

## LOCAL TEST DESK (LTD) REMOTE TEST CIRCUIT

### NEAR END

### TROUBLE LOCATING PROCEDURE

#### 1. GENERAL

**1.01** This section describes typical trouble conditions and solutions that may be encountered on remote testing circuit near-end SD-99310-01 and near-end test trunk or line circuit SD-99309-01.

**1.02** This section provides sequential circuit functions under normal operational conditions allowing the tester visual verification of both relay and circuit pack slave relay operation.

**1.03** This section also provides readjustment procedures on various circuit packages due to aging of components responsible for normal operation failures.

**1.04** *Caution: When testing with a 716C test receiver, test only the points designated on Tables B, C, E, F, and G. Refer to Section 032-173-301 for proper semiconductor circuit testing procedures.*

#### 2. APPARATUS

**2.01** 72A frequency meter J64072A (Tables B, D, F, and G).

**2.02** Timing test set J24753A (SD-25707-01) (Table B).

**2.03** Vacuum tube voltmeter (Table B).

**2.04** Volt ohmmeter (Table B).

**2.05** KS-3008 stopwatch (Tables B and E).

**2.06** 25MF capacitor (Table D).

*Note:* This capacitor is used to extend the timing of the TMR timer which extends the time element in which the frequency is observed on the 72A frequency meter.

**2.07** Blocking and insulating tool as required. Use tools and apply as covered in Section 069-020-801 (Tables B, D, F, and G).

**2.08** Two W1U cords, 1 foot 8 inches long, equipped with one No. 2 test clip AT-6928 and one KS-6780 connecting clip (Tables D, F, and G).

*Note:* W1U cords are referred to as clip cords and are used to short out the designated capacitors.

**2.09** Test receiver, 716C receiver, attached to a W2AB cord, equipped with two 360A tools (2W21A cord), a 411A (test pick) tool, and a KS-6278 connecting clip for use in checking for the presence and absence of ground (Tables B, C, E, F, and G).

**2.10** Cord, P3N cord, 15 feet long, equipped with one 310 plug and one 241A plug (Tables B, C, E, F, and G).

*Note:* In Table D this cord is connected to the LTD multiple corresponding to the test trunk designation in which the primary cord is inserted.

**2.11** KS-19355-L2 tool (for tuning transformers and inductors).

#### 3. METHOD

**3.01** Table A provides a list of trouble conditions and test locations that may be used to determine the equipment component in trouble. This table also lists possible faulty circuit packages in respect to the trouble condition and component location. In the event the trouble report did not define the trouble clearly, 4.01 describes setup procedures from the LTD to the remote test facility, providing the tester complete flexibility for analyzation.

TABLE A

TROUBLE CONDITIONS AND TEST LOCATIONS	SD-99310-01	SD-99309-01	POSSIBLE FAULTY CIRCUIT PACKAGE
Primary secondary test circuit failed to transfer to remote test mode.	Table B		
Primary ringing circuit.			BD
Order signal failed to be transmitted to remote office.	Table B Table D		LC
Failure of slave relays associated with LTD keys.	Table B		
Spurious kicks LTD meter.	Table B		
TM timer failure.	Table B		TMR
PTM timer failure.	Table B		PTM
Telemetry detector driver and amplifier failure.	Table B		AMP-1 AMP-2
Failure of restore order to be transmitted.	Table C		
Multitone oscillator adjustment.	Table D		OSC
Test trunk failure SD-99309-01 (non-dedicated).		Table E	
Call answer failure (dedicated and non-dedicated).		Table E	
Supervisory lamp control.		Table E	
Plug-out oscillator adjustment.		Table F	POO
Disconnect cord in and cord out.		Table G	
Disconnect oscillator adjustment.		Table G	DO
Far end disconnects.		Table G	
Pilot tone timer.		Table F	PTT
Supervisory receiver.			S AMP SR

#### 4. PREPARATION

##### 4.01 Setting Up Test Connection

***Nondedicated Transmission Path:*** The connection is set up by using one of the out-trunk keys to dial the telephone number assigned to remote testing in the distant office. This triggers a dialer at the far end which dials the telephone number associated with a test trunk at the LTD. When the connection completes, the trunk will trip ringing and its supervisory lamp will flash as an indication for the tester to plug in with the primary test cord. (See Figure 1.)

***Dedicated Transmission Path:*** The test connection is established when the tester plugs the primary test cord into the jack of an idle remote test trunk. (See Figure 1.)

**4.02** Trouble isolation may require the operation of various keys directly associated with remote testing where response to order code at the far end is required. The key function is identified in 4.03 through 4.26.

**4.03** ***The 24MA key***, when operated, connects 20 volts of test battery to the equivalent of the 1000-ohm winding of the voltmeter. Deflections are read on the ***24-volt scale***.

**4.04** ***The 60V key***, when operated, connects 60 volts of test battery to the equivalent of the 50,000-ohm winding of the voltmeter. Deflections are read on the ***120-volt scale***.

**4.05** ***The VM REV (voltmeter reverse) key*** has two functions:

- (a) To reverse the voltmeter leads when measuring a foreign potential of the same polarity as that of the test battery.
- (b) To measure the potential of the test battery at the remote office.

**4.06** ***The FEMF (foreign emf) key*** is used for measuring dc potentials foreign to the test desk. Operation of the FEMF key disconnects the test battery and substitutes ground through the VM REV circuit.

**4.07** ***The M (monitor) key*** causes a high impedance monitoring amplifier to be connected across the line under test permitting the

tester to monitor on a connection without producing appreciable transmission loss.

**4.08** ***The IN key***, when operated, causes the MDF test circuit, in the remote office, to disconnect from the tip and ring of the line and connect to the tip and ring of the central office equipment associated with the line.

**4.09** ***The 3WO (third wire open) key*** performs the following functions:

- (a) On an established test connection, operation of the 3WO key releases the cutoff relay of the line under test except in crossbar and ESS offices. Subsequent operation of the T key places a bridge across the line under test. The line relay should operate and be indicated by reception of dial tone. In ESS offices operation of the 3WO key releases the ***ferreed*** relay. Subsequent operation of the T key saturates the ***ferrod*** and dial tone should be heard.

- (b) Operation of the 3WO key on an established connection conditions the test circuit to make a voltmeter check of the F cross-connection at the block relay frame in a No. 1 CSBR office or the number group frame in a No. 5 CSBR office.

- (c) When the test circuit (via MDF test trunk) is connected to a line at the main or protector frame, or to the toll testboard, operation of the 3WO key causes the circuit to keep the line under test closed through relay contacts. This permits the tester to monitor on the line.

- (d) When testing on permanent signal holding trunks, operation of the 3WO key after the trouble has been cleared releases the line from the trunk equipment.

**4.10** ***The RCCI (repeating coil cut-in) key*** connects 48-volt battery through the ring winding of the repeating coil and the milliammeter to the ring side of the line. When measuring transmitter current on a line, operate RCCI key only (operation of T key cuts out telemetry from remote office which blocks volt-milliammeter measurements).

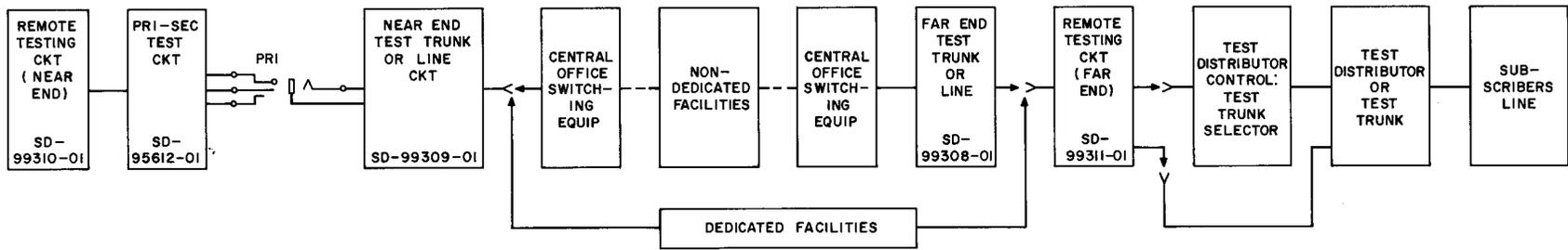


Figure 1

**4.11** *The LRP (line relay prepayment) key* is for use in operating the line relay on a coin subscriber line when the T, 3WO, and where required, the REV keys are operated.

**4.12** *The +STA and -STA keys* are used for checking the presence of cold-cathode tube stations on party lines and visual indicators. Use the +STA key for positive stations and 21-type indicators and the -STA key for negative stations and 103A key equipments.

**4.13** *The DIAL key*, when operated, switches the position dial from the telephone circuit to the near-end remote test circuit where the operation pulses the B1 frequency of the DIAL order code. A pulse repeating circuit in the remote office applies the pulse to the test train as required. When dialing a subscriber line number in the extra number series in a No. 1 CSBR office, operation of the REV key is required before the DIAL key is operated. When the circuitry at the remote office is ready to receive dial pulses, the P (supervisory) lamp is extinguished as a start dialing signal.

**4.14** *The KP key*, when operated, transfers the tip and ring of the test cord to the MF keyset circuit. When the subscriber line number is in the extra number series in a No. 1 CSBR office, operation of the REV key is required before the KP key is operated. When the circuitry at the remote office is ready to receive MF key-pulsing, the S lamp is lighted as a start dialing signal.

**4.15** *The CC and CR key* are used for testing coin collector and coin telephone relays. The CC key connects coin collect battery to the test circuit and the CR key connects coin return battery to the test circuit.

**4.16** *The REV key* reverses the tip and ring leads of the test circuit for all test features except ringing.

**4.17** *The G key* connects ground to the tip side of the test circuit if the REV key is normal and to the ring of the circuit if the REV key is operated.

**4.18** *The +R, -R, +T, and -T keys* are non-locking manual ringing keys used for superimposed ringing and control the ringing

circuits in the remote office testing equipment. Operation of the -R or +R keys causes negative or positive superimposed battery and ringing current to be connected to the ring side and ground to the tip side of the line on test. Operation of the -T or +T keys causes negative or positive superimposed battery and ringing current to be connected to the tip side and ground to the ring side of the line on test. The ringing circuits in the remote office are tripped automatically when a called station goes off-hook while a ringing key is operated. When the ringing is tripped the P (primary cord supervisory) lamp is extinguished if the RCCI and T keys are in an operated position. A steady burning lamp indicates no answer or no short on the line.

**Caution:** *Do not give a short ring or "tingle the bell" (as is often done with regular testing) because the rapid operation and restoral of the ringing key may cause a continuous ring at the customer's telephone.*

**4.19** *The RG (remove ground) key*, when operated, disconnects the ringing ground from the ringing circuits. On lines having ringers connected directly to ground, and with a receiver off-hook at one of the stations, bells may be rung by operating the RG key and either the +R, -R, +T, or -T key.

**4.20** *The SSRT (subscriber set relay test) key*, when operated, connects induced ringing to the line operating the station relays which in turn connect the ringers to ground. Operation of the 24MA key connects 20 volts of test battery to the ring side of the line. The resultant current through the ringers is telemetered to the LTD where the tester, by observing the meter reading, can estimate the number of subsets connected to the ring side of the line. Operation of the REV key applies the test to the tip side of the line.

**4.21** *The PS RLS (permanent signal release) key* is associated with the primary test circuit when the LTD position is in the remote testing mode. (*Do not operate X key.*) It is used for shunting down the A relay of a selector in a No. 1 or No. 350A step-by-step office when a test connection is established to a line which is holding the selector busy due to a "permanent" condition. When the A relay releases, the cutoff re-

lay operates to disconnect the line from the selector. When the PS RLS key is operated, the P (primary cord supervisory) lamp flashes during the release cycle. If the P lamp is lighted at the end of the release cycle, the selector has not been released. The P lamp will be extinguished if the selector is released.

**4.22 The H (ROH tone) key**, when operated, applies ROH tone to the subscriber line on test if a station is off-hook. The tone is applied to the line for about 1 minute. During the tone cycle, the H lamp at the LTD position flashes and will go steady when the station goes on-hook or timing cycle ends. The P lamp is extinguished during the cycle or until the station goes on-hook at which time it will light steadily. Restoring the H key at any stage of ROH tone application will restore the circuits to normal.

*Caution: When the H key is operated, all other keys except TTS, MDF, and NT, as required, must be normal to prevent possible acoustic shock to customers.*

**4.23 The TT (TOUCH-TONE® test) key**, when operated, transfers the subscriber line on test to the TOUCH-TONE frequency test applique circuit and lights the TOUCH-TONE busy lights. Instruct the customer to key digits 1 through 0 in numerical sequence when the dial tone is heard. Operating the TT key results in application of dial tone which remains audible during the keying sequence. The test circuit examines the sequence and returns one of the following tone indications audible to both the customer and tester:

- (a) Two zips of high tone indicating an OK dial.
- (b) One zip of high tone indicating failure of the dial or failure to complete keying of dial in proper sequence within a 15 second time limit. Additional frequency tests may be made by restoring the TT key, instructing the customer to repeat the proper sequence, and reoperating the TT key. If the test circuits

are all busy when the TT key is operated, only the tester will hear busy tone.

**4.24 The TTS (Test Trunk and Selector) key**, when operated, allows the LTD to be connected to permanent signal holding trunks or plugging-up lines after a connection is established to the remote office. After the TTS key is operated, it is necessary to dial the locally assigned code number for connection to a line.

**4.25 The MDF (main distributing frame) key**, when operated, conditions the test trunk in the remote office for in and out testing to MDF jack boxes. Advise the central office attendant by means of other facilities to connect the MDF test trunk jack to the desired circuit using a patch cord. Operation of the IN key allows testing toward the switching equipment. Operation of the 3WO key bridges the IN and OUT sides of the line. The MDF key must remain operated during these tests.

**4.26 The TD (test disconnect) key**, when operated, at the completion of testing, disconnects the subscriber line in the remote office. The connection between the LTD and remote office remains unbroken after operation of the TD key leaving the circuit ready for the tester to establish another test call.

*Caution: Operation of the DISC key associated with the remote testing jack will disconnect a nondedicated facility between the LTD and the remote office.*

**4.27 Tables B Through G Test Operation:**  
Ground and battery indicated in the ACTION column is the potential necessary to operate the relay indicated in the sequence column. When a relay fails to operate, check for the presence of the potential stated. If potential is present and relay did not operate, trace potential from point of origination which is stated in ACTION column to the relay required to operate. Release action in the sequence column is executed by the first previous relay action which may be in the operated or released condition.

**TABLE B**  
**SETTING UP TEST CONNECTION — SD-99310-01**

SEQUENCE	ACTION
Tester plugs in test trunk	
* SL primary secondary test circuit (PST)	
* SL	Ground contact 5 SL relay in PST circuit.
* SL1	Ground contact 10 SL relay.
— SL	
* RT (PST)	
PST circuit switched to remote testing mode.	
* PC	Ground contact 4 RT relay in PST circuit.
Battery connected to enable the following relays to operate.	If relay operate verification is required momentarily operate the following keys.
M	M key
DL	Dial key
RC	RCCI key
TT	TT key
PR	PS RLS key
T	T key
H	H key
KP	KP key
* PC1 test setup completed.	Ground contact 4 PC relay.
Power is applied to telemetry detector driver and amplifier.	
Grounds ST16 lead causes order code to be transmitted to remote office indicating tester has answered the call to the test trunk.	For frequency verification see Table D.

TABLE B (Cont)

SETTING UP TEST CONNECTION — SD-99310-01

SEQUENCE	ACTION
PTM timer starts.	To check timing block PC1 relay operated. Within 50 to 70 seconds PTM relay operates.
Sending order signals. (Answer order is illustrated.)	
* ST16	Ground 3 or 9 of CP1.
* TM	Ground 4 ST16 relay.
TM relay starts to calibrate TMR timer.	Calibrate TMR timer per SD-99310-01-F1 circuit requirements using timing test set SD-25707-01 (J24753A).
Opens M-meter lead to prevent spurious kicks on meter.	
* TMR timer times out.	
* TM1 end of timing cycle.	
* PRS	Ground 6 TM1 relay.
PTM timer resets.	
* TM2 (Closes M-meter lead to reactivate telemetry.)	Ground 11 TM1 relay.
* LO16	Ground 4 TM1 relay.
ST16	
TM	
* TMR timer resets.	
+ TM1	
+ TM2	
Circuit ready for next order.	

**TABLE C**  
**RESTORE ORDER SD-99310-01**

SEQUENCE	ACTION
<p><i>Note:</i> Removal of the primary test cord from the test trunk jack will not serve to illustrate the general nature of the restore order function; therefore, assume the 24MA key has been operated and the operate order signal sent.</p>	
<p>* 24MA key</p>	See Table D for ST-4 relay operation.
<p>* ST4</p>	
<p>* LO-4</p>	See Table D for frequency verification.
<p>24MA key (restore order transmitted)</p>	
<p>ST4</p>	
<p>* RL4</p>	Ground 9 fixed LO-4 relay.
<p>* ST-4</p>	Ground 4 fixed RL4 relay.
<p>* TM</p>	Ground 4 fixed ST-4 relay.
<p>* TM1</p>	Battery 1 make TM relay.
<p>+ LO-4</p>	
<p>+ ST-4</p>	
<p>+ TM</p>	
<p>+ TM1</p>	
<p>+ RL4</p>	Circuit is restored to normal.
<p>Detector calibration: See Figure 2</p>	<p>Connect OSC OUT jack of 72A to CAL jack.</p> <p>Connect VTVM, (grounded) to LEV pin jack.</p> <p>Set signal 72A 1100 CPS.</p> <p>Adjust level 0.094 volts VTVM.</p> <p>Connect ungrounded VOM (5000 ohms per volt or higher) across test points 1 and 2 of AMP1. (Use AC scale.)</p> <p>Adjust gain potentiometer (R6) of AMP2 clockwise from maximum counter clockwise position until VOM reads at least 2 volts RMS.</p> <p>At associated test desk position, insert primary test cord into an idle remote test trunk jack. With the 1100 CPS still connected, adjust the (ZERO) potentiometer until test desk meter reads zero. Change 72A to 1500 CPS and adjust (DEFL) potentiometer until meter reads 0.96 MA (96 on 120 scale).</p>

**TABLE D**  
**MULTITONE OSCILLATOR VERIFICATION**

Connect 72A 600 ohm IN jack to primary cord of LTD position to be tested. Connect 25 MF capacitor across terminal, and 2 of TMR timer. Negative to terminal 1 and positive to terminal 2. Block RT relay operated in LTD. Remove PTM timer package associated with position to be tested. Place clip cords across CB and CC capacitors.

Operate and release the following keys (Note 1):

RELAY	KEY	OPERATE AND RELEASE FREQUENCY	
X	ST1	TD	600 CPS
X	ST2	RG	697 CPS
X	ST3	FEMF	697 CPS
X	ST4	24MA	697 CPS
X	ST5	60V	770 CPS
X	ST6	IN	770 CPS
X	ST7	VM REV	770 CPS
X	ST8	-T	852 CPS
X	ST9	-R	852 CPS
X	ST10	G	852 CPS
X	ST11	M	941 CPS
X	ST12	REV	941 CPS
X	ST13	3WO	941 CPS
X	PTM	Momentarily operate relay.	941 CPS
X	ST14	T	941 CPS
X	ST15	RCCI	941 CPS
X	ST16	Momentarily operate ST16 relay. Remove clip cord from CB capacitor and place across CA capacitor.	941 CPS
X	ST1	TD	1209 CPS
X	ST2	RG	1336 CPS
X	ST3	FEMF	1477 CPS
X	ST4	24MA	1633 CPS
X	ST5	60V	1098 CPS
X	ST6	IN	1336 CPS
X	ST7	VM REV	1633 CPS
X	ST8	-T	1098 CPS
X	ST9	-R	1209 CPS
X	ST10	G	1477 CPS
X	ST11	M	1098 CPS
X	ST12	REV	1209 CPS
X	ST13	3WO	1336 CPS
X	ST14	T	1633 CPS
X	ST15	RCCI	1098 CPS
X	ST16	Momentarily operate ST16 relay.	1633 CPS

TABLE D (Cont)

Remove clip from CC capacitor and place across CB capacitor.			
RELAY	KEY	OPERATE FREQUENCY	RELEASE FREQUENCY
* ST1	TD	1950 CPS	2050 CPS
* ST2	RG	1950 CPS	2050 CPS
* ST3	FEMF	1950 CPS	2050 CPS
* ST4	24MA	1950 CPS	2050 CPS
* ST5	60V	1950 CPS	2050 CPS
* ST6	IN	1950 CPS	2050 CPS
* ST7	VM REV	1950 CPS	2050 CPS
* ST8	-T	1950 CPS	2050 CPS
* ST9	-R	1950 CPS	2050 CPS
* ST10	G	1950 CPS	2050 CPS
* ST11	M	1950 CPS	2050 CPS
* ST12	REV	1950 CPS	2050 CPS
* ST13	3WO	1950 CPS	2050 CPS
* ST14	T	1950 CPS	2050 CPS
* ST15	RCCI	2150 CPS	2250 CPS
* ST16		2150 CPS	2250 CPS
Remove clip cords from CA and CB capacitors. Remove blocking tool RT re- lay (LTD). Replace PTM timer package. Remove 25 MF capacitor from TMR.			

**Note:** Other key and ST- assignments may be checked in a similar manner. Refer to note 401 of SD-99310-01 for frequencies.

TABLE E

**SEIZURE OF TEST TRUNK SD-99309-01**  
(DEDICATED AND NONDEDICATED)

SEQUENCE	ACTION
* Tester dials remote test number from LTD. (nondedicated) * SL (nondedicated).	Battery or ground 5 SL jack. (Note 102 SD-99309-01-D1)
* SUPV lamp (flashes) (nondedicated).	Interrupted battery 8M SL relay.
<i>Call Answered</i>	
LTD primary cord inserted into T jack.	
* RT	Ground 4 fixed TC relay.
* TC	Ground 1 fixed TC relay.
+ SUPV lamp extinguished (nondedicated).	
+ RT	
* H	Ground 2 fixed TC relay.
* BSY lamp lighted	
* PD	Ground 1 fixed TC relay.
* PO power on plug out oscillator.	Ground 1 fixed PC relay.
* SL (dedicated).	Battery or ground 5 SL jack (Note 102 SD-99309-01).

**TABLE F**  
**PLUG OUT SIGNAL — NO DISCONNECT**

SEQUENCE	ACTION
* PD for operation, see Table E. Primary cord removed from T jack. TC Plug-out order is sent (941, 1633, and 2250 CPS). PD * H pilot tone timer on. Pilot tone timer check. * PTT timer times out. * P Nondedicated (ND). * PD Pilot tone timer recycles. * PO (ND) (Pilot burst is sent.) P (ND) PD (ND) PO (ND) Primary cord reinstated. * RT * TC * RT * PD * PO Pilot tone timer disabled. To adjust plug-out oscillator.	Ground 2 fixed TC relay. Operate H relay approximately 60 seconds. P relay operates. Ground 6 fixed P relay. Ground 1 fixed PD relay. Ground 4 fixed TC relay. Ground 1 fixed RT relay. Ground 1 fixed TC relay. Connect clip cord across CB and CC capacitors. Insulate PO relay contacts 8M, 9M and 10M. Connect 72A 600 ohm IN jack to T5 transformer terminals 2 and 5. Block PO relay operated. Adjust TA transformer slug to 600 CPS. Remove insulation 10M of PO relay. Adjust LA inductor for 941 CPS. Insulate 10M of PO relay. Move clip cord from CB capacitor to CA capacitor. Adjust TB transformer slug to 1098 CPS. Remove insulation from 8M of PO relay.

TABLE F (Cont)

SEQUENCE	ACTION
	<p>Adjust LB inductor to 1633 CPS. Insulate 8M of PO relay move clip cord frame CC capacitor to CB capacitor. Adjust TC transformer slug to 1950 CPS.</p> <p>Remove insulator 9M PO relay. Adjust LC inductor to 2250 CPS. Remove blocking tool from PO relay. Remove insulators 8M and 10M PO relay. Remove clip cords from CA and CB capacitors. Remove 72A connections.</p>

**TABLE G**  
**DISCONNECT CORD IN (CI) CORD OUT (CO)**

SEQUENCE	ACTION
<p>✕ Momentary operation of DISC key.</p> <p>✕ D</p> <p>✕ D1</p> <p>Power on disconnect oscillator.</p> <p>Disconnect signal to far end 941, 1477 and 2250 cycles.</p> <p>Disconnect oscillator adjustment.</p> <p style="text-align: center;">Far end disconnects.</p> <p>— SL</p> <p>— BSY lamp flashes (CI).</p> <p>— H (CO)</p> <p>— D (CO)</p>	<p>Operation of DISC key.</p> <p>Ground 10 fixed D relay.</p> <p>Connect 72A 600 ohm IN jack to terminals 2 and 5 of T6 transformer.</p> <p>Connect clip cords across CB1 and CC1 capacitors.</p> <p>Insulate 4M, 1M, and 2M of D1 relay.</p> <p>Block D1 relay operated.</p> <p>Adjust TA1 transformer slug to 600 CPS.</p> <p>Remove insulation 4M D1 relay.</p> <p>Adjust LA1 inductor 941 CPS.</p> <p>Insulate 4M D1 relay.</p> <p>Move clip cord CB1 capacitor to CA1 capacitor.</p> <p>Adjust TB1 transformer 1098 CPS.</p> <p>Remove insulation 1M D1 relay.</p> <p>Adjust LB1 inductor 1477 CPS.</p> <p>Insulate 1M D1 relay.</p> <p>Move clip cord CC1 capacitor to CB1 capacitor.</p> <p>Adjust TC1 transformer 1950 CPS.</p> <p>Remove insulator 2M D1 relay.</p> <p>Adjust LC1 inductor 2250 CPS.</p> <p>Remove blocking tools from D1 relay.</p> <p>Remove all insulators.</p> <p>Remove 72A cords from T6 transformer.</p>

TABLE G (Cont)

SEQUENCE	ACTION
+ D1 (CO) + Circuit normal (CO). + Cord out (CI). + TC + PD + H + D + PO + D1 + Circuit normal.	

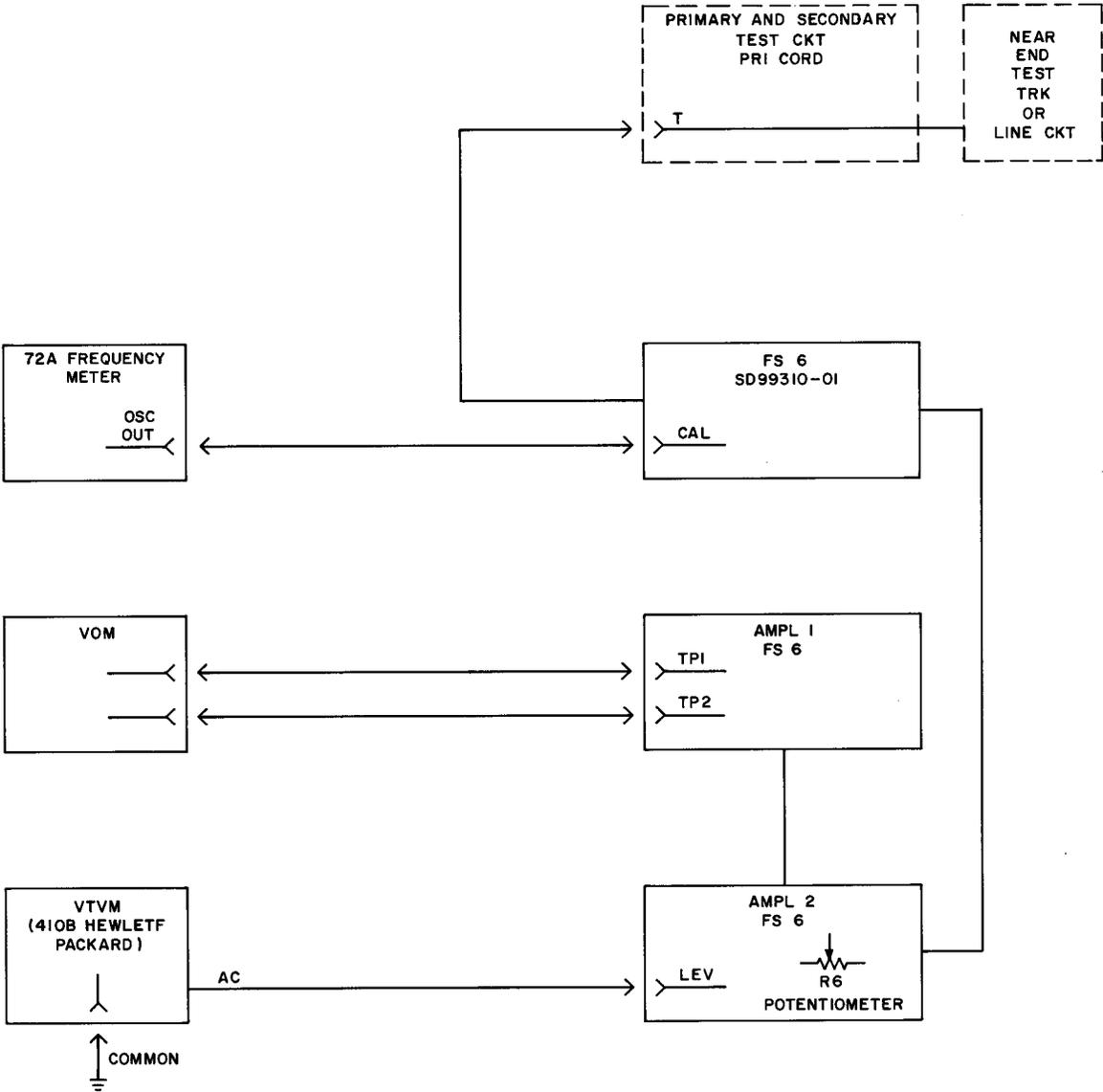


Fig. 2 — Detector Calibration