

STEP BY STEP SYSTEMS
NO. 355A, 356A OR 35-E-97
TEST SET FOR CONNECTORS
AND SELECTORS
OTHER THAN TOLL TRANSMISSION SELECTORS
AND TRUNKS EXCEPT THOSE WITH COIN FEATURES

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All other headings under Changes, no change.		

1. PURPOSE OF CIRCUIT

1.1 This circuit is intended to test reverting call selectors, connectors and selectors other than toll transmission selectors and trunks, other than those with coin features, in 355A, 356A or 35E97 dial offices to determine that they are functioning properly.

2. WORKING LIMITS

2.1 None.

3. FUNCTIONS

- 3.01 To provide a busy test of circuit under test.
- 3.02 To test for a ground on the sleeve lead from the switch under test when the circuit is seized.
- 3.03 To provide means for loop and leak pulsing tests.
- 3.04 To test local connectors for reverse battery supervision.
- 3.05 To test connectors for providing the proper kind of ringing.
- 3.06 To make pretrip and trip tests of connector or reverting call selector tripping relays.
- 3.07 To test reverting call feature of connectors having this feature.
- 3.08 To test connectors for audible ringing tone.
- 3.09 To provide means for testing the continuity of the transmission circuit of connectors and selectors.
- 3.10 To provide means for testing busy or flashing.
- 3.11 To test for proper ringing signals on reverting calls.
- 3.12 To test for ringing start feature on the toll side of combination connectors.
- 3.13 To test for busy flash and supervisory signals received over a fourth wire from operators incoming selectors and local connectors.
- 3.14 To test the release of the circuit under test.
- 3.15 To keep the ringing machine running while testing connectors.
- 3.16 To test outgoing repeaters and one or two-way dial trunks.

- 3.17 To test noncoin recording completing and special service trunks.
- 3.18 To test trunks to traffic and maintenance desks.
- 3.19 To test vacant level and overflow trunks.
- 3.20 To test message rate trunks.
- 3.21 To test operation of class of service relays of trunks.
- 3.22 To cause the connector test line to connect the 8 party visual ringing signal relays to either the tip or ring of the test line.
- 3.23 To receive visual ringing signals from the connector test line in tests of 8 party connectors and reverting call selectors.
- 3.24 Arranged to test 200 point connector, directing that connector to the upper or lower group of lines.
- 3.25 Arranged to test that connector calls in machine intercept trunk.
- 3.26 To test rotary feature of rotary hunting connectors.

4. CONNECTING CIRCUITS

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

- 4.1 Hand test set.
- 4.2 Toll incoming or intermediate selectors - SD-31915-01*.
- 4.3 Local connectors - SD-31737-01*.
- 4.4 Operator's incoming or local selectors - SD-30976-01*.
- 4.5 Combination connector - SD-30862-01*.
- 4.6 Test jack and connector test line circuit - SD-31857-01 & SD-30981-01.
- 4.7 Message rate trunk - SD-32082-01*
- 4.8 200 point local connectors - SD-33005-01, SD-33006-01, SD-33007-01, SD-33008-01.
- 4.9 200 point combination connectors - SD-33009-01, SD-33010-01.

*Typical circuit.

DESCRIPTION OF OPERATION

5. GENERAL

As there are several types of hand test sets, some using button type keys to

short circuit a condenser and a resistance, some using similar keys to remove a short around the condenser and some using toggle switches (locking) in the hand set for controlling the condenser and in the cord for controlling the resistance, the following terminology will be used in respect to these keys.

- BUT TALK*
- (C) Button or Key operated or depressed means condenser short circuited.
- BUT MEN*
- (C) Button or Key released means condenser is in series with hand test set.
- ON UP*
- (R) Button or Key operated means the resistance is in the circuit.
- OFF UP*
- (R) Button or Key released means the resistance is short circuited.

6. BUSY TESTS

Before making any of the tests described hereafter, the test man should make a busy test. To make this test the (Bat. G) jack is patched to the battery supply jack on the frame (except when using the connector test line in which case the battery supply is obtained from the test line jacks), the hand test set is plugged into the (TJ) jack and the cord used for the tests is plugged into the proper jack of the test circuit and into the test jack of the circuit under test. If the circuit is busy the (C) lamp lights. If it is idle the test man seizes it by operating the (C) key of the hand test set. When Fig. A is used and tests are made on selectors, the test man must monitor to determine if the circuit is busy because there is no battery supply.

7. LOCAL SELECTORS

7.1 Preliminary Operation

Before starting any tests the plug of Fig. 2 is inserted into jack (T) or where the "F" lead appears in the selector test jack, the plug of Fig. 5 is inserted into jacks (L) and (M), and the hand test set is plugged into the (TJ) jack. When Fig. A is furnished the (TLP) plugs are not used. When Fig. B is furnished the (BAT G) jack of Fig. B is connected by means of cord shown in Fig. 4 or 6 to the battery and ground supply jack located on the selector frame. In some offices it will be necessary to operate the make busy key of the associated line finder before the selector can be dialed off normal.

7.2 Loop or Leak Pulsing Tests

When the plug of Fig. 2 is inserted into the test jack of the switch under test and the (C) key of the hand test set is operated a loop is closed to the switch through the P and S windings of the (A) relay in parallel. Where Fig. A is provided

the (C) lamp will not light since no battery is connected to the test set. Where Fig. B is provided the (C) lamp will light when the selector connects ground to its "S" lead.

The (C) and (R) keys of the hand set are operated for loop tests and the (C) button only with the (Leak) key for leak tests. The dial on the hand set is operated to dial the switches to the proper level. The selector should stop on the first idle terminal.

7.3 Test for Busy Flash

Where the test set has Fig. B and "R" option, and the busy flash lead "F" appears in the selector test jack, dial the selector to a level where all terminals are grounded, or to a restricted service level. If there is no such level, connect ground to the sleeve wiper and dial any level, removing the ground from the sleeve wiper as soon as the switch reaches the 11th rotary step. Operate Key TR1-L. Lamp (C) should flash at 120 ipm.

7.4 Release

To restore the switch to normal the (C) key in the hand set is released at which time the switch should restore and extinguish the C lamp.

8. CONNECTORS (LOCAL OR LOCAL SIDE OF COMBINATION CONNECTORS)

8.1 Preliminary Operation

Before starting any tests the (TLP) plugs of Fig. A are inserted in the test line jacks, or the (B) and (R) jacks of Fig. B are connected to similar jacks of the test line circuit by means of the cords shown in Fig. 4 or 6. The hand test set plug is inserted in the (TJ) jack.

8.111 With Figs. C and E, jack (TL) is patched to jack (TR1), (TR2), (TR3) or (TR4) or to jack (AC) of the test line, and the (S) key is operated as shown in Note 101.

8.112 With Figs. D and E, jack (TL) is patched to jack (SUP) or (AC) of the test line, or to jack (TR1) and keys (TR2), (TR3), (TR4), (S) and (L) are operated as shown in Note 101. Where a key is not mentioned it should be nonoperated, i.e. the arrow should point up.

8.113 With Figs. E and ~~F~~, jack (TL) is patched to jack (SUP) or (AC) of the test line, or keys (TR2), (TR3), (TR4), (S) and (L) are operated as shown in Note 105.

8.114 In offices equipped with 100 point connectors only, options G and Z are furnished. When testing connectors that do not have a test jack connection to the "F" lead, the plug in Fig. 2 is inserted.

in jack (T). For connectors that do have a test jack connection to the "F" lead, the plug in Fig. 5 is inserted in the (TT) jacks.

8.115 In offices equipped with both 100 and 200 point connectors, Option ZA is furnished. When testing connectors, the red shell of the cord in Fig. 11 is inserted in the (T) jack and the black shell in the (FR) jack. If it is desired to test upper set of banks of 200 point connectors, operate (LO-UP) key to UP position.

8.2 Loop Pulsing Test

When the plug of Fig. 2 or 5 is inserted into the test jack and the (C) key of the hand test set is operated a loop is closed over the tip and ring leads of the switch under test through the P and S windings of the (A) relay in parallel. The polarity of the T winding opposes the P winding so that the (A) relay remains unoperated. The switch under test grounds the sleeve lead lighting the (C) lamp.

With all keys (except (TR2), (TR3) and (TR4) of the set in a normal position, the dial on the hand test set is operated with the (C) and (R) buttons depressed to establish a connection to the test line. With the (C) and (R) buttons depressed in the hand test set the pulsing tests are made with a high resistance in the loop.

8.3 Ringing and Audible Ringing Tone Test

When the wipers of a connector are stepped to the test line, battery through the (D) resistance over the sleeve lead causes the connector to seize the test line and connect ringing current thereto. When a connector applies ringing current to the tip and ring of the test line a circuit is closed from the ring through the R winding of the (B) relay and the (R) condenser to ground on the sleeve through normally closed contacts on the (PTR) or (NTR) and (TR) keys. This test is for bridged ringing, or ringing on the ring side of the line. To test for ringing on the tip side of the line the (REV-L) key is operated in which case ringing current on the tip side of the line operates the (B) relay through its R winding as just described. The (B) relay follows the alternations of the ringing current and performs as an AC buzzer to provide an audible buzzer signal during the ringing period. The audible ringing tone current from the connector is transmitted over the tip and ring of the test jack to the hand test set. When testing 8-party semiselective terminal per station or terminal per line or 10-party 3 code terminal per station connectors in 355A offices the (-R) and (+R) bells of the test jack circuit should when provided be used to test the polarity of the ringing current. Where the test line is arranged for visual ringing signal in the test set, jack (8R)

in Fig. 7 should be patched to jack (T) of the test line, and (TR1) key should be operated for the plus (+) ringing indication. Lamps (+) and (-) will indicate polarity of ringing. In 356A offices the (-R) and (+R) lamps in the test jack circuit are used to test the polarity of the ringing currents.

8.4 Pretrip and Tripping Tests

To apply a pretripping test to the connector tripping relay the (PTR) or (NTR) key is operated during the ringing or silent interval as specified in Note 101 or 105. This opens the circuit to the (B) relay and bridges a resistance across the tip and ring of the test line. To check that the connector tripping relay has not falsely operated, the (PTR) or (NTR) key is restored to normal causing the (B) relay to buzz again during the ringing period. If the (B) relay fails to operate again under this condition it is an indication that the tripping relay falsely operated. To test for the operation of the connector trip relay, the (TR) key is operated (see Note 101 or 105 for silent or ringing interval) which bridges a resistance across the tip and ring of the test line. After this test is made the (TR) key is restored and the (B) relay should not buzz during the ringing period. If it should buzz at this time it is an indication that the tripping relay failed to operate on the tripping test.

8.5 Transmission and Reverse Battery Test

The (ANS) key is operated which bridges the R winding of the (B) relay (in series with resistance (T) where key (L-S) is provided and is operated to its (L) position) across the tip and ring of the test line. In offices where ZC option is furnished, when testing connectors that furnish battery to the called party on the ring side of the line, the (REV LA) key is operated. This will cause the (B) relay to operate and close its front contact. The current which flows in the P winding of the (B) relay is opposed to that flowing in the R winding so that the (B) relay acts as a buzzer. It may be necessary in some cases to release the (ANS) key momentarily to start the buzzer action. Under this self-interrupted condition the pulses of the current in the P winding induce a tone in the R winding which is sent over the tip and ring of the test line through the connector and back over the tip and ring of the switch under test to the hand test set. The tone heard in the receiver of the hand test set is an indication that the transmission circuit is functioning.

When the (ANS) key was operated it caused the connector to reverse the direction of battery flowing through the P and S windings of the (A) relay. When this occurs the (A) relay should light the (REV-BAT)

lamp indicating that reversal of battery has occurred. The (A) relay will operate only if the (R) button is released. When "F" wiring is used the (C) lamp will be extinguished. On connector levels on which the connector does not reverse, the (ANS) key operation should not light the (REV-BAT) lamp. Such free service connectors may be arranged to provide supervision to an operator over the "F" lead. To test this feature operation of the (TR1)-L key will connect the (C) lamp to the "F" lead through the (N) jack or with ZA option the (FR) jack. With the (ANS) key operated, the (C) lamp should light, and the (REV-BAT) lamp should remain extinguished.

When testing 8-party terminal per line connectors the transmission test should be made after dialing a code which sends ringing out on the ring side of the line.

8.6 Disconnect Supervision and Supervisory Tests

8.61 Supervisory 1 Test

To make this test the (ANS) key is re-stored opening the circuit of the R winding of the (B) relay and at the same time causing the current flow through the P and S windings of the (A) relay to be reversed to normal. This releases the (A) relay (if the (R) button is released), extinguishes the (REV-BAT) lamp and relights the (C) lamp where "F" wiring is used. The supervisory 1 signal is brought in. The (ANS) key is re-operated closing the circuit to the R winding of the (B) relay, reversing the current again through the P and S windings of the (A) relay. Relay (A) operates (if the (R) button is released), extinguishes the (C) lamp where "F" wiring is used and lights the (REV-BAT) lamp. The supervisory 1 signal is cut-off. If the (ANS) key is not re-stored to normal before disconnecting from the switch the (A) relay may remain operated.

8.62 Supervisory 2 Test

When the connectors are arranged for joint control on disconnect, a supervisory 2 test is provided in addition to the supervisory 1 test described in Section 8.61.

To make this test the (ANS) key is operated and the (C) key of the hand test set is released or the hand test set is removed from the (TJ) jack. The (C) lamp where "F" wiring is used should be extinguished momentarily and the supervisory 2 signal brought in. The (C) key of the hand test telephone should then be operated or the hand set reinserted. The supervisory 2 signal is cut-off. If the (ANS) key is not restored to normal before disconnecting from the switch the (A) relay may remain operated lighting the (REV-BAT) lamp.

8.7 Leak Pulsing and Busy Test

After the (C) button on the hand set is released or the hand test set plug is removed from the (TJ) jack to restore the switch to normal, it is reinserted and the (LEAK) key operated. This bridges 10,000 ohms of the (A) and (B) resistances across the tip and ring conductors of the switch under test and connects the (C) resistance of 146 ohms to ground on the sleeve of the test line to simulate a busy line. The test line is dialed by means of the hand test set with the (C) button depressed. Under this condition, the (A) relay remains unoperated and the (C) lamp lighted and the (REV-BAT) lamp extinguished. When the wipers of a connector are stepped to the test line, ground through the (C) resistance on the sleeve lead causes the connector to return a busy tone signal over the tip and ring to the hand test set. When the test set is equipped with "R" option, and the "F" lead of the 100 point connector is on the test jack, or when R and ZA options are furnished operate Key TR1-L. Lamp (C) should flash at 60 ipm.

8.8 Connection to Machine Intercept - 200 Point Connectors

When testing 200 point connectors, to test that the connector calls in the machine intercept trunk, operate the (MI) key. This operation opens the sleeve of the test line. When the test line number is dialed, the connector, finding an open sleeve, operates a relay to connect to the machine intercept trunk. When the connector is connected to the machine intercept equipment, the recorded message is heard in the receiver connected to the (TJ) jack.

9. REVERTING CALL TEST - FOR CONNECTORS WITH REVERTING CALL FEATURE

9.1 Preliminary Operation

The same patching as that for other tests on connectors is used.

9.2 Tests

The (LEAK) key is operated, and the (C) button on the hand set is operated. The (A) relay remains normal with the (C) lamp lighted and the (REV-BAT) lamp extinguished. From the hand test set the proper digits are dialed to establish a connection to the connector test line. The (10 PTY TFS RC) key is then operated momentarily which in turn operates the (C) relay. The (C) relay locks to the sleeve connecting the sleeve of the calling side to the sleeve of the called line. The (LEAK) key is released and the (C) button in the hand set is released opening the circuit through the P and S windings of relay (A). The

connector then goes into the reverting call position. In so doing it momentarily removes ground from its sleeve wiper which releases the (C) relay and extinguishes the (C) lamp. Then it grounds its incoming sleeve which relights the (C) lamp. The plug is then removed from the (TJ) jack. If the connector is the terminal per station type, the (B) relay buzzes in unison with the ringing code sent out on the ring side. To check the reverting ring the (REV-L) key is operated to connect the (B) relay to the tip side of the line. If the connector is of the terminal per line type, the same result will occur if the code of a ring party is dialed. If the code of a tip party is dialed the (B) relay buzzes in unison with the code when the (REV-L) key is operated and the reverting ring code is checked with the (REV-L) key normal.

The (ANS) key is operated closing the bridge of the R winding of the (B) relay across the tip and ring to cut off the ringing. The (ANS) key is then released opening the circuit to the connector test line and the switch releases.

10. REVERTING CALL TEST - 8-PARTY SEMI-SELECTIVE, 4-PARTY SEMISELECTIVE, 5-CODE AND 10-CODE REVERTING CALL SELECTORS.

10.1 Preliminary Operation

The same patching is used as for local selectors. The (C) and (R) buttons of the hand test set are operated when making a loop test and the (C) button only with the (LEAK) key operated for a leak test.

If the reverting call switch is the 8 party semiselective type, the (R) plug of Fig. A or the (R) jack of Fig. B is connected to the (RC) jack on the reverting call frame.

10.2 Ringing Test

The proper digits are dialed and the (C) key of the hand test set is released. The (REV-CALL) key is operated. If the reverting call switch is of the 8 party semiselective type, the (BELL-T) and (BELL-R) key (for 355A) if provided or (R) and (T) keys (for 356A) of the test jack circuit are manipulated to check the ringing polarity and code. When ringing is applied to the ring side of the line by the reverting call switch, the (B) relay may also operate.

When the ringing test feature of the No. 355A test line is arranged for control by the test set, Fig. 7 is required. Jack DR of the test set should be patched to jack (T) of the test line (as well as patching jack (R) to jack (RC) as described above.) The 498E key is operated to T or R for testing ringing over the tip or ring, respectively. This causes a two step relay in the test line to operate to its first step, or fully, respectively, to connect

the ringing test circuit to the tip or ring. The receipt of positive or negative superimposed ringing current will be indicated on lamps (+) and (-) respectively.

The (R) plug of Fig. A or the (R) jack of Fig. B is not connected to the (RC) jack when testing other than 8 party semiselective reverting call switches. In these cases the (B) relay in the test set is used as a ringing indicator.

10.3 Pretrip and Tripping Test

The (R) plug of Fig. A or the plug from the (R) jack of Fig. B is removed from the (RC) jack on the reverting call frame.

10.31 Pretrip or Nontrip Test

The (TL) jack is connected as outlined in Note 105. To apply a pretripping test to a reverting call selector tripping relay, the (PTR) or (NTR) key is operated during the ringing interval. The ringing interval is determined by buzzing of the (B) relay. This opens the circuit to the (B) relay and bridges a resistance across the tip and ring of the reverting call switch. To check that the reverting call tripping relay has not falsely operated, the (PTR) or (NTR) key is restored to normal causing the (B) relay to operate on the alternations of the ringing current. The (REV-L) key is operated to put the (B) relay on the proper side of the line to receive the ringing. If the (B) relay fails to operate under this condition it is an indication that the tripping relay has falsely operated. The switch will release if it pretrips.

10.32 Trip Test - Fig. E

To test for the operation of the reverting call selector tripping relay, the (TR) key is operated (see Note 101 for silent or ringing interval which bridges a resistance across the tip and ring of the reverting call switch. After this test is made the (TR) key is restored and the (B) relay should not buzz on the ringing period. If it should buzz at this time it is an indication that the tripping relay has failed to operate on the tripping test. The (AC) readjust test should be made during the ringing period.

10.33 Trip Test - Fig. F (See Note 105)

The (TR) key is operated and released during the ringing interval. If ringing is tripped, the selector will release when the (TR) key is released. The selector should again be dialed as in 10.2 and the trip test repeated in the silent interval. If the selector fails to trip on either the ringing or silent interval test, and the trip relay meets its dc current flow "readjust" requirements, it should be further readjusted, using the "adj." values per Note 105. Note

that the silent interval adjust trip value, in offices with 67 volt trip battery, is applied by operating the (NTR) key in the silent interval.

11. TOLL INCOMING OR INTERMEDIATE SELECTORS OR TOLL FEATURES OF COMBINATION CONNECTORS

11.1 Preliminary Operation

The test set is connected to an incoming or intermediate selector by connecting the (TT) jacks of the test set with a cord in Fig. 5. In offices equipped with 100 point connectors only, option G is furnished. In offices equipped with both 100 and 200 point connectors, option ZA is furnished. The test set is connected to the toll side of a 100 point combination connector with a cord in Fig. 3 with either option G or ZA furnished and to the toll side of a 200 point combination connector with a cord in Fig. 10 when option ZA is furnished. If it is desired to test upper set of banks of 200 point connectors, operate (LO-UP) key to UP position. For connectors the (TLP) plugs of Fig. A or the (B) and (R) jacks of Fig. B are connected to the connector test line jacks. For toll incoming or intermediate selectors the (BAT G) jack is connected to a similar jack on the selector frame. The hand test set is connected to (TJ) jack. Ground ("Z" wiring) on the sleeve at the (B) jack causes the ringing machine to run when option G is provided. Where option ZA is provided, ground on a jack in the test line causes the ringing machine to run.

11.2 Toll Connector Features

11.21 Busy Test

The (C) button in the hand set is operated and the (LEAK), (PTR) or (NTR), and (SL) keys in the test set are operated. The test line number is dialed. After the number is dialed the (CT) key is operated. The (CT) key operated opens the circuit to the dial, connects the (CT) relay through to the tip and ring and places an auxiliary ground on the "C" lead. The test line being busy, the connector will not cut through to the test line but will send interrupted ground over the ring. The (CT) relay will follow these interruptions and flash the (REV-BAT) lamp.

11.22 Release

To release the switch the (SL) key is released. The (PTR) or (NTR) and (CT) keys should then be released.

11.23 Idle Test

The (C) button in the hand set and the (SL), (TR1)-R, and (PTR) or (NTR) keys in the test set are operated. The (R) button of the hand test set is not operated

since the connector might not function properly. The test line number is dialed with the (LEAK) key normal. The test line being idle will be seized by the connector. The (CT) key is operated and then the (PTR) or (NTR) key is released. Ringing should not occur. To start ringing the (CT) key is released momentarily.

11.24 Ringing

The ringing test will be the same as referred to in Section 8.3. Except the 498E key in Fig. 7 is operated to (T) or (R) for testing ringing over the tip or ring, respectively.

11.25 Pretrip and Tripping Test

The pretrip and tripping test will be the same as referred to in Section 8.4.

11.26 Continuity Test of Tip and Ring Conductors

The (ANS) key is then operated which bridges the 1000 ohm R winding of the (B) relay across the tip and ring of the test line. This will cause the (B) relay to operate. The bridge through the 1000 ohm R winding of the (B) relay operates the (CT) relay which in turn lights the (REV-BAT) lamp which indicates that the tip and ring conductors are cut through.

11.27 Rering Test

To test the rering condition the (ANS) key should be released and then the (CT) key should be released momentarily to release the ringing relay in the connector and restart the ringing. To release the connector the (SL) key is restored to normal.

11.3 Toll Incoming or Intermediate Selector

11.31 Loop or Leak Pulsing Tests

The (SL) key is operated. The (C) and (R) buttons of the hand set are operated for loop tests and the (C) button only with the (LEAK) key for leak tests. The dial on the hand set is operated to dial the switches to the proper level. The selector should stop on the first idle terminal.

11.32 Release

The switch is restored to normal by releasing the (C) button in the hand set and the (SL) and (TR1)-R Keys.

12. NONCOIN RECORDING-COMPLETING TRUNK TESTS

12.1 The hand test set is plugged into jack (TJ) and the (T) jack of the test set is connected with the test jack of a particular trunk to be tested with a cord in

Fig. 6. When testing trunks not equipped with test jacks a cord in Fig. 2 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 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. On tests through the test jack if the trunk is busy, ground from the sleeve will light the (C) lamp, in which case the cord should be removed from the test jack. If the cord is not removed, when the trunk becomes idle, the (C) lamp will be extinguished. If the (C) lamp does not light when the plug of the test cord is inserted in the test jack, the trunk may be considered idle and ready for further tests.

12.11 Test for the Operation of the Trunk Relay, Noncoin Trunks

If the trunk is not busy the (C) key and (R) keys of the hand test set are operated 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 lights lamp (C). 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-BAT) lamp lights during tests of these trunks, it indicates reverse polarity of the trunk. Operate key (LEAK).

12.12 Test for the release of the Trunk Relay

With the (C) key of the hand test set released the trunk circuit is opened and a 10,000 ohm lead (resistances (A) and (B) 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 (C) key of the hand test set. When giving the operator a flashing signal the (C) lamp will remain steadily lighted, indicating that the sleeve holding ground is not removed by this condition. When the operator disconnects and with the (C) key released ground will be removed from the sleeve. This will extinguish the (C) lamp.

13. OUTGOING REPEATERS OR ONE- OR TWO-WAY DIAL TRUNKS

The (T) jack of the test circuit is patched to the trunk or repeater test jack with a cord per Fig. 2. If the trunk or repeater is busy, lamp (C) will light, and the plug should be removed from the test jack. If the (C) lamp does not light connect the hand test set, with its (C) and (R) keys operated, to jack (TJ). The trunk or repeater should return ground on the sleeve, lighting lamp (C). If the tip and

ring are reversed, lamp (REV-BAT) will light. Dial a test line in this or a distant office. Should the sleeve open at any time, lamp (C) will be extinguished. Connection being established to a test line through a connector giving reverse battery supervision, relay (A) will operate and release, following the reversals from the test line, causing lamp (REV-BAT) to flash. Where "E" option is used, lamp (C) will also flash. Operate key (LEAK) and then release key (C) of the hand test set. The trunk or repeater should release, removing ground from the sleeve and extinguishing lamp (C).

14. TEST ON ONE- OR TWO-WAY TRUNKS TO MANUAL OR TOLL OPERATORS

14.1 These trunks will be tested in a manner similar to that described under Paragraph 13 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. 2 is connected to a selector having access to these trunks and to the (T) jack of the test set. When the proper code is dialed for these trunks, a signal will be given to the operator. When the operator answers, the (A) relay will operate and light the (REV-BAT) lamp if the trunk reverses battery. When the (C) key of the hand test set is released to open the loop, the operator disconnects. The (REV-BAT) and (C) lamps will be extinguished. In testing trunks such as those to an operator office, no reversal will be given when operator answers and the (REV-BAT) lamp will not light.

14.2 Test of Class of Service Tone

Where trunks to an operator provide a class of service tone indication, tests of the relays providing this indication are made in connection with the tests of 14.1. Where only one class of service tone is provided, and a 221 or 222 type relay is used, operate key (T) before connecting to the trunk under test. Where a Y type relay is used, operate key (R). Where two class of service tones are provided the (T-R) key should be in its normal position when connecting to the trunk. Connect the cord of Fig. 8 to jack (8R) of the test set and connect the sleeve (red) conductor to the class of service relay winding terminal connected to the "A" lead, either directly via the "A" lead terminal punching when available on a cable well type terminal strip, or through the "A" lead wiper cord terminal when testing through a selector. Proceed with the tests as described in 14.1, to test the class of service relay, (a) at the same time as the (C) key of the hand test set is operated except when testing through a selector or (b) when the selector cuts through to the trunk under test. When the operator answers, check with her that class of service tone was received.

If only one class of service tone is provided, ask her to recheck the tone by disconnecting momentarily. If two classes of service tones are provided, check with the operator that the class of service tone corresponding to a 3,000 ohm ground was received, operate key (T) and ask the operator to recheck the tone. The same tone should be received. These two tests check the 2-check class of service relay for closure of its preliminary make springs on minimum current, and nonoperation of its remaining springs on a greater current. Operate key (R) and again ask the operator to recheck the tone. Tone corresponding to a direct ground should now be received. This checks the class of service relay for full operation.

14.3 Combined Interlocal and One Digit Tandem Trunks

When testing combined interlocal and one digit tandem trunks for operator office traffic, make the test from the zero level of a selector having access to these trunks.

15. TRUNKS TO TRAFFIC AND MAINTENANCE DESKS

The dial hand test set is connected to jack (TJ) and a cord in Fig. 2 is connected to a selector having access to these trunks and to the (T) jack of the test set. Operate the (C) key of the hand test set. Dial the selector to the level of which the particular trunks appear. If the first trunk is idle, a signal will be given to the desk operator and audible ringing will be heard. The (REV-BAT) 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 check at the desk by the assistance of the desk operator. Operate key (LEAK) and release the (C) key of the hand test set to open the loop. The desk operator should disconnect 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 dialing the next trunk. This procedure may be followed until all trunks on the bank have been tested.

16. OUTGOING TRUNK CIRCUITS TO SPECIAL SERVICE OPERATOR AT CENTRAL "A" SWITCHBOARD (NONCOIN)

These trunks may be tested in a manner similar to these for testing noncoin

recording-completing trunks as covered in Paragraph 12 except that if the charge feature is provided, the operation of the charge key will reverse the polarity over the trunk causing (A) relay to operate and light (REV-BAT) lamp.

17. TRUNKS FROM VACANT LEVELS AND OVERFLOW TRUNKS

17.1 Preliminary Operation

Connect the dial hand test set to jack (TJ) and the (T) jack of the test set to a selector having access to these trunks with a cord in Fig. 2. If the selector is busy, the (C) lamp lights.

17.2 Operation Test

Operate the (C) key of the hand test set. Dial the selector to the level on which the particular trunks appear. The selector cuts through to the trunk circuit. If the trunk is a vacant level trunk no tone or "no such number" tone will be heard. If it is an overflow trunk, busy tone will be heard. The (REV-BAT) lamp in the test set should not light during the test of these trunks and if it does light it indicates a reversed trunk.

17.3 Release

Operate the (LEAK) key and release the (C) key of the hand test set to open the loop. The selector and trunk circuit are restored to normal. 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 of the selector through which the test is being made.

18. MESSAGE RATE TRUNKS

18.1 Class of Service Tone Test

Connect the hand test set to jack TJ. Connect the cords per Figs. 8 and 9 to jacks 8R and T. Touch the clip of the sleeve (Red) cord per Figure 9 to the (S) terminal of the trunk to be tested at the unit terminal strip. If the trunk is busy lamp (C) will light. If the lamp does not light connect the sleeve (Red), tip (White) and ring (Blue) clips to the sleeve, tip and ring, and connect the clip on the sleeve (Red) of the cord per Fig. 8 to the "A" lead of the unit terminal strip. If lamp (C) is still extinguished, operate the (C) key of the hand test set. The associated circuits will return ground on the sleeve lighting lamp (C). Dial the operator. (Where these trunks are associated with line finders having only six springs in the VON assembly it will be necessary to operate the line finder make busy key before dialing). When the operator answers

verify that the class of service tone corresponding to a 3,000 ohm ground was received. Operate the (T) key and ask the operator to recheck the tone. The same tone should be heard. These two tests check the two step relay of the trunk for closure of its preliminary make springs only, and for nonclosure of remaining springs. Operate key (R) and again ask the operator to recheck the tone, which should now be that corresponding to direct ground. This test check the two step relay of the trunk for full operation. Restore key (R), operate (LEAK) and release key (C) of the hand test set. The operator should disconnect, which will remove ground from the sleeve, extinguishing lamp (C). Unless test of the message register feature is to be made, disconnect cords from the unit terminal strip and release the line finder make busy key if operated.

18.2 Message Register Operate Test ("N" Option)

Connect to the trunk as described in 18.1, except that the clip on the tip (White) conductor of the cord per Fig. 8 is used instead of the clip on the sleeve. Operate the (R) and (C) keys of the hand test set, which will cause the selector associated with the trunk to return ground on

the sleeve lighting lamp (C). Operate the line finder make busy key if necessary as described in Paragraph 18.1 and dial the trunk test line or if not available a near by telephone, operating the switchhook thereof to simulate the opens and closures normally returned by the test line. Momentarily operate key (10-PTY-TPS-RC) key where the trunk circuit is equipped with a class of service relay. Lamp (+) should light, indicating full operation of the class of service relay of the trunk, and the return of guarding ground on the (A) lead. Operate key (SL). Lamp (+) will be extinguished. The trunk test line will trip ringing and give a number of short closures, reversing the line current, operating relay (A), and flashing lamp (REV-BAT). The test line will then give a long closure which will cause lamp (REV-BAT) to light. After this lamp has been lit for about 2 seconds the trunk will return battery over lead "A" lighting lamp (+) for about 1/2 second. When this lamp is extinguished restore key (SL). The trunk should now return ground on lead (A) lighting lamp (+). Operate key (LEAK) and release the (C) key of the hand test set. The circuit should release removing ground from the sleeve and extinguishing lamp (C). Disconnect the cords and restore the line finder make busy key is operated.

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