the connector circuit which removes ground from the "C" lead and extinguishes the (C) lamp. Busy tone may or may not be heard in the receiver depending upon the office arrangement. The (CT) key is then operated. The (CT) key operated opens the circuit to the dial and connects the (CT) relay through to the tip and ring, removes the short-circuit from the (S) condenser, and places a ground on the "C" lead. The test line being normally busy, the connector will not cut through but will send interrupted ground over the ring. The (CT) relay will follow these interruptions and flash the (C) lamp.

If testing level hunting connectors, a 240A plug is inserted in the sleeve cutoff

jack of the switch and one or two digits as required by the particular circuit wiring are dialed.

17.3 Test Line Idle

The connector is released by releasing the (DL ST) key and operating the (SL) key. If the connector is not busy the (SL) key is released, lighting the (C) lamp. Operate the (SW) key which will extinguish the (C) lamp and then the (ID) and (LP) or (LK) and finally the (DL ST) keys and again dial the test line number. As the test line is now idle, it will be seized by the connector.

17.4 Ringing Tests

17.4.1 Test Line Arranged to Test Ringing and Pretrip Separately

The (ID) key is left operated for testing the ringing with this type of test line. The (SW) key is released, removing ground from the (TT) jack spring connected to the "C" lead. This releases the tripping relay in the connector and causes the bell in the subset to ring or the (RR) or (C) lamp to follow the ringing code. The (CT) key is then operated to place a ground on the "C" lead and connect the telephone set to the loop.

17.4.2 Test Line Arranged to Test Ringing and Pretrip Simultaneously

After the test line has been seized by the connector the (ID) key should be released to test the ringing with this type of test line. Releasing the (ID) key, releases a relay in the test line circuit, to connect a subset for testing the ringing. The (SW) key is released, removing ground from the (TT) jack spring connected to the "C" lead. This releases the tripping relay in the connector circuit and causes the bell in the subset to ring or the (RR) or (C) lamp to follow the ringing code. The (CT) key is then operated to place ground on the "C" lead and connect the telephone set to the loop. The continuation of ringing indicates the satisfactory pretrip adjustment of the tripping relay.

17.5 Premature Tripping Test. Test Line Arranged to Test Ringing and Pretrip Separately.

This test is made as described in paragraph 16.5

17.6 Tripping Test

This test is made as described in paragraph 16.6.

17.7 Talking Position Test

This test is made as described under paragraph 16.7 except the (CT) relay operates lighting the (C) lamp.

17.8 Release

The circuit is released by restoring the keys in the test set to normal except the (SL) and (ID) keys which should be operated.

18. TEN PARTY TERMINAL PER STATION CONNECTORS ARRANGED FOR REVERTING CALLS - REVERTING CALL FEATURE TEST 350A AND 360A OFFICES ONLY

18.1 Preliminary Operation

In offices equipped with 100 point connectors only, the (T) jack of the test set is connected to the jack of the connector under test with a cord in Fig. 3. In offices equipped with both 100 and 200 point connectors, the (T) jack is connected to connector with a cord in Fig. 3 for 100 point connectors and the (T) and (FR) jacks are connected with a cord in Fig. 19 for 200 point connectors. The (TL) jack is connected to the jack of the test line circuit with a cord in Fig. 4. If the connector is busy the (SB) relay operates, locks to the sleeve and lights the (BSY) lamp when the connection is made to the test jack. The (C) jack of the test set is connected to the (10-P) jack in the test line circuit with a cord in Fig. 4.

18.2 Reverting Call Test

If the connector is not busy, the (ID) (LP) and (DL ST) keys are operated. The (T) key is operated momentarily and the test line dialed. After the (DL ST) key is operated, the (SA) relay operates from ground on the sleeve lead and lights the (SL) lamp. After the (SL) lamp lights the (DL ST) key should be restored to normal to test for sleeve continuity as described in 5.2. When the test line is seized by the connector, busy tone should be heard in the receiver due to the incoming and the outgoing sleeves of the connector being connected together over the (T) and (C) jacks. After the tone is received the (FL) key is held operated

until the (SL) lamp is extinguished. When ground is again placed on the sleeve lead by the connector, relay (SB) operates and lights the (BSY) lamp. If the connector has functioned correctly ringing will be received by the test line as indicated by the ringing of the bells in the subsets in the test line or lighting of lamps in the test set.

18.3 Trip Test

After the ringing has been tested, the (TP BT) key is operated to trip the ringing.

18.4 Release

The connector under test is restored to normal by operating the (ID) key momentarily.

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