

**NO. 14 LOCAL TEST DESK
TEST AND TROUBLE LOCATING PROCEDURES**

1. GENERAL

PAGE

1.01 This section describes the tests to be performed on the No. 14 local test desk (LTD) to verify that it is functioning properly. This section also includes trouble locating information should the test verifications not be obtained.

D. CC, CR, DO Keys and Dial-Tone-First Feature: This test checks the coin collect and coin return voltages and dial-tone-first feature, when provided, for coin telephones. **14**

1.02 This section is reissued for the following reasons:

E. RHE, 1000 Ohms, and 2000 Ohms Keys: This test checks the operation of the rheostat and associated keys. **15**

- Add new test equipment to Part 2, APPARATUS
- Revise Table A
- Add new Test M on Remote Test System—Enhanced (RTS-E)
- Add new Table F
- Correct technical errors in Part 3, METHOD.

F. Continuity Test to Station With Ringer Isolation or 11A Ringing Extender (Option YC): This test checks the operation of the subscriber relay test (SSRT) and associated keys. **17**

Since this is a general revision, arrows ordinarily used to indicate changes have been omitted. The Equipment Test List is affected.

G. Electronic Voltmeter Test SD-95596-01: This test checks the operation of the electronic voltmeter test circuit when the LTD is so equipped. **18**

1.03 The following tests are covered:

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A. LTD Meter Calibration: This test checks the calibration of the test desk voltmeter for ac and dc voltages and dc current. **3**

H. LRP and DSL Keys: This test checks the operation of the LRP and DSL keys. **20**

B. Battery Voltage, Primary, and Supervision Circuit Tests: This test checks the battery or power supply voltages along with the primary test circuit and the supervision lamp. **8**

I. Dial Speed Indicator Test or TOUCH-TONE® Dialing Frequency Test: This test checks the operation of the test desk switches that control access to its internal dial test circuit and meter indication, the 51-type dial testers, or TOUCH-TONE dialing frequency test circuit. **21**

C. PS-RLS and IN Keys: This test checks the operation of the PS-RLS and IN keys. **12**

J. Receiver Off-Hook Tone Test:
This test checks operation of the howler or tone generator circuit to alert the subscriber that a telephone is off-hook. **24**

K. Line Insulation Breakdown Tests: This test checks that the

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line insulation breakdown voltages are applied to the tip and ring at the operation of the proper keys. 25

L. Constant Current Source SD-97763-01 (Option YM): This test checks the constant current source used for coin phone testing. 26

M. Remote Test System-Enhanced (Option YO) Test: This test checks the operation of the test desk keys associated with the Remote Test System-Enhanced. 28

1.04 References: When a test desk position is equipped with a Wheatstone bridge per KS-3011, refer to Section 100-810-711 for requirements and adjusting procedures. Refer to division 662 for description and operational information on the No. 14 LTD.

Danger: Certain terminals of relays and keys of the No. 14 LTD have battery voltages ranging from 20 volts to 200 volts. Exercise care when performing the prescribed tests.

1.05 Lettered Steps: A letter a, b, c, etc, added to a step number in Part 3 of this section, indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

1.06 For troubles which are encountered while performing the tests of this section, **CORREC-**

TIVE ACTION suggestions are provided. These list the "checks" that should be made should the associated verification not be obtained. The "checks" are listed in the order in which they should be performed.

2. APPARATUS

2.01 The type and quantity of apparatus required to perform each test is shown in Table A. Additional apparatus may be needed if trouble locating procedures must be used to correct deficiencies before completing the tests. The details of each item are covered in the paragraph indicated by the number in parentheses. Verify that all test equipment is calibrated and functioning properly.

2.02 KS-20599 L4 volt-ohm-milliammeter (VOM), or equivalent.

2.03 A 12V, 60-Hz source, such as a transformer or adjustable autotransformer, or equivalent.

2.04 310 plug.

2.05 716C test receiver.

2.06 0-600 ohm, 25 watt rheostat.

2.07 48K-ohms, 1/2 watt, 1 percent resistor.

2.08 80K-ohms, 1/2 watt, 1 percent resistor.

2.09 1K-ohms, 5 watt, 1 percent resistor.

2.10 2K-ohms, 2 watt, 1 percent resistor.

2.11 A 1-conductor cord equipped with KS-6780 alligator clips at each end, or equivalent.

2.12 Relay blocking tools as required.

TABLE A

| APPARATUS | TESTS | | | | | | | | | | | |
|---|-------|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L |
| KS-20599 L4 VOM (2.02) | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | | | 1 | 1 |
| 12V, 60 Hz Source (2.03) | 1 | | | | | | | | | | | |
| 310 plug (2.04) | | | | | | 1 | | | | | | |
| 716C Test Receiver (2.05) | | | 1 | | | | | | | | | |
| 0-600 Ω , 25W, Rheostat (2.06) | 1 | | | | | | | | | | | |
| 48K-ohms, 1/2 W Resistor (2.07) | 1 | | | | | | | | | | | |
| 80K-ohms, 1/2 W Resistor (2.08) | 1 | | | | | | | | | | | |
| 1K-ohms, 5W Resistor (2.09) | | | | | | | | | | | | 1 |
| 2K-ohms, 2W Resistor (2.10) | | | 1 | | | | | | | | | |
| One conductor cord equipped with KS-6780 alligator clips at each end (2.11) | ✓ | ✓ | ✓ | | | | | | | | | ✓ |
| Relay blocking tools (2.12) | ✓ | | | | | | ✓ | ✓ | | | | |

✓ As required.

3. METHOD

STEP

ACTION

VERIFICATION

A. LTD Meter Calibration

DC Voltmeter

- 1 Connect a KS-20599 L4 VOM, set to the 1KV dc range, to the (-) and 120V, 1.2 mA terminals of the LTD meter.

| STEP | ACTION | VERIFICATION |
|------|--|--|
| 2 | Zero the pointer of the LTD meter. | LTD meter set on zero. CORRECTIVE ACTION Replace LTD meter. |
| 3 | Operate the VM-REV key. | LTD meter indicates between 99 and 101 volts. CORRECTIVE ACTION Adjust or replace batteries or check test voltage power supply. |
| 4 | Compare the readings of the KS-20599 L4 VOM and the LTD meter. | KS-20599 L4 VOM indicates within 1.0 volt of the LTD meter. CORRECTIVE ACTION Replace LTD meter. |
| 5 | Transfer the KS-20599 L4 VOM lead from the 120V, 1.2 mA terminal of the LTD meter to the 60V, 1.2 mA terminal. | |
| 6 | Operate the 60V key and compare the meter readings. | LTD meter indicates between 49 and 51 volts. The KS-20599 L4 VOM indicates within 0.6 volt of the LTD meter indication. CORRECTIVE ACTION (a) Adjust voltage of batteries or adjust power supply level. Note: The 100V level must be rechecked if adjustment to the power supply is made. (b) Replace LTD meter. |
| 7 | Transfer the KS-20599 L4 VOM lead from the 60V, 1.2 mA terminal to the 24V, 1.2 mA terminal of the LTD meter. | |
| 8 | Release the 60V key and operate the 24V key. Compare the meter readings. | LTD meter indicates between 19 and 21 volts. KS-20599 L4 VOM indicates within 0.24 volt of the LTD meter indication. CORRECTIVE ACTION (a) Adjust voltage of batteries or adjust power supply level. Note: The 100V and 50V levels must be rechecked if adjustment to the power supply is made. (b) Replace LTD meter. |

| STEP | ACTION | VERIFICATION |
|------|--|--|
| 9 | Transfer the KS-20599 L4 VOM lead from the 24V, 1.2 mA terminal to the 24V, 24 mA terminal of the LTD meter. | |
| 10 | Release the 24V key and operate the 24 mA key. Compare the meter readings. | LTD meter indicates between 19 and 21 volts. KS-20599 L4 VOM indicates within 0.24 volt of the LTD meter indication. CORRECTIVE ACTION (a) Adjust voltage of batteries or adjust power supply level. Note: The 100V and 50V levels must be rechecked if adjustment to the power supply is made. (b) Replace LTD meter. |
| 11 | Return all keys to normal position. | |
| 12 | Disconnect the KS-20599 L4 VOM from the LTD meter terminals. | |
| 13 | Block operated the STA relay of the LTD. | |
| 14 | Set the 0-600 ohm rheostat to its maximum resistance position. | |
| 15 | Connect the KS-20599 L4 VOM, set to the 1A dc range, in series with the LTD meter, the 0-600 ohm rheostat, and 48-volt battery as shown in Fig. 1. | |

STEP

ACTION

VERIFICATION

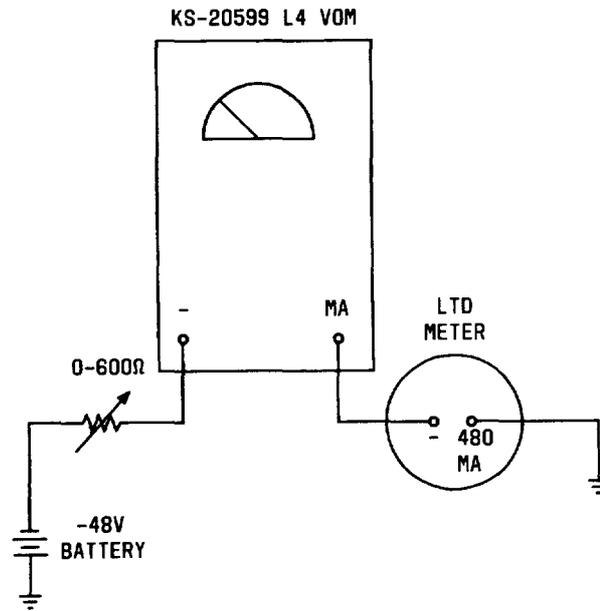


Fig. 1—Milliammeter Calibration Circuit —480 mA Connection

- | | | |
|----|--|--|
| 16 | Decrease the resistance of the rheostat until the KS-20599 L4 VOM meter indicates 80 mA. | |
| 17 | Observe the reading of the LTD meter. | LTD meter indicates within 4.8 mA of the KS-20599 L4 VOM meter. |
| | | CORRECTIVE ACTION Replace LTD meter. |
| 18 | Repeat Steps 16 and 17 for a current of 240 mA. | LTD meter indicates within 14.4 mA of the KS-20599 L4 VOM meter. |
| | | CORRECTIVE ACTION Replace LTD meter. |
| 19 | Repeat Steps 16 and 17 for a current of 480 mA. | LTD meter indicates within 28.8 mA of the KS-20599 L4 VOM. |
| | | CORRECTIVE ACTION Replace LTD meter. |
| 20 | Disconnect all test connections. | |
| 21 | Connect the KS-20599 L4 VOM, set to the 1A dc range, to the LTD meter and 80K ohm resistor as shown in Fig. 2. | |

STEP

ACTION

VERIFICATION

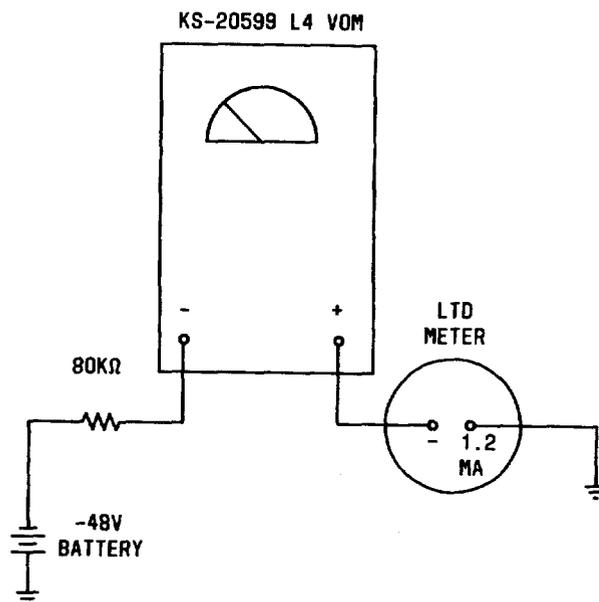


Fig. 2—Milliammeter Calibration Circuit —1.0 mA Connection

- | | | |
|---------------------|---|---|
| 22 | Compare the reading of the LTD meter and the KS-20599 L4 VOM. | KS-20599 L4 VOM indicates approximately 0.6 mA. LTD meter indicates within ± 0.006 mA of the KS-20599 L4 VOM reading. |
| | | CORRECTIVE ACTION Replace LTD meter. |
| 23 | Replace the 80K ohm resistor of Fig. 2 with a 48K ohm resistor. | KS-20599 L4 VOM indicates approximately 1.0 mA. LTD meter indicates within ± 0.010 mA of the KS-20599 L4 VOM reading. |
| | | CORRECTIVE ACTION Replace LTD meter. |
| 24 | Disconnect all test connections. | |
| 25 | Release the STA relay. | |
| AC Voltmeter | | |
| 26 | Connect 12V, $\pm 0.5V$, 60 Hz from the transformer or autotransformer between the ring of the primary test cord and ground. | |

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| STEP | ACTION | VERIFICATION |
|-------------|--|---|
| 27 | Measure the voltage applied between the ring of the primary test cord and ground with the KS-20599 L4 VOM. | |
| 28 | Operate the AC and 24V keys. | LTD meter reads within ± 0.5 volts of the KS-20599 L4 VOM reading. <i>CORRECTIVE ACTION</i> Strap resistors AC4-AC8 to obtain a reading between 11.5 and 12.5 volts. |
| 29 | Release all position keys. | |
| 30 | Disconnect all test equipment from the desk position. | |

B. Battery Voltage, Primary, and Supervision Circuit Tests

| | | |
|---|---|---|
| 1 | Operate the MET-VM key. | |
| 2 | Insert the primary test cord plug into the SC jack. | LTD voltmeter indicates between 99 and 101 volts. <i>CORRECTIVE ACTION</i> Recalibrate voltmeter per Test A. |
| 3 | Remove the plug from the SC jack. | |
| 4 | Release the MET-VM key. | |
| 5 | Operate the +STA key. | |
| 6 | Apply ground to the ring of the primary test cord plug. | LTD meter indicates between 116 and 120 volts. |
| 7 | Release the +STA key and operate the -STA key. | LTD meter indicates between 116 and 120 volts. |
| 8 | Release the -STA key. | LTD meter indicates between 99 and 101 volts. |
| 9 | Remove ground from the ring of the primary test cord. | |

Primary Test Circuit

| | | |
|----|--|---|
| 10 | Operate the REV (PRI) key. | |
| 11 | Place a ground on the tip of the primary test cord plug. | LTD voltmeter indicates between 99 and 101 volts. |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| | | CORRECTIVE ACTION Check for operation of the RV relay and REV (PRI) key contacts. |
| 12 | Remove the ground from the tip of the primary test cord plug. | |
| 13 | Operate the G (PRI) key. | |
| 14 | Insert primary cord plug in SC jack. | LTD voltmeter indicates between 99 and 101 volts. |
| | | CORRECTIVE ACTION Check contacts of G (PRI) key. |
| 15 | Release the REV (PRI) key. | LTD meter indicates between 99 and 101 volts. |
| 16 | Release the G (PRI) key. | LTD meter indicates zero. |
| | | CORRECTIVE ACTION Check meter zero adjustment or check for leakage from ring to ground. |
| 17 | Remove the primary cord plug from the SC jack. | |
| 18 | Operate the SC key. | |
| 19 | Place a ground on the tip of primary test cord plug. | LTD meter indicates between 99 and 101 volts. |
| | | CORRECTIVE ACTION Check SC key contacts. |
| 20 | Release the SC key. | LTD meter indicates zero. |
| 21 | Remove the ground from the tip of the primary test cord plug. | |
| Supervision of Secondary Circuit | | |
| 22a | If testing of dial pulse supervision is desired— Operate DIAL (SEC) key. | The S (secondary) lamp lights. |
| 23a | Insert the secondary test cord plug into an idle test trunk jack equipped with dial pulse receiver. | S (secondary) lamp extinguishes when CO is ready to receive dial pulses. |
| 24a | Dial the number of idle lines terminated at the desk position. | S (secondary) lamp lights after dialing is completed. |

| STEP | ACTION | VERIFICATION |
|------|---|--|
| 25a | Release the DIAL (SEC) key. | S (secondary) lamp remains lighted. |
| 26a | Operate the X key. | S (secondary) lamp extinguishes and the P (primary) lamp lights. |
| 27a | Release the X key. | P (primary) lamp extinguishes and S (secondary) lamp lights. |
| | | CORRECTIVE ACTION Check operation of X key. |
| 28a | Operate the 3WO (SEC) key. | S (secondary) lamp extinguishes. |
| | | CORRECTIVE ACTION Check 3WO (SEC) key contacts. |
| 29a | Release the 3WO (SEC) key. | S (secondary) lamp lights. |
| 30b | If testing of key pulse supervision is desired— Insert secondary test cord plug into an idle test trunk jack equipped with key pulse receiver. | |
| 31b | Operate KP key. | S (sender) lamp lights when CO connects to an MF receiver and key pulsing can start. |
| 32b | Keypulse the number of an idle line terminated at the test desk. | |
| 33b | Release the KP key. | S (sender) lamp extinguishes. |
| 34 | Remove the secondary test cord plug from the test trunk jack and depress the DIS key. | |
| 35 | Operate the DIAL (SEC) key. | The S (secondary) lamp lights. |
| 36 | Use the KS-20599 L4 VOM to measure for -48V between the secondary test cord sleeve and ground. | -48V present on secondary test cord. |
| | | CORRECTIVE ACTION Check L and M resistors. |
| 37 | Change the KS-20599 L4 VOM to the 120 mA scale. | |
| 38 | Connect a series combination of the KS-20599 L4 VOM and a 1K-ohm resistor between the ring side of the secondary test cord plug and ground. | KS-20599 L4 VOM indicates greater than 40 mA. |
| 39 | Release DIAL (SEC) key and observe meter reading. | KS-20599 L4 VOM indicates between 10 and 11 mA. |

| STEP | ACTION | VERIFICATION |
|---------------------------------------|---|--|
| | | CORRECTIVE ACTION |
| | | Check H resistor. |
| 40 | Disconnect the KS-20599 L4 VOM and the 1K-ohm resistor series combination. | |
| 41c | If equipped with the CONN-RELS key— Operate the CONN-RELS key. | |
| 42c | Use the KS-20599 L4 VOM to measure for -48V on the ring of the secondary test cord. | -48V present on ring of secondary test cord. |
| | | CORRECTIVE ACTION |
| | | Check CONN-RELS key contacts. |
| 43c | Check that secondary test cord tip is free of both battery and ground. | Neither battery or ground present on secondary cord tip. |
| 44 | Release all keys. | |
| Supervision of Primary Circuit | | |
| 45a | If testing of dial pulse supervision is desired— Operate DIAL (PRI) key. | P (primary) lamp lights. |
| 46a | Insert the primary test cord plug into an idle test trunk jack equipped with dial pulse receiver. | P (primary) lamp extinguishes when CO is ready to receive dial pulses. |
| 47a | Dial the number of an idle line terminated at the desk position. | P (primary) lamp lights after dialing is completed. |
| 48a | Release the DIAL (PRI) key. | P (primary) lamp remains lighted. |
| 49a | Operate the 3WO (PRI) key. | P (primary) lamp extinguishes. |
| | | CORRECTIVE ACTION |
| | | Check 3WO (PRI) key contacts. |
| 50a | Release the 3WO (PRI) key. | P (primary) lamp lights. |
| 51b | If testing of key pulse supervision is desired— Insert primary test cord plug into an idle test trunk jack equipped with key pulse receiver. | |
| 52b | Operate KP key. | S (sender) lamp lights when CO connects to an MF receiver and key pulsing can start. |
| 53b | Keypulse the number of idle line terminated at the desk position. | |

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| STEP | ACTION | VERIFICATION |
|------------------------------|---|--|
| 54b | Release the KP key. | S (sender) lamp extinguishes. |
| 55 | Remove the primary test cord plug from the test trunk jack and depress the DIS key. | |
| 56 | Operate the DIAL (PRI) key. | The P (primary) lamp lights. |
| 57 | Use the KS-20599 L4 VOM to measure for -48V between the primary test cord sleeve and ground. | -48V present on primary test cord. <i>CORRECTIVE ACTION</i> Check L and M resistors. |
| 58 | Change the KS-20599 L4 VOM to the 1A dc range. | |
| 59 | Connect a series combination of the KS-20599 L4 VOM and a 1K-ohm resistor between the ring side of the primary test cord plug and ground. | KS-20599 L4 VOM indicates greater than 40 mA. |
| 60 | Release DIAL (PRI) key and observe meter reading. | KS-20599 L4 VOM indicates between 10 and 11 mA. <i>CORRECTIVE ACTION</i> Check H resistor. |
| 61 | Disconnect the KS-20599 L4 VOM and the 1K-ohm resistor series combination. | |
| 62c | If equipped with the CONN-RELS key— Operate the CONN-RELS key. | |
| 63c | Use the KS-20599 L4 VOM set to the 100V dc range, to measure for -48V on the ring of the primary test cord. | -48V present on ring of primary test cord. <i>CORRECTIVE ACTION</i> Check CONN-RELS key contacts. |
| 64c | Check that the primary test cord tip is free of both battery and ground. | Neither battery or ground on primary test cord tip. |
| 65 | Release all keys and restore the position to normal. | |
| C. PS-RLS and IN Keys | | |
| 1 | Connect a 1K-ohm resistor between the sleeve of the secondary test cord and ground. | |
| 2 | Operate the T (SEC) key. | |

| STEP | ACTION | VERIFICATION |
|------|---|---|
| 3 | Talk into the position telephone set while listening on the tip and ring of the secondary test cord with the 716C test receiver. | Voice is heard in the 716C receiver. |
| 4 | Release the T (SEC) key and operate the PS-RLS key. | |
| 5 | Test for battery and ground on the sleeve of the secondary test cord using the KS-20599 L4 VOM. | The sleeve is clear of both battery and ground. |
| 6 | Set the KS-20599 L4 VOM to the 1A dc range. | |
| 7 | Connect a series combination of a 1K-ohm resistor and the KS-20599 L4 VOM between the tip of the secondary test cord and ground. | S (secondary) lamp lights. KS-20599 L4 VOM indicates between 20 and 25 mA. |
| | | CORRECTIVE ACTION Check RL relay. |
| 8 | Connect the series combination of the 1K-ohm resistor and KS-20599 L4 VOM between the ring of the secondary test cord and ground. | KS-20599 L4 VOM indicates between 35 and 40 mA. |
| | | CORRECTIVE ACTION Check the RL resistor (should be 284 ohms). |
| 9 | Release the PS-RLS key. | |
| 10 | Restore all equipment to normal. | |
| 11 | Operate the primary test circuit IN key. | The P (primary) lamp on the LTD lights and the NS relay operates. |
| | | CORRECTIVE ACTION Check IN key contacts or NP relay. |
| 12 | Operate the IN (SEC) key. | The S (secondary) lamp on the LTD lights and the NS relay operates. |
| | | CORRECTIVE ACTION Check IN key contacts or NS relay operation. |
| 13 | Connect the series combination of a 1K-ohm resistor and the KS-20599 L4 VOM between the sleeve of the primary test cord and ground. | KS-20599 L4 VOM indicates between 35 and 40 mA. |
| | | CORRECTIVE ACTION Check the IN (PRI) key contacts. |

| STEP | ACTION | VERIFICATION |
|------|---|---|
| 14 | Repeat Step 13 for the sleeve of the secondary test cord. | KS-20599 L4 VOM indicates between 35 and 40 mA. CORRECTIVE ACTION Check the IN (SEC) key contacts. |
| 15 | Remove all test equipment and return all keys to the normal position. | |

D. CC, CR, DO Keys, and Dial-Tone-First Feature

Note: For LTDs equipped with a constant current source (Option YM), Test L should be performed instead of this test.

| | | |
|----|--|--|
| 1 | Connect one side of the KS-20599 L4 VOM (set to measure dc voltage) to the desk position ground. | |
| 2a | If not equipped with dial-tone-first feature, option ZP— Separately test the tip and ring of the primary cord plug as shown in Table B. | Coin disposal voltages appear on both tip and ring. Coin voltages shall be within local office requirements. CORRECTIVE ACTION Check coin batteries or power supply and adjust or repair. |

TABLE B

| OPERATE KEYS | TEST FOR (SEE NOTE) |
|--------------|---|
| CC | Coin Collect Voltage |
| CR | Coin Return Voltage |
| CC and DO | Coin Collect and Booster Battery Voltages |
| CR and DO | Coin Return and Booster Battery Voltages |

Note: Voltage and polarity vary and must be determined locally.

| | | |
|----|--|--|
| 3b | If equipped with dial-tone-first feature, option ZP— Test the tip and ring of the primary test cord plug per Table C. | Coin voltages appear on the tip only and are within local office limits. CORRECTIVE ACTION Check option ZP wiring. Check coin batteries or power supply and adjust or repair. |
|----|--|--|

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|
|------|--------|--------------|

TABLE C

| OPERATE KEYS | TEST FOR (SEE NOTE) |
|--------------|----------------------|
| G and CC | Coin Collect Voltage |
| G and CR | Coin Return Voltage |

Note: Voltage and polarity vary and must be determined locally.

- 4 Restore all keys to normal.
- 5 Disconnect the KS-20599 L4 VOM.

E. RHE, 1000 Ohms, 2000 Ohms Keys

- 1 Insert the primary test cord in the SC jack.
- 2 Operate the 24 mA and G (PRI) keys.

Zero ohms indicated on OHMS scale of desk position voltmeter.

CORRECTIVE ACTION

Adjust battery or power supply voltage to indicate zero ohms.

- 3 Set the R (0 to 1000 ohms) potentiometers to zero.
- 4 Operate the RHE key.

There is no change in desk position meter indications.

CORRECTIVE ACTION

Check that the circuit path through the RHE key and potentiometers do not contain any resistance.

- 5 Operate the R1 potentiometer to 100 ohms and read the LTD meter.
- 6 Return potentiometer R1 to the zero position.

LTD meter indicates 100 ohms, ± 5 percent.

LTD meter indicates zero ohms.

CORRECTIVE ACTION

(a) If the readings of Steps 5 and 6 are off by the same amount, adjust potentiometer knob.

Note: The 100 ohm potentiometer does not

| STEP | ACTION | VERIFICATION |
|------|---|--|
| | | <p>require routine maintenance. If cleaning and adjustment become necessary, the potentiometer may be (1) washed with a Freon type spray; (2) lubricated with a light coat of lubricant such as lubriplate; and (3) wiper arm contact pressure adjusted for 15-20 grams. The contact pressure is not critical. The points shall be set to zero when the brush is on the first turn of resistance. The potentiometer has a $\pm 5\%$ tolerance. Therefore, the 100 ohm potentiometer should insert between 95 and 105 ohms into the circuit when its pointer is set to 100 ohms.</p> <p>(b) Replace potentiometer R1.</p> |
| 7 | Operate the R potentiometers to 200 ohms and observe the LTD meter reading. | LTD meter indicates 200 ohms, ± 5 percent. |
| 8 | Repeat Step 7 for values of 400, 600, 800, and 1000 ohms. | LTD meter indicates the setting of the R potentiometers, ± 5 percent. |
| | | <p>CORRECTIVE ACTION</p> <p>(a) If all readings are off by the same amount, adjust potentiometer knob.</p> <p>Note: The 100 ohm potentiometer does not require routine maintenance. If cleaning and adjustment become necessary, the potentiometer may be (1) washed with a Freon type spray; (2) lubricated with a light coat of lubricant such as lubriplate; and (3) wiper arm contact pressure adjusted for 15-20 grams. The contact pressure is not critical. The points shall be set to zero when the brush is on the first turn of resistance. The potentiometer has a $\pm 5\%$ tolerance. Therefore, the 100 ohm potentiometer should insert between 95 and 105 ohms into the circuit when its pointer is set to 100 ohms.</p> <p>(b) Replace potentiometer R.</p> |
| 9 | Return potentiometer R to its zero position. | |
| 10 | Operate the 1000 key. Note LTD meter reading. | LTD meter indicates 1000 ohms, ± 10 percent. |
| | | <p>CORRECTIVE ACTION</p> <p>Check the 1000 key contacts and the RE resistances.</p> |

| STEP | ACTION | VERIFICATION |
|--|--|---|
| 11 | Operate the 2000 key and note the LTD meter reading. | LTD meter indicates 2000 ohms, ± 10 percent. |
| | | CORRECTIVE ACTION Check 2000 key contacts and the RE resistances. |
| 12 | Return all keys to the normal position. | |
| 13 | Remove the primary cord from the SC jack. | |
| F. Continuity Test to Station With Ringer Isolation or 11A Ringing Extender (Option YC) | | |
| 1 | Connect the KS-20599 L4 VOM, set to the 100V ac range, to the tip and ring conductors of the primary test cord plug. | |
| 2 | Operate keys LRP, +STA, and SSRT. | KS-20599 L4 VOM indicates 24 Vac. (The needle will vibrate slowly as this voltage is at 20 Hz.) |
| | | CORRECTIVE ACTION Check LRP, +STA, SSRT key contacts. |
| 3 | Change the KS-20599 L4 VOM to the 500V ac range. | |
| 4 | Release the SSRT key and operate the SC key. | LTD meter indicates 116V on the 500V ac range. |
| | | CORRECTIVE ACTION Check SC key contacts. |
| 5 | Release keys SC and +STA. | |
| 6 | Operate the -STA and SSRT keys. | KS-20599 L4 VOM indicates 24 Vac. (The needle will vibrate slowly as this voltage is at 20 Hz.) |
| | | CORRECTIVE ACTION Check -STA and SSRT key contacts. |
| 7 | Release the SSRT key and operate the SC key. | LTD meter indicates 116V on the 120 volt scale. |
| | | CORRECTIVE ACTION Check SC key contacts. |
| 8 | Release the SC, LRP, and -STA keys. | |
| 9 | Disconnect the voltmeter from the primary cord plug. | |

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| STEP | ACTION | VERIFICATION |
|--|---|--|
| G. Electronic Voltmeter Test, SD-95596-01 | | |
| <i>Note:</i> This test requires the aid of a second craft person at the electronic voltmeter circuit location and a means of communication between that locale and the desk position under test. | | |
| 1 | If the LTD position is equipped with an electronic voltmeter— Insert a No. 310 plug into the electronic voltmeter TST jack. | |
| 2 | Set the KS-20599 L4 VOM to the 100V dc range. | |
| 3 | Connect the KS-20599 L4 VOM between terminal 5 of the electronic voltmeter electron tube and ground. | KS-20599 L4 VOM indicates 20 volts. CORRECTIVE ACTION Adjust voltage as close to 20V as possible by means of straps on resistances E through H. |
| 4 | Disconnect the KS-20599 L4 VOM. | |
| 5 | Change the scale of the KS-20599 L4 VOM to the 100 mA dc range. | |
| 6 | Connect the + and — leads of the KS-20599 L4 VOM to tip and ring, respectively, of the 310 plug. Wait at least 1-1/2 minutes before making reading. | KS-20599 L4 VOM indicates at least 4.5 mA. CORRECTIVE ACTION Replace electronic voltmeter electron tube. |
| 7 | Disconnect the KS-20599 L4 VOM and remove the 310 plug. | |
| 8 | Insert an operators headset into the jacks at the desk position. | |
| 9 | Operate the EL-VM key. | |
| 10 | At the electronic voltmeter circuit— Set both ADJ-1 and ADJ-2 potentiometers at midrange. | |
| 11 | Operate the ADJ-100 key. | |
| 12 | Adjust potentiometer ADJ-2 until LTD voltmeter indicates 100V. | LTD voltmeter indicates 100V. CORRECTIVE ACTION Check ADJ-100 key contacts. Replace ADJ-2 potentiometer. |
| 13 | Restore the ADJ-100 key to normal and operate the ADJ-80 key. | |

| STEP | ACTION | VERIFICATION |
|------|---|---|
| 14 | Adjust potentiometer ADJ-1 until LTD voltmeter indicates 80V. | LTD voltmeter indicates 80V. <i>CORRECTIVE ACTION</i> Check ADJ-80 key contacts. Replace ADJ-1 potentiometer. |
| 15 | Restore the ADJ-80 key to normal. | |
| 16 | Repeat Steps 11 through 15 until the voltmeter readings remain stable. | |
| 17 | At the test desk— Operate the G (PRI) key. | |
| 18 | Insert the primary test circuit cord plug into the test desk SC jack. | LTD voltmeter indicates approximately 100V. <i>CORRECTIVE ACTION</i> Check G key contacts. |
| 19 | Release the G (PRI) key. | The LTD voltmeter indicates zero. |
| 20 | Remove the primary plug from the SC jack. | |
| 21 | Operate the FEMF key. | |
| 22 | Apply 24V or 48V CO battery to the ring of the primary test cord. | LTD voltmeter indicates approximately the voltage applied to the primary test cord ring. <i>CORRECTIVE ACTION</i> Check FEMF key contacts. |
| 23 | Release the FEMF key. | Voltmeter indicates zero. |
| 24 | Remove the CO battery from the primary test cord ring. | |
| 25 | Operate the MET-VM key. | |
| 26 | Insert the primary test cord into the test desk SC jack. | LTD voltmeter indicates approximately 100 volts. <i>CORRECTIVE ACTION</i> Check MET-VM key contacts. |
| 27 | Release the EL-VM and MET-VM keys. | Voltmeter indicates zero. |
| 28 | Remove the primary test cord from the SC jack. | |
| 29 | At the electronic voltmeter circuit— Block electronic voltmeter circuit relays B and C normal. | |

| STEP | ACTION | VERIFICATION |
|------|---|--|
| 30 | At the test desk position— Operate the EL-VM key. | |
| 31 | Use the KS-20599 L4 VOM to check for ground on both the tip and ring of the primary test cord. | Ground indicated on the tip and ring of the primary test cord. |
| 32 | At the electronic voltmeter circuit— Remove the block from electronic voltmeter circuit relay B. | Electronic voltmeter relay B operates. |
| 33 | At the test desk position— Check for ground on the tip of the primary test cord using the KS-20599 L4 VOM. | Ground indicated on the tip of the primary test cord. |
| 34 | Measure between the ring of the primary test cord and ground using the KS-20599 L4 VOM set to the 100V range. | KS-20599 L4 VOM indicates between 25 and 35 volts. |
| 35 | Release the EL-VM key. | |
| 36 | At the electronic voltmeter circuit— Unblock the C relay. | |

H. LRP and DSL Keys

| | | |
|---|--|---|
| 1 | Operate the DSL and T keys. | |
| 2 | Measure between the tip and ring of the primary test cord with the KS-20599 L4 VOM for the resistances shown in Table D. | Resistances measured according to Table D. Resistor tolerance is ± 1 percent. |

CORRECTIVE ACTION

Check DSL and T key contacts. Replace resistors that are out of tolerance.

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|
|------|--------|--------------|

TABLE D

| TEST DESK KEY OPERATED | MEASURED RESISTANCE |
|------------------------|---------------------|
| 100 | 135 |
| 200 | 235 |
| 400 | 435 |
| 800 | 535 |
| None | *35 |

* Nominal Resistance of Transformer A

- | | | |
|--|--|---|
| 3 | Rotate desk position dial off normal position and repeat Step 2. | Resistance measurement of Step 2 is reduced to less than 10 ohms. CORRECTIVE ACTION Check rotary dial circuit. |
| 4 | Return dial to normal position. | |
| 5 | Operate the LRP key. | |
| 6 | Measure the resistance between tip and ground and then between ring and ground of the primary cord with the KS-20599 L4 VOM. | Resistance measurements are 1500 ±150 ohms. CORRECTIVE ACTION Check LRP key contacts. |
| 7 | Operate the DO key. | |
| 8 | Repeat the measurements of Step 6. | Resistance measurements are 1000 ±100 ohms. CORRECTIVE ACTION Check DO key contacts. |
| 9 | Release all keys. | |
| I. Dial Speed Indicator Test or TOUCH-TONE Dialing Frequency Test | | |
| 1 | Connect the secondary test cord to an idle local trunk accessible to a telephone number appearing at the test desk. | |
| 2 | Operate the secondary DIAL (or KP key) and dial or key pulse the telephone number at the LTD. | |

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| STEP | ACTION | VERIFICATION |
|---|---|---|
| 3 | Release the DIAL or KP key and ring the test number by using the appropriate ringing key. | Supervisory lamp under the test number blinks during ringing. |
| 4 | Operate the incoming call key. | Supervisory lamp under the test number lights steadily. |
| 5 | Operate the S (sounder) key. | Sounder tone heard in position headset. |
| <p><i>CORRECTIVE ACTION</i> Check the operation of the DB, NP, DA (or DD, NS, DC), and D relays for mechanical dial. Check the operation of the MF keyset circuit for TOUCH-TONE dialing.</p> | | |
| 6a | If the test desk position is equipped with the dial testing circuit— Operate the SET 10 key (SET 18 key for high-speed dials). | The DT lamp at the desk position under test flashes, and the DT lamps at the three other associated positions light steadily. |
| <p><i>CORRECTIVE ACTION</i> Check the operation of the DT and DT1 relays.</p> | | |
| 7a | Operate the RHE key. | |
| 8a | Adjust the test desk rheostat for an indication of 10V (18V for high-speed dials) on the 24V meter scale. | Meter indicates 10V (or 18V) on the 24V scale. |
| 9a | Release the RHE key. | |
| 10a | Operate the DIAL TEST key. | Dial tone is heard over the position headset. |
| 11a | Dial "0" on the desk position dial. | |
| 12a | Observe the desk position meter reading just prior to its indicating zero. | Dial pulses are indicated on the meter scale as the needle moves to a new position where it vibrates momentarily and then falls to zero. The meter reading just prior to the needle falling to zero corresponds to the dial speed in pulses per second as read on the 0-24 scale. |
| <p><i>CORRECTIVE ACTION</i></p> <p>(a) Check test telephone dial.</p> <p>(b) Troubleshoot or calibrate the dial test circuit.</p> | | |
| 13a | Release and then reoperate the DIAL TEST key. | Dial tone is heard on the desk position headset. |

| STEP | ACTION | VERIFICATION |
|------|---|---|
| 14a | Dial "0" and manually slow the dial as it returns to its normal position. | The test desk meter indicates a slower dial speed than in Step 12a. |
| 15a | Release and then reoperate the DIAL TEST key. | Dial tone is heard at the desk position headset. |
| 16a | Dial "0" and manually speed the dial as it turns to its normal position. | The test desk meter indicates a faster dial speed than in Step 12a. |
| 17a | Release the DIAL TEST key. | |
| 18b | If the test desk position is equipped with a 51-type dial tester— Operate the LSDT and ADJ keys. | Dial tone is heard on the test desk headset. The DT lamp at the desk position under test flashes and lights steadily at the three other associated positions. The S (secondary) lamp at the desk position lights. |
| 19b | Dial "0" on the desk position dial. | |
| 20b | Listen for tone indicating the dial speed in the desk headset. | Tone heard in the test desk headset. |
| 21b | Release the ADJ key. | Dial tone is removed and the S (secondary) lamp is extinguished. |
| 22b | Operate the test desk TEST key. | The S (secondary) lamp lights and dial tone is heard in the test telephone and desk position headset. |
| 23b | Dial "0" on the position dial and manually speed the dial as it returns to its normal position. | Rapidly interrupted dial tone is heard in the desk headset indicating fast dial pulses. |
| | | <p>CORRECTIVE ACTION Check operation of the 51-type dial tester per Section 100-141-701.</p> |
| 24b | Release the desk position TEST key. | Dial tone is removed; S (secondary) lamp is extinguished. |
| 25b | Release the LSDT key and operate the HSDT key. | |
| 26b | Operate the TEST key. | Dial tone is heard on the desk position headset. The S (secondary) lamp lights. |
| 27b | Dial "0" on the desk position dial. | A slowly interrupted dial tone is heard at the desk position headset indicating slow dial pulses. |
| 28b | Release the HSDT key. | |

| STEP | ACTION | VERIFICATION |
|---|--|--|
| 29c | If TOUCH-TONE dialing testing is required— Operate the desk TT key. | |
| 30c | At an adjacent test desk position— Have a craft person bridge onto the test telephone number. | |
| 31c | Have the craft person operate the 4 by 4 key and then several tone keys. | Dial tone and tone signals heard at test telephone and desk position headset. (A busy signal heard at the test desk position only indicates that all TOUCH-TONE dialing frequency test circuits are busy.) |
| <p style="text-align: center;">CORRECTIVE ACTION</p> <p>Troubleshoot TOUCH-TONE dialing frequency test connector circuit or TOUCH-TONE dialing frequency test circuit.</p> | | |
| 32 | At the desk position under test— Restore equipment to normal. | |
| J. Receiver Off-Hook Tone Test | | |
| 1 | Connect the secondary test cord to an idle test trunk accessible to a telephone number appearing at the desk position. | |
| 2 | Operate the DIAL (SEC) or KP (SEC) key and dial or key pulse the test telephone number. | |
| 3 | Release the DIAL (SEC) or KP (SEC) key and operate the appropriate ringing key. | Supervisory lamp under telephone key will flash. |
| 4 | Operate the incoming talk line key. | Supervisory lamp lights steadily. |
| 5 | Operate S key to verify number. | Tone heard on position headset. |
| 6 | Operate BG key to silence buzzer. | |
| 7 | Restore S and BG key to normal. | |
| <p><i>Danger: When listening for the howler tone at the test telephone, do not hold the receiver close to the ear.</i></p> | | |
| 8a | If equipped with options ZC and ZG— Operate test desk secondary key H. | The howler circuit functions and applies a graduated tone that rises from a low volume to a high volume. This sequence is performed four times. The H lamp of the position under test flashes during these four applications of tone |

| STEP | ACTION | VERIFICATION |
|------|---|--|
| | | and then, at the completion of the tone, lights steadily. The H lamp of the other three associated positions, that are furnished, lights steadily throughout the test. |
| | | CORRECTIVE ACTION Check the operation of H and H1 relays. |
| 9a | Reoperate the secondary H key. | The howler circuit functions as described in Step 8a. |
| 10a | While tone is being applied to the test line, return the incoming talk line key to the normal position. | The howler circuit restores and the H lamp extinguishes when the test line is disconnected. |
| 11b | If equipped with options ZD and ZG, or options ZD and ZH— Operate the secondary key H. | The H lamp flashes as the off-hook tone is applied to the test telephone. When the tone times out, H lamp lights steadily. |
| | | CORRECTIVE ACTION Check the operation of H and H1 relays. |
| 12b | Allow the tone to time out. | |
| 13b | Reoperate the secondary H key. | Tone is applied and H lamp flashes as described in Step 11b. |
| 14b | Return the incoming talk line key to normal while the tone is being applied. | The tone is no longer applied and the H lamp extinguishes. Lamp S lights. |
| 15 | Remove the secondary test cord plug from the test trunk jack. | |
| 16 | Operate the disconnect key. | |
| 17 | Restore all keys to normal. | |

K. Line Insulation Breakdown Tests**Danger: This test requires the measurement of high voltages.**

| | | |
|---|----------------------|--|
| 1 | Operate the BT1 key. | Lamp BT at the test desk position flashes while BT lamps at the other associated desks light steadily. |
| | | CORRECTIVE ACTION Check BT1 key contacts. |

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| STEP | ACTION | VERIFICATION |
|--|--|---|
| 2 | Measure for 200V between the ring of the primary test cord and ground with the KS-20599 L4 VOM. | 200V present on the primary test cord ring conductor. CORRECTIVE ACTION Check operation of BD, BD1, and BD2 relays. |
| 3 | Allow the test to cycle to completion. | Lamp BT at the desk position extinguishes when the test has cycled to completion. |
| 4 | Operate the REV key and the momentary BT1 key. | |
| 5 | Measure for voltage between the tip of the primary test cord and ground with the KS-20599 L4 VOM. | No voltage present between the tip of the primary test cord and ground. |
| 6 | Release the REV key and operate the BT2 key. | Lamp BT at the test desk position flashes while BT lamps at the other associated desks light steadily. CORRECTIVE ACTION Check BT2 key contacts. |
| 7 | Measure for 200V between both the tip and ring of the primary test cord and ground with the KS-20599 L4 VOM. | 200V present on both the tip and ring of the primary test cord. CORRECTIVE ACTION Check for operation of BD and BD2 relays. |
| 8 | Allow the test to cycle to completion. | Lamp BT extinguishes when the test has cycled to completion. |
| 9 | Restore all keys to normal. | |
| L. Constant Current Source, SD-97763-01 (Option YM) | | |
| 1 | Connect the (-) lead of the KS-20599 L4 VOM to the constant current source TS (A), punching 11. | |
| 2 | Measure voltages with the KS-20599 L4 VOM as indicated in Table E. | Voltages present as indicated in Table E. CORRECTIVE ACTION Check test voltage power supply. |

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|
|------|--------|--------------|

TABLE E

| CONSTANT CURRENT SOURCE TS(A) PUNCHING NO. | VOLTAGE READING VDC |
|--|------------------------|
| 15 | +163 |
| 13 | -163 |
| 17 | -48 |

3 Connect the series combination of a 1K-ohm resistor and the KS-20599 L4 VOM between the tip of the primary test cord and ground.

4 Set the KS-20599 L4 VOM to the 1A dc range.

5 Operate the CC and CR keys.

The desk position meter and KS-20599 L4 VOM indicate 41 ± 1 mA.

CORRECTIVE ACTION

Check constant current source or position meter circuit.

6 Operate the CN-NOP key and then the CC and CR keys.

The desk position meter and KS-20599 L4 VOM indicate 30 ± 1 mA.

CORRECTIVE ACTION

Check constant current source or position meter circuit.

7 Release the CN-NOP key.

8 Replace the 1K-ohm resistor of Step 3 with a 2K-ohm resistor.

9 Operate the CC and CR keys.

The desk position meter and KS-20599 L4 VOM indicate 41 ± 1 mA.

CORRECTIVE ACTION

Check constant current source or position meter circuit.

10 Operate the CN-NOP key and then the CC and CR keys.

The desk position meter and KS-20599 L4 VOM indicate 30 ± 1 mA.

CORRECTIVE ACTION

Check constant current source or position meter circuit.

| STEP | ACTION | VERIFICATION |
|------|--|---|
| 11 | Release the CN-NOP key. | |
| 12 | Connect the series combination of a 1K-ohm resistor and the KS-20599 L4 VOM between the tip and ring of the primary test cord. | |
| 13 | Operate RCCI, T, and TOT keys. | The desk position meter and the KS-20599 L4 VOM indicate 18 ± 1 mA. CORRECTIVE ACTION Check constant current source or keying circuit. |
| 14 | Release all keys. | |
| 15 | Replace the 1K-ohm resistor of Step 12 with a 2K-ohm resistor. | |
| 16 | Operate the RCCI, T, and TOT keys. | The desk position meter and KS-20599 L4 VOM indicate 18 ± 1.0 mA. CORRECTIVE ACTION Check constant current source or keying circuit. |
| 17 | Restore all keys to normal and disconnect test equipment. | |

M. Remote Test System-Enhanced (Option YO) Test

| | | |
|---|---|--|
| 1 | Connect KS-20599 L4 VOM, set to the 10 K ohm resistance range, between ground and the terminal on the TST terminal strip as given in Table F. | |
| 2 | Operate and release the associated test desk key as given in Table F. | Ground is indicated on the terminal each time the associated test desk key is operated (KS-20599 L4 VOM indicates zero ohms.) CORRECTIVE ACTION Check key contacts and associated wiring. |

STEP

ACTION

VERIFICATION

TABLE F

| CONNECT KS-20599 L4 VOM TO TST TERMINAL STRIP: | | OPERATE AND RELEASE TEST DESK KEY |
|--|------------------|-----------------------------------|
| TERMINAL | | |
| 88 | DIAL TEST | |
| 89 | NOISE MET | |
| 90 | NOISE LONG | |
| 91 | BAL | |
| 92 | FLT - V1/1 - TRK | |
| 92 | FLT - V2/1 - TRK | |
| 93 | FLT - V1/2 - TRK | |
| 94 | FLT - V2/2 - TRK | |
| 95 | TONE MET | |
| 96 | TONE LONG | |
| 97 | TRK ACC | |
| 98 | CN - NOP | |
| 99 | TOT | |

3 Disconnect KS-20599 L4 VOM.