

## LOCAL TEST DESK (LTD) NO. 16

### TESTS AND TROUBLE LOCATING PROCEDURES

**1. GENERAL**

PAGE

**1.01** This section describes the maintenance and tests to be performed on the No. 16 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.

**1.02** This section affects the Equipment Test List.

**1.03** The following tests are covered:

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<b>A. LTD Meter Calibration:</b> This test checks the battery voltages and operation of the desk position voltmeter for ac and dc voltages and dc current. . . . .	10
<b>B. Primary and Secondary Test Circuits:</b> This test checks the operation of the primary and secondary control and supervision keys. . . . .	15
<b>C. Test Circuit Selection and Disconnect:</b> This test checks the operation of the three control groups. . . . .	17
<b>D. Outgoing Trunk Connection, Disconnect, and Group Busy Tests:</b> This test checks the operation of the outgoing trunks keys. . . . .	20
<b>E. Incoming Trunk Test:</b> This test checks the operation of the incoming test trunk keys. . . . .	22
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<b>H. Potentiometer Circuit:</b> This test checks the operation of the three potentiometers. . . . .	26
<b>I. Receiver Off-Hook Tone Test:</b> This test checks the operation of the howler circuit. . . . .	27
<b>J. Night Alarm Key Test:</b> This test checks the function of the night alarm key. . . . .	27
<b>K. Dial Speed Indicator or TOUCH-TONE® Dialing Frequency Test:</b> This test checks the operation of the desk keys and the dial testing circuit (SD-96335-01) or TOUCH-TONE dialing frequency test connector circuit. . . . .	28
<b>L. Conductor Identification Circuit Test:</b> This test checks the conductor identification or sounder circuit operation. . . . .	31
<b>M. Electronic Voltmeter Test (SD-95596-01):</b> This test checks the calibration and operation of the electronic voltmeter when a desk position is so equipped. . . . .	32
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<b>P. Insulation Breakdown Test (SD-95772-01):</b> This test checks	

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the operation of the insulation breakdown circuit. . . . .	37
<b>Q. Call Circuits Test:</b> This test checks the operation of the call circuits used to communicate between desk positions. . . . .	38
<b>R. Remote Test System-Enhanced (Option ZY) Test:</b> This test checks the operation of the test desk keys associated with the Remote Test System-Enhanced. . . . .	39
<b>1.04 Lettered Steps:</b> A letter a, b, c, etc, added to a step number in Part 4 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.	
<b>1.05</b> For troubles which are encountered while performing the tests of Part 4 of this section, <b>CORRECTIVE ACTION</b> 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.	
<b>1.06</b> All tests are performed at the LTD. A headset or handset must be plugged into one or both	

of the headset jacks before any test functions may be performed.

**1.07** For some tests in Part 4, access to the tip and ring leads within the test desk position is required. The tip and ring may be accessed from the following or equivalent points on the back plane after removing the LTD back cover.

**SD-1C379-01**

	TERMINAL STRIP	PUNCHING
Tip	TS(E)	17
Ring	TS(E)	56

**1.08** Tests C, I and M require the aid of an additional craft person. Test F requires the aid of two additional craft persons.

***Danger: Certain terminals of relays and keys of the No. 16 LTD have battery voltages ranging from 20 volts to 200 volts. Exercise care when performing the prescribed tests.***

**1.09** This issue of the section is based on the following drawings. If this section is to be used with equipment or apparatus reflecting later issues of the drawings, reference should be made to the SD and CD to determine the extent of the changes and the manner in which the section may be affected.

CIRCUIT		TITLE
SD-&CD-1C379-01	SD-Issue 9B	Primary and secondary test circuits
SD-&CD-1C380-01	SD-Issue 1	Common system telephone circuits—Talk trunks, loudspeaker trunks, and test circuits
SD-&CD-1C381-01	SD-Issue 1	Trunk switching circuit
SD-&CD-1C401-01	SD-Issue 1	60 and 120 IPM flashing circuit
SD-&CD-95570-02	SD-Issue 11D	TOUCH-TONE dialing and MF circuit
SD-&CD-95737-01	SD-Issue 19B	Incoming or outgoing test trunk circuits
SD-&CD-95741-01	SD-Issue 6B	Secondary ringing circuit
SD-&CD-95764-01	SD-Issue 2B	Test trunk circuit for detecting intermittent trouble
SD-&CD-96472-01	SD-Issue 7B	MDF loudspeaker trunk circuit
SD-&CD-99549-01	SD-Issue 7B	Fulse alarm circuit
SD-&CD-97763-01	SD-Issue 1	Constant current source circuit.

## 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.

**2.02** KS-20599, L4, Volt-Ohm-Milliameter (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** 0 through 600 ohms, 25 watt rheostat.

**2.06** 48 Kohms, 1 percent, 1/2 watt resistor.

**2.07** 80 Kohms, 1 percent, 1/2 watt resistor.

**2.08** 1 Kohms, 1 percent, 1/2 watt resistor.

**2.09** 2 Kohms, 1 percent, 1/2 watt resistor.

**2.10** 553A tool.

**2.11** 363 tool.

**2.12** Relay blocking tools as required. Apply as covered in Section 067-020-801.

## 3. MAINTENANCE

### 647-TYPE KEYS

**3.01** To perform any maintenance on the 647-type key modules, the key must be removed from the panel assemblies. The left and right panel assemblies have an indent along the lower outside edge to provide a hand hold for raising the panel. The panels are hinged at the top and raised from the bottom to

TABLE A

APPARATUS	MAINTENANCE	TEST																	
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
KS-20599 L4 VOM (2.02)		1							1					1	1	1	1		1
12V 60 Hz Source (2.03)		1																	
310 Plug (2.04)													1						
0-600 ohm, 25 watt rheostat (2.05)		1																	
48K, 1 percent 1/2 watt resistor (2.06)		1																	
80k, 1 percent 1/2 watt resistor (2.07)		1																	
1K, 1 percent, 1/2 watt resistor (2.08)																		1	
2K, 1 percent, 1/2 watt resistor (2.09)																		1	
553A Tool (2.10)	1																		
363 Tool (2.11)	1																		
Relay Blocking Tools, as required (2.12)					✓			✓											

gain access to the keys. **The ticket box in the left panel assembly must be removed before the panel is raised.** The ticket box would strike the writing shelf if an attempt is made to raise the panel with the ticket box in place. The center panel assembly must be in the lowered position before raising or lowering the left or right panel assemblies.

**Danger: Do not perform any work on a raised panel assembly unless the shelf support bars and latch are properly secured.**

**3.02** The replacement components of a 647-type key consists of:

- E5837 designation strip
- P-23F437 button
- P-23F427 (clear) cap
- P-23F428 (red) cap
- P-23F101 collar
- Lamp 51A.

**3.03** Refer to Table B and Fig. 1 and 2 for the most common maintenance information on the 647-type keys.

TABLE B

KEY MAINTENANCE (647-TYPE)		
COMPONENTS	TROUBLE	CLEARING PROCEDURE
Buttons and Plunger	Binding or Squeaking	<p>VERIFY COLLAR IS PROPERLY SEATED ON KEY. Clean bearing surfaces with water damp cloth. Do not lubricate. If excessive trouble, replace key.</p>
	Fails to Remain in Locked Position	<p>Check that P-28E773 locking pin is properly seated in plunger. If more than one button is affected, replace key.</p>
Contacts	Contact Failure Due to Improper Making or Breaking	<p>Gauge open contacts to a minimum separation of 0.010 inch. (Fig. 2 shows tools used for spring adjustment.) Avoid kinking spring.</p>
		<p>Separations between contact springs have minimum separation of 1/64 inch.</p>
	Contact Failure Due to Foreign Matter on Contacts	<p>Burnish contacts with 265C tool equipped with burnishing blade.</p>
Lamps	Improper Illumination	<p>Remove dirt or film from lamps and illuminated area with water damp cloth. (Fig. 1 shows proper removal of lamps.)</p>
		<p>Position lamps properly.</p>
		<p>Clean and check tension on lamp mounting contacts.</p>

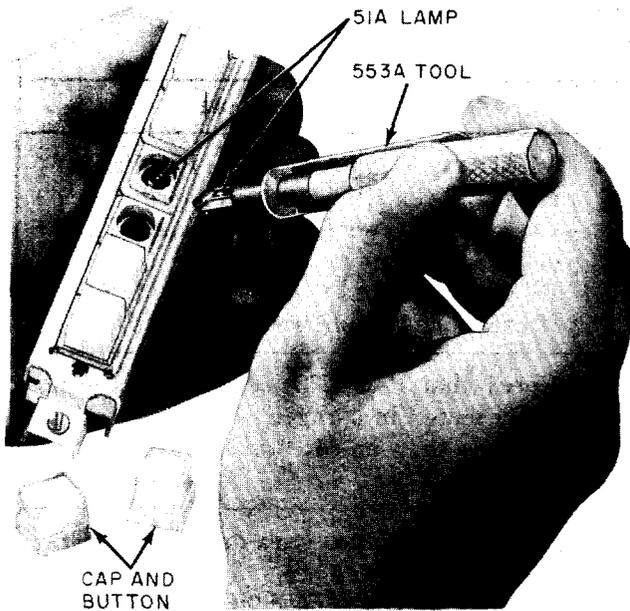


Fig. 1—Removing Lamp From 647-Type Key

**3.04** To replace or remove designation tabs in the 647-type keys, the button cap may be removed without removing the key from the panel assembly. The cap is removed by gripping the cap between the thumb finger and pulling up with a slight rocking motion to free the cap from the button. Insert the designation tab, replace the cap on the button, and push down until the cap snaps into place.

**Note:** Tabs and opening on caps and buttons must align to properly lock cap to button just as the tabs on the inside of the button must align with the recess on the plunger assembly.

**3.05** To remove 647-type keys from the panel assembly, the key and its mounting bracket are removed as one unit. Keys are removed from the panel assembly by removing the screw holding the bracket on the end which does not have an open slot, and loosening the screw at the open-slotted end of the key bracket until the key may be slid free. To electri-

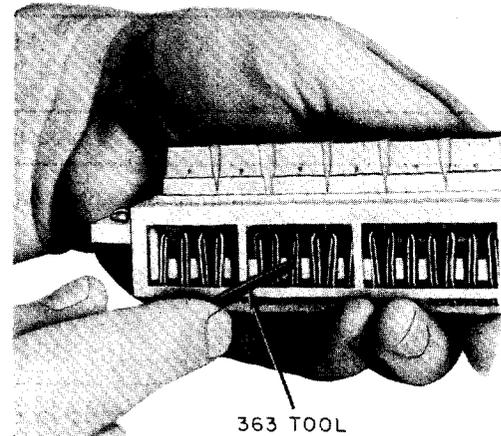


Fig. 2—Use of 363 Tool to Adjust Spring and Control Separation, 647-Type Key

cally disconnect the key, remove the plug retaining clip and disengage the plugs.

**3.06** To replace a button lamp, the collar must be removed before the button may be removed to gain access to the lamp. Use a 553A tool to remove the lamp (Fig. 1).

#### LEVER-TYPE KEYS

**3.07** Refer to Section 032-709-701 for requirements and adjusting information on the lever-type keys.

#### VOLTMILLIAMMETER

**3.08** The meter in the test desk should be periodically checked for accuracy in accordance with Test A in Part 4. The specification on the S9A meter requires  $\pm 1\%$  accuracy.

**SWITCHBOARD**

**3.09** The switchboard clock operates on 18 to 24 volts ac. The clock cover is held in place by magnets and is removed from the front by pressing against any of the upper corners. The clock cover must be removed to set the clock. A slotted screw is provided on the right side of the clock for setting the seconds and minutes numerals. To set the seconds and minutes numerals, place a screwdriver in the slot and press in before turning the screw counter-clockwise. A push switch with normally closed contacts controls the power supply to the clock. Depress the switch to stop the clock. A knurled trunk wheel is provided for setting the hour numerals.

**SPEAKERPHONE SYSTEM**

*Remove power from 55-type control unit before attempting any maintenance of speakerphone components.*

**3.10** *If speakerphone system transmits but does not receive:*

- (1) Visually inspect for loose or broken SP1 and SP2 leads between loudspeaker and 55B control unit. Refer to SD-1C379-01.
- (2) Replace 761A loudspeaker, if defective.

**3.11** *If speakerphone system receives but does not transmit:*

- (1) Check for loose or broken M1 and M2 leads between the transmitter and 55B control unit. Refer to SD-1C379-01.
- (2) Replace 667B transmitter unit, if defective.

**3.12** *If volume control does not vary loudspeaker volume:*

- (1) Check for loose or broken P1 lead between the transmitter and the 55B control unit.
- (2) Check for defective volume control.
- (3) Verify control unit is operating properly. Refer to Section 512-620-100 for information on the 55-type control unit.

**3.13** *If amplifier in receiver and/or transmitter unit(s) is poor:*

- Replace defective 55B control unit.

**3.14** *If incoming speech is choppy:*

- (1) Room conditions may cause voice-switching or choppiness of incoming speech.
- (2) Move SP2 loudspeaker lead from terminal 29 to terminal 30 on 55B control unit to compensate for room conditions which cause choppiness in incoming speech.

**EQUIPMENT MAINTENANCE****A. Incoming and Outgoing Test Trunks**

**3.15** *If a test trunk cannot be seized by operating an incoming or outgoing key button, verify the start signal is received by the position control circuit as follows:*

- (1) Connect voltmeter to base of ST transistor (terminal 25 of CC terminal strip) on the trunk switching circuit of the J95005EA-1 position control unit.
- (2) Meter should read zero voltage.
- (3) Depress outgoing or incoming trunk button.
- (4) Meter should read 4.5 Vdc. Relays LOA and BSA lock operated.
  - (a) If meter stays at 0 voltage or 4.5 Vdc, check wiring of chaining switches for the incoming and outgoing trunk selection keys.
  - (b) If meter reads approximately 48 Vdc, check the ST transistor.

**3.16** *If the test trunk cannot be seized by the control circuit, perform the following tests:*

- (1) Verify at least one headset is properly plugged into one of the headset jacks.
- (2) Verify AP relay in position control circuit and CO and CO1 relays of the control group test trunk lock operated when PRI button is operated.
- (3) Depress SEC button associated with the same control group. Verify AS relay locks operated.

AP relay releases if test trunk was transferred from primary to secondary test circuit.

(4) Depress SO button associated with the same control group. Verify relay ASO locks operated. AS relay releases if test trunk was transferred from secondary test circuit.

(5) Perform Test B in Part 4 for a step-by-step check of control circuit relays.

(6) If test circuits cannot be seized after proper operation of all relays is verified, check to ensure that all control keys are properly connected. Check for loose or broken connections.

**3.17** Adjustable relays in the secondary ringing circuit, test trunk circuits, and test and no-test central office trunks should be checked periodically for proper operation. Malfunctions may develop and not be detected in normal use, especially in circuits which are infrequently used.

**3.18** *If busy (BY) indicator does not illuminate when PRI, SEC, or SO test circuit is seized, perform the following tests:*



*The BY indicator will not illuminate when the test circuits are connected to main distributing frame (MDF) test trunks, since MDF trunks bypass the test trunk circuit of the position control circuit.*

- (1) Depress incoming or outgoing test trunk button.
- (2) Verify TA, TB, or TC relay operates, when seizing a test or no-test trunk. (Relays will not operate when MDF trunks are seized.)
- (3) Block the TM0 relay, nonoperated, to bypass the control circuit.
- (4) Manually operate the ST relay.
- (5) Verify BA and BID relays operate when ST relay is operated.
- (6) If BA and BID relays do not operate, check wiring of lockout control circuit. Verify ground is connected to punching 6F of BA relays and 10F of BID relay. Check for loose or broken

connections to the incoming or outgoing test trunk keys.

**B. Visual Indicator Circuit**

**3.19** *If no numeral is displayed in the visual indicator tube, when the VI button is depressed, make the following tests:*

- (1) Block L relay operated.
- (2) Measure 130 Vdc on terminal 1 of L relay.
- (3) Connect one cord of a test receiver to -48 Vdc and observe the numerals which appear in the visual indicator while connecting the opposite cord of the test receiver to the following punchings:

POSITION STRIP (C)	TERMINAL PUNCHING	NUMERAL IN PUNCHING
	1	9
	2	8
	3	7
	4	6
	5	5
	6	4
	7	3
	8	2
	9	1
	10	0

- (4) If correct numerals are made to appear on the visual indicator while proceeding through Step 3, check wiring of visual indicator lockout circuit.
- (5) If numerals do not appear on the visual indicator when completing Step 3, the visual indicator tube may be defective.

**C. Group Busy Indicator**

**3.20** *If the group (GB) indicator does not illuminate when all outgoing test trunks in a trunk group are seized or made busy, make the following tests:*

- (1) Measure -48 Vdc at L coil terminal of GB relay.
- (2) Measure -48 Vdc on 10M of last BY relay in the trunk group.
- (3) Block last BY relay operated.

- (4) Measure -48 Vdc on 10M of next lower BY relay.
- (5) Continue Steps 3 and 4 until -48 Vdc is measured at all BY relays in the trunk group.
- (6) If the group busy indicator does not function properly after completing Step 5, verify that the outgoing trunks keys are properly wired and there are no loose or broken connections.

#### D. Dial Testing Circuit

**3.21** *If the dial test (DT) indicator does not illuminate when SET 10 or 18 key is operated, verify that the position relays DT and DT1 are operated.*

**3.22** *If the position meter cannot be adjusted to the 10V or 18V setting for making a dial test, perform the following checks:*

- (1) Verify C, P and P1 relays in the dial testing circuit operate.
- (2) Verify G resistor in dial testing circuit has one side connected to ground.
- (3) Verify G resistor is a 400-ohm resistor.

**3.23** *If the subscriber does not receive dial tone when the dial test key is operated, verify that the DT relay in the dial testing circuit operates.*

**3.24** *If there is no meter reading when dialing zero, perform the following checks:*

- (1) Verify that the P and P1 relays follow the dial pulses when dialing with the SET 10 or 18 key and dial test key operated.
- (2) Check the C relay releases when the dial test key operated.
- (3) Check C capacitor.

#### E. Conductor Identification Tone Circuit

**3.25** *If no conductor identification tone is heard when the sounder (S) key is operated:*

- (1) Verify TN1 relay operated.

- (2) Verify ST relay associated with the conductor identification tone circuit operates.

**3.26** A steady conductor identification tone indicates the tuned circuits are not oscillating. Check for a short or open in the T1 transformer and L1 inductor.

#### F. Buzzer Circuit

**3.27** *If buzzer does not operate:*

- (1) Verify TN relay operates.
- (2) Measure for 105 Vdc between the buzzer and 6B of TN relay.

#### G. Line Insulation Breakdown Circuit

**3.28** *If no breakdown voltage is applied to circuit when BT1 or BT2 key is operated:*

- (1) Verify position relays BD, BD1, and BD2 operate when BT1 key is operated or BD and BD2 relays operate when BT2 key is operated.
- (2) Verify BY and G relays in the breakdown test circuit operate.

**3.29** *If selector for line insulation breakdown steps to terminal 2 and stops:*

- Measure for 105 Vdc between terminal 1B and 17 of SC relay.

**3.30** *If selector steps slowly (20 seconds) to complete the line insulation breakdown cycle:*

- SC relay is not operating properly. SC relay should operate more rapidly after stepping off step 2 of the selector.

**3.31** *If maximum breakdown is not applied for a 3 second interval:*

- (1) Verify S and S1 relays in breakdown test circuit operate.
- (2) Verify ground is present on wiper terminal of ARC 6.

**3.32** *If selector switch does not stop after two cycles:*

**SECTION 201-828-504**

- Check EC relay in breakdown test circuit operates.

**4. METHOD**

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
-------------	---------------	---------------------

**A. LTD Meter Calibration**

**DC Voltmeter**

- |   |   |   |
|---|---|---|
| 1 | Connect a KS-20599 L4 VOM to the (-) and 120V, 1.2 mA terminals of the LTD meter.                               |   |
| 2 | Zero the pointer of the LTD meter if necessary.   | LTD meter set on zero.<br><br><b>CORRECTIVE ACTION</b><br><br>Replace LTD meter.  |
| 3 | Operate the VM-REV key.   | LTD meter indicates between 99 and 101 volts.<br><br><b>CORRECTIVE ACTION</b><br><br>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.<br><br><b>CORRECTIVE ACTION</b><br><br>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.   | The KS-20599, L4 VOM indicates between 49 and 51 volts.<br><br><b>CORRECTIVE ACTION</b><br><br>Adjust voltage of batteries or adjust power supply level.<br><br><b>Note:</b> The 100V level must be rechecked if adjustment to the power supply is made.<br><br>The LTD meter indicates within 0.6 volts of the KS-20599, L4 VOM. |

STEP	ACTION	VERIFICATION
		<b><i>CORRECTIVE ACTION</i></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.	The KS-20599, L4 VOM indicates between 19 and 21 volts.
		<b><i>CORRECTIVE ACTION</i></b>
		Adjust voltage of batteries or adjust power supply level.
		<b><i>Note:</i></b> The 100V and 50V levels must be rechecked if adjustment to the power supply is made.
		The LTD meter indicates within 0.24 volts of the KS-20599, L4 VOM.
		<b><i>CORRECTIVE ACTION</i></b>
		Replace LTD meter.
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.	The KS-20599, L4 VOM meter indicates between 19 and 21 volts.
		<b><i>CORRECTIVE ACTION</i></b>
		Adjust voltage of batteries or adjust power supply level.
		<b><i>Note:</i></b> The 100V and 50V levels must be rechecked if adjustment to the power supply is made.
		The LTD meter indicates within 0.24 volts of the KS-20599, L4 VOM.
		<b><i>CORRECTIVE ACTION</i></b>
		Replace LTD meter.

STEP	ACTION	VERIFICATION
11	Return all keys to normal position.	
12	Disconnect the KS-20599 L4 VOM from the LTD meter terminals.	

**Milliammeter**

- 13 Block operated the STA relay of the LTD.
- 14 Set the 0 to 600 ohms rheostat to its maximum resistance position.
- 15 Connect a KS-20599, L4 VOM in series with the LTD meter, the 0-600 ohm rheostat, (set for 600 ohms) and 48-volt battery as shown in Fig. 3. The lead to ground must be supplied for this test.

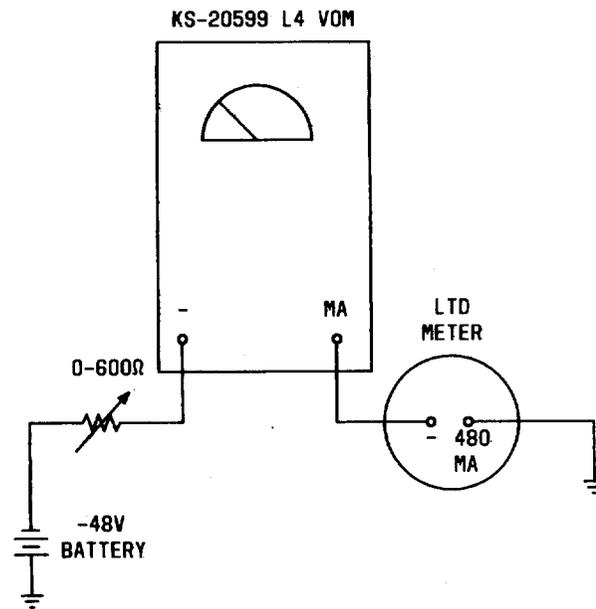


Fig. 3—Milliammeter Calibration Circuit—480mA Connection

- 16 Set the KS-20599, L4 VOM to the 100 mA DC scale.
- 17 Decrease the resistance of the rheostat until the KS-20599, L4 VOM indicates 80 mA.
- 18 Observe the reading of the LTD meter.

LTD meter indicates within 4.8 mA of the KS-20599, L4 VOM.

**CORRECTIVE ACTION**

Replace LTD Meter.

STEP	ACTION	VERIFICATION
19	Change the KS-20599, L4 VOM to the 1A DC scale.	
20	Repeat Steps 17 and 18 for a current of 240 mA.	LTD Meter indicates within 14.4 mA of the KS-20599, L4 VOM.  <b>CORRECTIVE ACTION</b>  Replace LTD meter.
21	Repeat Steps 17 and 18 for a current of 480 mA.	LTD meter indicates within 28.8 mA of the KS-20599, L4 VOM.  <b>CORRECTIVE ACTION</b>  Replace LTD meter.
22	Disconnect all test connections.	
23	Connect a KS-20599, L4 VOM to the LTD meter and resistor as shown in Fig. 4. Ground the 1.2 mA lead of the LTD meter.	

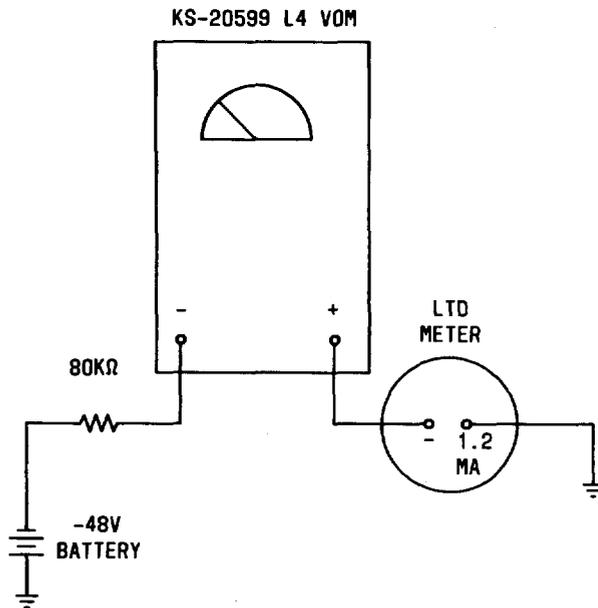


Fig. 4—Milliammeter Calibration Circuit—1.0 mA Connection

24	Set the KS-20599, L4 VOM to the 1 mA DC scale.	
25	Compare the reading of the LTD meter and the KS-20599, L4 VOM meter.	KS-20599, L4 VOM indicates approximately 0.6 mA. LTD meter indicates within $\pm 0.006$ mA of the KS-20599, L4 VOM.

STEP	ACTION	VERIFICATION
		<b><i>CORRECTIVE ACTION</i></b>
		Replace LTD meter.
26	Replace the 80 Kohms resistor of Fig. 4 with a 48 Kohms resistor.	KS-20599, L4 VOM indicates approximately 1.0 mA. LTD meter indicates within $\pm 0.01$ mA of the KS-20599, L4 VOM.
		<b><i>CORRECTIVE ACTION</i></b>
		Replace LTD meter.
27	Disconnect all test connections.	
28	Release the STA relay.	
<b>AC Voltmeter</b>		
29	Connect 12V, $\pm 0.5$ V, 60 Hz from a transformer or autotransformer between the ring lead of the test desk and ground.	
30	Measure the voltage applied between the ring lead of the desk position and ground using the KS-20599, L4 VOM set to the 100V ac scale.	
31	Operate the AC and 24V keys.	LTD meter reads within $\pm 0.5$ volts of the KS-20599, L4 VOM reading.
		<b><i>CORRECTIVE ACTION</i></b>
		Strap resistors AC4-AC8 to obtain a reading between 11.5 and 12.5 volts.
32	Release all position keys.	
33	Disconnect all test equipment from the desk position.	
<b>Other Battery Voltages</b>		
34	Operate the MET-VM key.	LTD voltmeter indicates between 99 and 101 volts.
35	Release the MET-VM key.	LTD voltmeter indicates zero volts.
36	Operate the VM REV and +STA keys.	LTD voltmeter indicates between 116 and 118 volts.

STEP	ACTION	VERIFICATION
		<b><i>CORRECTIVE ACTION</i></b>
		Replace batteries or check test voltage power supply.
37	Release the +STA key and operate the -STA key.	LTD voltmeter indicates between 116 and 118 volts.
		<b><i>CORRECTIVE ACTION</i></b>
		Replace batteries or check test voltage power supply.
38	Release the -STA and VM REV keys.	LTD voltmeter indicates zero volts.
<b>B. Primary and Secondary Test Circuits</b>		
<b>Primary Test Circuit</b>		
1	At LTD— Depress an idle OG trunk key.	The depressed OG key lights.
		<b><i>CORRECTIVE ACTION</i></b>
		Check OG key contacts.
2	Operate the PRI (A) button.	The PRI (A) button lights.
3	Operate the DIAL (PRI) or KP (PRI) key, depending upon the type of trunk seized.	Relays DB, NP, DA, and D operate. S (sender) lamp lights.
4	Dial or keypulse the number of an incoming talk trunk terminated on an adjacent desk position.	
5	Release the DIAL or KP key.	PRI lamp lights when connection is established.
6	Ring the telephone with the ±T, ±R, or +T, -T, +T, or -R keys as required.	Adjacent desk position rings, indicated by a flashing lamp.
		<b><i>CORRECTIVE ACTION</i></b>
		Check contacts of ringing keys.
7	Operate T and RCCI (PRI) keys.	
8	Verify the connection between the two desk positions.	Talking connection established between the two desk position.
		<b><i>CORRECTIVE ACTION</i></b>
		Check T and RCCI (PRI) key contacts.

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
9	Release the T and RCCI (PRI) keys and operate the M (PRI) key.	Talking at the terminating position can be heard at the originating desk position but not vice versa.  <b><i>CORRECTIVE ACTION</i></b>  Check the M (PRI) key contacts.
10	Release the M(PRI) key and operate the T(PRI) and SEC CO keys.	Talking at the terminating desk position can be heard at the originating desk position but not vice versa.  <b><i>CORRECTIVE ACTION</i></b>  Check the SEC CO key contacts.
11	Release the T(PRI) and SEC CO keys and operate the 3WO (PRI) key.	Primary lamp is extinguished  <b><i>CORRECTIVE ACTION</i></b>  Check the 3WO key contacts.
12	Release the 3WO (PRI) key.	The primary lamp lights.
13	Operate the X key.	The primary lamp extinguishes and the secondary lamp lights.  <b><i>CORRECTIVE ACTION</i></b>  Check the X key contacts.
14	Release the X key.	The secondary lamp extinguishes and the primary lamp lights.
15	Operate the DIS (A) button.	All lamps extinguished.
<b>Secondary Test Circuit</b>		
16	Depress an idle OG trunk key.	The depressed OG key lights.
17	Depress the SEC(A) button.	The SEC(A) button lights.  <b><i>CORRECTIVE ACTION</i></b>  Check the SEC(A) button contacts.
18	Operate the DIAL (SEC) or KP(SEC) key, depending upon the type of trunk seized.	Relays DD, NS, DC, and D operate.

STEP	ACTION	VERIFICATION
19	Dial or key pulse the number of the incoming talk trunk at an adjacent test position.	
20	Release the DIAL or KP key.	The secondary lamp lights.
21	Ring the position with the appropriate secondary ringing key.	Nearby test position rings, indicated by flashing light or buzzer, indicating an incoming call.
22	Go off-hook at the nearby test position.	Lamps lights steady or buzzer silences indicating an off-hook condition.
23	Operate the T(SEC) key.	
24	Verify the connection to the adjacent desk position by answering the incoming call.	Good connection established between the two positions. TR lamp lights indicating tip ringing.
		<b><i>CORRECTIVE ACTION</i></b>
		Check the T(SEC) key contacts.
25	Release the T(SEC) key and operate the M(SEC) key.	Talking at the terminating position can be heard at the originating desk position but not vice versa.
		<b><i>CORRECTIVE ACTION</i></b>
		Check the M(SEC) key.
26	Release the M(SEC) key.	
27	Operate the SEC/CO key.	Talking at the terminating position can be heard at the originating desk position but not vice-versa.
28	Release the SE4CO key.	<b><i>CORRECTIVE ACTION</i></b>
		Check the SEC/CO key.
29	Operate the DIS(A) button.	All lamps extinguished.

### C. Test Circuit Selection and Disconnect

**Note:** This test requires the aid of a second craft person stationed at the relay test rack.

1	At LTD, depress desk position PRI(A) key.	Lamps PRI(A) and BY(A) light. Relays AP, CO, and CO1 lock operated.
2	Momentarily operate the relays indicated in the steps of Table C.	Relay specified in Table C operates or a specified relay operates or releases.

STEP

ACTION

VERIFICATION

***CORRECTIVE ACTION***

If the relay not specified operates or a specified relay does not operate or release, clear this trouble before proceeding.

If the test circuit still cannot be selected, check the wiring of the desk position control keys.

\*



STEP	ACTION	VERIFICATION
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**D. Outgoing Trunk Connection, Disconnect, and Group Busy Tests**

*Note:* This test requires a second craft person stationed at the trunk switch bay J95005F for Steps 1 through 8, and at the trunk switch bay, J95005D for Steps 9 through 14. Set up talking circuits between the test desk position and the trunk switch and trunks bays.

**Seizure**

1 At LTD, insert an operator headset into the desk position telephone jacks.

2 Depress an assigned OG key.

The depressed OG key and lamp ON(A) light. Relays TA, LOA, and BSA lock operated. At the trunk switch bay, the first hold magnet associated with the test desk position operates.

***CORRECTIVE ACTION***

If the relay TA does not operate, block nonoperated the TMO relay. Manually operate the ST relay and verify BA and BID relays operate. Release TMO relay.  
 (a) If these relays do not operate, check wiring of lockout control circuit and verify ground at 6 of BA relays and 10 of BID relays.  
 (b) If these relays do operate, check wiring of OG selection keys.

3 Depress a second OG key.

The depressed OG key and OG key and lamp ON(B) light. Relays TB, LOB, and BSB lock operated. At the trunk switch bay, the second hold magnet associated with this test desk position operates.

***CORRECTIVE ACTION***

If relay TB does not operate, perform the corrective action of Step 2.

4 Depress a third OG key.

The depressed OG key and lamp ON(C) light. Relays TC and LOC lock operated. At the trunk switch bay, the third hold magnet associated with this test desk position operates.

***CORRECTIVE ACTION***

If relay TC does not operate, perform the corrective action of Step 2.

STEP	ACTION	VERIFICATION
5	Depress the remaining desk position OG keys.	Only the ST relay operates.
<b>Disconnect</b>		
6	Depress desk position key DIS(A).	The OG key and lamp ON(A) extinguish. Relays TA, LOA, and BSA release. At the trunk switch bay, the first hold magnet associated with the test desk position releases.
7	Depress desk position key DIS(B).	The OG key and lamp ON(B) extinguish. Relays TB, LOB, and BSB release. At the trunk switch bay, the second hold magnet associated with the desk position releases.
8	Depress desk position key DIS(C).	The OG key and lamp ON(C) extinguish. Relays TC and LOC release. At the trunk switch bay, the third hold magnet associated with the desk position releases.
<b>Group Busy</b>		
9	Depress an assigned OG key.	At the trunk bay, a BY relay operates. The depressed OG key lights.
10	At the trunk bay, block operated the remaining BY relays in the same trunk group.  <i>Note:</i> Instead of blocking operated the BY relays, the same OG key at other positions may be operated to operate the BY relays. After a group busy indication, operate DISC key at the positions to release BY relays.	
11	Depress the same OG key depressed in Step 9.	Lamp GB flashes at 120 IPM.  <b>CORRECTIVE ACTION</b>  Measure -48V at L coil terminal of GB relay and 10M of last BY relay in trunk group. Block operated last BY relay and measure -48V at 10M of next lower BY relay. Continue procedure until -48V is measured at all BY relays in the group. (a) If there is no group busy indication with -48V at all BY relays, check wiring of OG selection keys.
12	At the trunk bay, remove blocks from the By relays.	

STEP	ACTION	VERIFICATION
13	Operate IDS(A) key.	At the trunk bay, the BY relay releases.
14	Repeat Steps 9 through 12 for each assigned OG key in the test desk position.	
<b>E. Incoming Trunk Test</b>		
<b>Seizure</b>		
1	At a nearby telephone, dial the number associated with an incoming test trunk of the desk position.	At LTD, the BSY lamp corresponding to the seized incoming trunk flashes at 60 IPM at all desk positions. Relays IC and LOC operate.
2	Depress the desk position IC key.	Lamps ON(C) and the IN lamp associated with the seized trunk light.
3	Depress the desk position PRI(C) key.	The PRI(C) lamp lights at that desk position and the BSY lamps at all desk positions light steadily.
<b>Hold</b>		
4	Depress the HOLD key.	The desk position IC and ON(C) lamps extinguish. Relay IC and LOC release.
<b><i>CORRECTIVE ACTION</i></b>		
Check HOLD key contacts.		
5	Depress the IC key again.	Incoming trunk is resealed. Lamps IC and ON(C) light. Relays IC and LOC operate.
<b>Disconnect</b>		
6	Depress the desk position DIS(C) key.	The IC, ON(C), and BSY lamps at the desk position extinguish. Relays IC and LOC release. The BSY lamps at all other desk positions extinguish.
7	Hang up the phone used to seize the incoming trunk.	

**F. Talking Trunk Test**

**Note:** This test requires two nearby test telephones, to which test calls can be made, and a craft person to answer each telephone.

STEP	ACTION	VERIFICATION
<b>Seizure</b>		
1	Insert an operator headset into the desk position telephone jacks.	
2	Depress an assigned talk trunk key TK.	The depressed key lights and dial tone is heard in the operator headset.
3	Dial the number assigned to the test telephone.	
4	Have the craft person answer the telephone.	
5	Verify that a good talking connection exists between the desk position and the test telephone.	A good talking path is established between the desk position and the test telephone.
<b>CORRECTIVE ACTION</b>		
(a) Check operation of S, S1, and CT relays in telephone circuit. (b) Check operation of the A relay in trunk bay. (c) If these relays are not operated, check wiring of talk trunk keys.		
6	Have the craft person place the test telephone on-hook	
7	Operate the REL key in the keystrip.	
8	Repeat Steps 2 through 7 for the remaining assigned TK keys in the keystrip.	
<b>Bridging</b>		
9	Establish a connection to a test telephone (phone A) by performing Steps 2 through 5.	A good talking path is established between the desk position and phone A.
10	Depress the red HOLD key in the keystrip.	Phone A is placed on hold. TK key used to call phone A flashes at 120 IPM.
<b>CORRECTIVE ACTION</b>		
(a) Check that CT, S, and S1 relays in the telephone circuit release. (b) On the trunk bay, check that the A relay releases and the H relay operates. (c) If the S and S1 relays do not release, check wiring of the HOLD key.		

STEP	ACTION	VERIFICATION
11	Establish a connection to a second test telephone (phone B) by performing Steps 2 through 5.	A good talking path is established between the desk position and phone B.
12	Hold down the TK key used to call phone B and depress the TK key that is on hold.	
13	Verify that a good talking connection exists between the two test telephones and the desk position.	The craft persons at the two test telephones can talk to each other and the test desk position operator.
<b>CORRECTIVE ACTION</b>		
Check the TK key contacts.		
14	Have the craft persons place the test telephones on-hook.	
15	Depress the REL key in keystrip.	
16	Repeat Steps 2 through 15 for all other assigned TK keys in the remaining keystrips.	

**G. Visual Indicator Test**

- |   |   |   |
|---|---|---|
| 1 | At the LTD, depress the desk position OG key that has the greatest number of trunks in the group three times. |   |
| 2 | Observe the visual indicator as the following keys are operated:  | The visual indicator lights as indicated. |

KEYS
VI(A)
VI(B)
VI(C)

VISUAL INDICATOR
0
1
2

**Note:** The visual indicator can be verified only for the maximum quantity of trunks in a group, for example:

- 2 trunks 0,1
- 7 trunks 0 through 6



STEP ACTION VERIFICATION

H. Potentiometer Circuit

- 1 Connect one lead of the KS-20599, L4 VOM, set to measure resistance, to punching 48 of TS(A) and the other lead to the (-) terminal of the desk position meter. KS-20599, L4 VOM indicates zero resistance.
- 2 Set potentiometers SW1, SW2, and R to each position shown in Table D and observe KS-20599, L4 VOM for each setting. KS-20599, L4 VOM readings are within  $\pm 10\%$  of that indicated in Table D.  
  
**CORRECTIVE ACTION**  
Replace faulty switches or resistors.
- 3 Disconnect the KS-20599, L4 VOM and return all switches to normal.

TABLE D

SW1	SWITCH POSITIONS		RESISTANCE IN OHMS
	SW2	R	
0	0	0	0
1K	0	0	1000
2K	0	0	2000
2K	100	0	2100
2K	200	0	2200
2K	300	0	2300
2K	400	0	2400
2K	500	0	2500
2K	600	0	2600
2K	700	0	2700
2K	800	0	2800
2K	900	0	2900
2K	1K	0	3000
2K	1K	50	3050
2K	1K	Fully clockwise	3100

STEP	ACTION	VERIFICATION
<b>I. Receiver OFF-Hook Tone Test</b>		
<i>Note:</i> This test requires a second craft person at a second position.		
1	At that position under test— Depress an idle OG trunk key.	The depressed OG key lights.
2	Depress the SEC(a) button.	The SEC(A) button lights.
3	Operate the DIAL(SEC) or KP(SEC) key, depending upon the type of trunk seized.	
4	Dial or key pulse the number of an incoming trunk at an adjacent test position.	
5	Release the DIAL(SEC) or KP(SEC) key.	
6	Test the connection by operating the T(SEC) key.	A good talking connection is established in both directions.
<b>CORRECTIVE ACTION</b>		
Check the T(SEC) key contacts.		
7	<b><i>Danger: When listening for howler tone, hold the headset away from the ear.</i></b>	
7	Release the T(SEC) key and operate the H key. Wait approximately 1 minute for the howler circuit to cycle to completion.	The desk position H lamp flashes at 60 IPM. The howler tone is heard at the second desk position.
<b>CORRECTIVE ACTION</b>		
Check for operation of the H and H1 relays.		
8	Depress the DIS(A) button.	
9	Return all keys to the normal position.	
<b>J. Night Alarm Key Test</b>		
1	At LTD, operate the NA key.	The NA key lights.
<b>CORRECTIVE ACTION</b>		
Check NA key contacts.		
2	Connect a ground to punching 27 of TS(F).	A beep tone is heard at the desk position.

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
3	Release the NA key.	The NA key light is extinguished and the beep tone is silenced.  <b><i>CORRECTIVE ACTION</i></b>  Check NA key contacts.
4	Remove the ground from terminal 27 of TS(F).	
<b>K. Dial Speed Indicator or TOUCH-TONE Frequency Test</b>		
1	At desk position under test— Depress an idle OG trunk key.	The depressed OG key lights. The PRI(A) button lights.
2	Operate the SEC(A) button.	
3	Operate the DIAL(SEC) or KP(SEC) key, depending upon the type of trunk seized.	
4	Dial or key pulse the number of an incoming trunk terminated at an adjacent test position.	
5	Release the DIAL(SEC) or KP(SEC) key.	
6	Verify that a connection is established between the two desk positions.	A good connection is established between the two positions.
7a	At the desk position under test— If dial testing is required, operate the SET 10 key.	The DT lamp on the desk position under test flashes at 60 IPM, and the DT lamps at the other three associated positions light steadily.  <b><i>CORRECTIVE ACTION</i></b>  Check for operation of relays DT and DT1.
8a	Adjust the potentiometer circuit (switches SW, SW2, and the R rheostat) to obtain a 10V reading on the 24V scale of the desk voltmeter.	Desk voltmeter indicates 10V on the 24V scale.  <b><i>CORRECTIVE ACTION</i></b>  Check the operation of the C, P, and P1 relays in the dial testing circuit (SD-96335-01).
9a	Operate the DIAL TEST key.	Dial tone is heard at the second desk position.  <b><i>CORRECTIVE ACTION</i></b>  Check the operation of the DT relay.
10a	At the second desk position— Dial zero.	

STEP	ACTION	VERIFICATION
11a	At the position under test— Observe the desk position voltmeter.	The desk voltmeter needle assumes a new position about which it vibrates momentarily and then falls to zero.  The indication just prior to the needle falling to zero indicates the dial speed in pulses per second and should, in this case, be 10 on the 24 scale.
<b>CORRECTIVE ACTION</b>		
At the dial testing circuit (SD-96335-01): (a) Verify that the P and P1 relays follow the dial pulses and that relay C releases. (b) Check the C capacitor.		
12a	Release and reoperate the DIAL TEST key.	Dial tone is heard at the test telephone.
13a	At the second desk position— Dial zero and manually slow the dial as it returns to its normal position.	The desk voltmeter needle final indication (before dropping to zero) is less than 10 on the 24 scale.
14a	At the position under test— Release and reoperate the DIAL TEST key.	Dial tone is heard at the test telephone.
<b>CORRECTIVE ACTION</b>		
Check the DIAL TEST key contacts.		
15a	At the second desk position— Dial zero and manually speed the dial as it returns to its normal position.	The desk voltmeter needle final indication (before dropping to zero) is greater than 10 on the 24 scale.
16a	At the position under test— Release the DIAL TEST and SET 10 keys.	The DT lamps at the desk position under test and associated desks extinguish.
17a	Operate the SET 18 key.	The DT lamp on the desk position under test flashes at 60 IPM and the DT lamps at the three other associated desk positions light steadily.
<b>CORRECTIVE ACTION</b>		
Check the SET 18 key contacts.		
18a	Readjust the potentiometer circuit (SW1, SW2, and R) to obtain a reading of 18V on the 24V scale of the desk voltmeter.	The desk voltmeter indicates 18V on the 24V scale.
<b>CORRECTIVE ACTION</b>		
Check the operation of the C, P, and P1 relays in the dial testing circuit (SD-96335-01).		

STEP	ACTION	VERIFICATION
19a	Operate the DIAL TEST key.	Dial tone is heard at the test telephone.  <b>CORRECTIVE ACTION</b>  Check the DIAL TEST key contacts.
20a	At the second desk position— Dial zero.	
21a	At the position under test— Observe the desk position voltmeter.	The final meter indication is less than 18V (approximately 10V) on the 24V scale.
22	Release the DIAL TEST and SET 18 keys.	The DT lamp at the desk position under test and at the associated desk extinguishes.
23b	At the desk position under test— If TOUCH-TONE dialing testing is required, operate the desk TT key.	Dial tone signal heard at test position and second desk position headset. (A busy signal heard at the test desk position only indicates that all TOUCH-TONE dialing frequency test circuits are busy.)  <b>CORRECTIVE ACTION</b>  Troubleshoot TOUCH-TONE dialing frequency test connector circuit or TOUCH-TONE dialing frequency test circuit.
24b	At second desk position— Dial a preliminary digit, if required, followed with the operation of all TT dial buttons in order; left to right and top to bottom. 10-button dial—No preliminary digit 12-button dial—preliminary digit 4 16-button dial—Preliminary digit 5.	Tone signals are heard with the following indications: (a) Two bursts of high tone, indicating dial is operating properly. (b) One burst of high tone, indicating failure of one of the following conditions: Incorrect level of a digit Incorrect frequency of a digit Incorrect sequence of digits Incomplete sequence of digits. Sequence not complete within an approximate 15-second interval.  <b>CORRECTIVE ACTION</b>  Troubleshoot TOUCH-TONE dialing frequency test circuit.
25b	Release the TT key when testing is completed.	
26	Depress the DIS(A) key.	The SEC(A) and OG trunk key lights extinguish.

STEP	ACTION	VERIFICATION
<b>L. Conductor Identification Circuit Test</b>		
1	At LTD, depress an idle OG trunk key.	The depressed OG key lights.
2	Depress the SEC(A) button.	The SEC(A) button lights.
<b>CORRECTIVE ACTION</b>		
Check the SEC(A) button contacts.		
3	Operate the DIAL(SEC) or KP(SEC) key, depending upon the type of trunk seized.	Relays DD, NS, DC, and D operate.
4	Dial or keypulse the number of an incoming talk trunk terminated at an adjacent desk position.	
5	Operate the T(SEC) key and verify the connection between the two positions.	Good connection established between the two positions.
<b>CORRECTIVE ACTION</b>		
Check trunk circuit used to establish the talking connection.		
6	Release the T(SEC) key and operate the S key.	A 500-Hz warbled tone is heard at the second position headset after a 5- to 10-second delay. A buzzer in the desk position also operates.
<b>CORRECTIVE ACTION</b>		
To change the volume of the tone heard at the test telephone, at the conductor identification tone circuit, (SD-95689-01), block operated the ST relay. Adjust potentiometer P1 so that a voltmeter connected to the units TS, punching 1 and 3, indicated +6 dBm.		
7	Operate the BG key.	The buzzer at the desk position is silenced.
<b>CORRECTIVE ACTION</b>		
Check the BG key contacts.		
8	Go on-hook at second test position.	The buzzer is heard.
9	Release the BG key.	The buzzer at the desk position is silenced.
10	Depress the DIS(A) key and return all keys to the normal position.	The SEC(A) and the OG trunk button lights extinguished.

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
<b>M. Electronic Voltmeter Test (SD-95596-01)</b>		
<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 location and the desk position under test.		
1	Insert No. 310 plug into the electronic voltmeter TST jack.	
2	Set the KS-20599, L4 VOM to the 100V scale.	
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. <b><i>CORRECTIVE ACTION</i></b> 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 10 mA DC scale.	
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. <b><i>CORRECTIVE ACTION</i></b> Replace electronic voltmeter electron tube.
7	Disconnect the KS-20599, L4 VOM and remove the 310 plug.	
8	Insert an operator's 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. <b><i>CORRECTIVE ACTION</i></b> Check ADJ-100 key contacts. Replace ADJ-2 potentiometer.

STEP	ACTION	VERIFICATION
13	Restore the ADJ-100 key to normal operate the HDJ-80 key.	
14	Adjust potentiometer ADJ-1 until LTD voltmeter indicated 80V.	LTD voltmeter indicates 80V.  <b>CORRECTIVE ACTION</b>  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	Depress the S/C key (botton type) located on the upper right portion of the center panel of the desk position.	LTD voltmeter indicates approximately 100V.  <b>CORRECTIVE ACTION</b>  Check G key contacts.
19	Release the G (PRI) key.	The LTD voltmeter indicates zero.
20	Release the S/C key.	
21	Operate the FEMF keys.	
22	Apply 24V or 48V CO battery to the ring of the primary test circuit.	LTD voltmeter indicates approximately the voltage applied to the ring side of the primary test circuit.  <b>CORRECTIVE ACTION</b>  Check FEMF key contacts.
23	Release FEMF key.	Voltmeter indicates zero.
24	Remove the CO battery from the primary test cord ring.	
25	Operate the MET-VM key.	
26	Depress the S/C key.	LTD voltmeter indicates approximately 100 volts.  <b>CORRECTIVE ACTION</b>  Check MET-VM key contacts.

STEP	ACTION	VERIFICATION
27	Release the EL-VM and MET-VM keys.	Voltmeter indicates zero.
28	Release the S/C key.	
29	At the electronic voltmeter circuit— Block electronic voltmeter circuit relays B and C normal.	
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 circuit.	Ground indicated on the tip and ring of the primary test circuit.
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 circuit using the KS-20599, L4 VOM.	Ground indicated on the tip of the primary test circuit.
34	Measure between the ring of the primary test circuit and ground using the KS-20599, L4 VOM set on the 100 V dc scale.	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.	

**N. Constant Current Source Test (SD-97763-01)**

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 is 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	-136
17	-48

- 3 Connect a series combination of a 1 Kohms resistor and the KS-20599, L4 VOM between the position tip lead and ground.
- 4 Set the KS-20599, L4 VOM to the 100 mA scale.
- 5 Operate the CC and CR keys. The position meter and KS-20599 L4 VOM indicate  $41 \pm 1$  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 the KS-20599 L4 VOM indicate  $28 \pm 1$  mA.
- CORRECTIVE ACTION***
- Check constant current source or position meter circuit.
- 7 Release the CN-NOP key.
- 8 Replace the 1 Kohms resistor of Step 3 with a 2 Kohms resistor.
- 9 Operate the CC and CR keys. The desk position meter and KS-20599, L4 VOM indicate  $41 \pm 1$  mA.
- CORRECTIVE ACTION***
- Check constant current source or position meter circuit.
- 10 Operate the CN-NOP and then the CC and CR keys. The desk position meter and KS-20599, L4 VOM indicate  $28.0 \pm 1$  mA.

***CORRECTIVE ACTION***

STEP	ACTION	VERIFICATION
		Check constant current source or position meter circuit.
11	Release the CN-NOP key and remove all test connections.	
12	Connect the series combination of a 1 Kohms resistor and the KS-20599, L4 VOM between the tip and ring leads of the desk position.	
13	Operate the RCCI, T and TOT keys.	The desk position meter and KS-20599, L4 VOM indicate $18.0 \pm 1$ mA.
		<b>CORRECTIVE ACTION</b>
		Check constant current source or keying circuit.
14	Release all keys.	
15	Replace the 1-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 $11.5 \pm 1$ mA.
		<b>CORRECTIVE ACTION</b>
		Check constant current source or keying circuit.
17	Restore all keys to normal and disconnect all test equipment.	
<b>O. Coin Station Tests</b>		
1	Connect one lead of the KS-20599, L4 VOM to the desk position ground.	
2	Set the KS-20599, L4 VOM to measure DC voltage.	
3a	If equipped with dial tone first feature, option ZP—Separately test the tip and ring leads for the voltage specified in Table F.	Coin disposal voltages appear on the tip only and are within local office limits.
		<b>CORRECTIVE ACTION</b>
		(a) Check option ZP wiring. (b) Check coin batteries or power supply and adjust or repair.

STEP

ACTION

VERIFICATION

TABLE F

OPERATE KEYS	TEST FOR
G and CC G and CR	Coin Collect Voltage Coin Return Voltage

- 4b If not equipped with dial tone first feature, option ZP—separately test the ring and tip leads for the voltage specified in Table G.

Coin disposal voltages appear on both the tip and the ring leads.  
Coin voltages are within local office limits.

**CORRECTIVE ACTION**

Check coin batteries and power supply and adjust or repair.

TABLE G

OPERATE KEYS	TEST FOR
CC CR CC and DO CR and DO	Coin Collect Voltage Coin Return Voltage Coin Collect and Booster Battery Voltages Coin Return and Booster Battery Voltages

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

**P. Insulation Breakdown Test (SD-95772-01)**

- 1 Connect one side of the KS-20599 L4 VOM to the desk position ground.  
2 Depress the PRI(A) button.  
3 Set the KS-20599 L4 VOM to the 1 KV DC scale.

**Danger: This test requires the measurement of high voltages.**

STEP	ACTION	VERIFICATION
4	Operate the BT1 key.	Lamp BT at the test position flashes while the BT lamp at the associated positions lights steadily.  <b>CORRECTIVE ACTION</b>  Check the BT1 key contacts.
5	Measure the 200V on the tip and ring conductors of the trunk being used.	200V present on the ring conductor only:  <b>CORRECTIVE ACTION</b>  (a) Check operation of the BD, BD1, and BD2 relays. (b) Check the breakdown test circuit per SD-95772-01.
6	Allow the breakdown test to cycle to completion.	All BT lamps extinguish when the test is completed.
7	Operate the BT2 key.	Lamp BT at the test position flashed when the BT lamp at the associated positions lights steadily.  <b>CORRECTIVE ACTION</b>  Check the BT2 key contacts.
8	Measure for 200V on the tip and ring conductors of the trunk being used.	200V present on both the tip and ring leads.  <b>CORRECTIVE ACTION</b>  (a) Check operation of the BD and BD2 relays. (b) Check the breakdown test circuit per SD-96772-01.
9	Allow the test to cycle to completion.	All BT lamps extinguish when the test is completed.
10	Disconnect the KS-20599 L4 VOM.	
11	Depress the DIS(A) button.	
<b>Q. Call Circuits Test</b>		
<b>Note:</b> This test requires the aid of another test desk operator.		
1	At LTD, depress one of the assigned call circuit (CC) keys.	The CC lamp at the called position flashes at 60 IPM.



**SECTION 201-828-504**

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
		(KS-20599, L4 VOM indicates zero ohms.)
		<b><i>CORRECTIVE ACTION</i></b>
		Check key contacts and associated wiring.
3	Disconnect KS-20599, L4 VOM	
4	Connect plug PAA and PAF.	