

REMOTE TESTING FEATURES AND CIRCUITS
SD-99309-01 AND SD-99310-01 NEAR-END
AND SD-97559-01 NEAR TO FAR-END
TESTS AND TROUBLE LOCATING PROCEDURES
NO. 14 LOCAL TEST DESK AND NO. 16 LOCAL TEST DESK

1. GENERAL

PAGE

1.01 This section describes procedures for testing the basic features and circuits used to provide remote testing of subscriber lines in a distant office from a local test desk (LTD).

E. *Detector:* Checks the operation of the detector. **8**

1.02 This section is reissued to:

- Add new test equipment
- Add CORRECTIVE ACTION column to tests
- Revise Test F and Table C
- Change title
- Correct technical errors.

F. *Lockout Circuits:* Checks the operation of the lockout circuits. **9**

G. *Supervision:* Checks the return of a supervisory signal when operating relays corresponding to selected keys. **12**

H. *Dialing:* Checks that dialing is completed to the far-end circuit and returned. **13**

I. *Keys Operating Relays:* Checks the operation of relays corresponding to selected keys. **14**

Since this reissue is a general revision, no revision arrows have been used to denote changes. The Equipment Test List is not affected.

J. *Plug-Out Oscillator:* Checks output frequency of the plug-out oscillator. **16**

1.03 The following tests are covered.

PAGE

A. *PTM Timer:* Checks the operation of the PTM Timer. **3**

K. *Disconnect Oscillator:* Checks output frequency of the disconnect oscillator. **16**

B. *TMR Timer:* Checks the operation of the TMR Timer. **5**

L. *Pilot Tone Timer:* Checks the operation of the pilot tone timer. **17**

C. *Multitone Oscillator:* Checks for correct frequency output of the oscillator. **6**

M. *Plug Out Supervision:* Checks the ability of detecting the removal of the primary test cord at No. 14 LTD and operation of DIS key at No. 16 LTD. **17**

D. *Amplifiers:* Checks the output of the amplifiers. **7**

N. *Establish Connection (Non-dedicated):* Checks the ability of

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	PAGE
establishing a connection over a nondedicated facility.	18
O. Establish Connection (Dedicated): Checks the ability of establishing a connection over a dedicated facility.	20
P. Night Test Coverage (Option ZB): Checks the feature that will allow a test center to transfer control of the far-end remote testing equipment to a night covering office.	20
Q. MDF Telephone and Loud-speaker Circuit (Option YS): Checks the feature that provides communication between the local test desk and the distributing frames in the remote central office.	21
R. Permanent Signal Holding Trunk Identification Crossbar and Step-by-Step Offices: Checks the feature that provides means to identify a particular permanent signal holding trunk associated with a receiver off-hook line in an unattended office.	26
1.04 The procedures are all performed at the LTD and remote testing circuit frame except for Tests Q and R which require action and verification at a far end location.	
1.05 Remote testing converts DC states to AC signals for transmission over facilities such as carrier, repeater, etc, which provide any required degree of amplification. At the LTD location (near-end), key operations are converted to signals made up of three frequencies which are transmitted to the remote office (far-end). The AC signals are converted back to DC states to control the remote circuitry. Dial pulses are treated similarly. In addition a pilot tone, which prevents release of test connection if the test cord is removed from the jack, and a disconnect signal are transmitted to the remote office.	
1.06 At the remote office, DC currents equivalent to those normally flowing in the meter at the desk are used to control a variable oscillator. Current flow between 0 and 1.2 milliamperes generates a cor-	

responding frequency range of 1100 Hz through 1600 Hz. This signal is transmitted to the near-end where it is reconverted to direct current to activate the desk meter. Additionally, a tone signal which indicates the switchhook state of a called line and, when required, a signal which indicates a test connection to an extended range (unigauge) line are sent to the near-end.

1.07 In the dedicated mode, the test path is hard-wired and is continuous from the test desk jack or key to the remote testing circuit at the far-end (Section 201-828-501).

1.08 In the nondedicated mode, the test path is routed through a switching network in order to provide access to trunk groups between the local and remote offices. This mode requires an additional circuit, the far-end test trunk or line circuit (Section 201-828-501). The far-end test trunk or line circuit is assigned a two-party line terminal in the remote office and can be reached by calling either of the two-party line numbers assigned to it. Thus, test desk A could be assigned the tip party number and test desk B could be assigned the ring party number. A call from test desk A to the assigned tip party number would be completed through the local and remote switching networks to the far-end test trunk or line circuit. The call would then be returned to the near-end trunk in the test desk position by a dialing feature of the far-end trunk. Similar action would take place on a call from test desk B to the assigned ring party number.

1.09 Descriptive information and operational procedures using remote testing features at the No. 14 LTD or at the No. 16 LTD are covered in the 662 division. Sections 201-828-503 and 201-828-504 cover tests and trouble locations procedures for the No. 14 and No. 16 LTDs respectively.

1.10 Lettered Steps: 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 series of 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.

1.11 For troubles which are encountered while performing the tests of this section, CORRECTIVE ACTION suggestions are provided. This column lists the "checks" that should be made should the associated verification not be obtained. The "checks" provided in this column are listed in the order in which they should be performed.

2. APPARATUS

2.01 The apparatus required for each test is shown in Table A. A more descriptive name and additional information on each item are covered in the paragraph indicated by the number in parentheses. Calibration and operating procedures for each set may be found in the section listed with each test set. Determine the testing equipment to be correctly calibrated.

2.02 Model 3551 Hewlett-Packard frequency counter.

or

Model 8120 Dana Corp. Automatic frequency counter

2.03 Model 3311A Hewlett-Packard frequency generator

or

Model 19353, L5 oscillator (Section 103-302-106) or equivalent.

2.04 J24753A Test Set for Timing Tests (Section 100-130-101).

2.05 Model 400-D Hewlett Packard vacuum tube voltmeter (VTVM) (Section 100-526-101).

2.06 KS-20599 L4 volt-ohm-milliammeter (VOM)

or

KS-14510 L1 volt-ohm-milliammeter (VOM) (Section 100-520-101).

2.07 52-type headset equipped with 310 plug.

2.08 1014A handset.

2.09 Patching cord, P3K, 6 feet long, equipped with two 310 plugs (3P15A cord).

2.10 Patching cord, P3N, 6 feet long, equipped with one 310 plug and one 241A plug (3P17B cord).

2.11 Testing cord, P2AA, 3 feet long, equipped with one 241A plug and two 120 cord tips (2W3A cord).

2.12 Testing cord, 893, 6 feet long, equipped with two 360A tools (1W13B cord).

2.13 Testing cord, W2CK, 5 feet long, equipped with one 310 plug and one 471A jack (2W38A cord).

2.14 KS-6278 connecting clip.

2.15 639A relay contact connector.

2.16 651C relay contact connector holder.

2.17 Blocking and insulating tools as required. Use tools and apply as covered in Section 069-020-801.

3. PREPARATION

STEP	ACTION	VERIFICATION
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Tests A Through F and J Through M and P

- | | | |
|---|--|--|
| 1 | Restore all test desk keys to normal. | |
| 2 | Request that operator make no operations at desk position. | |

4. METHOD

A. PTM Timer

SECTION 201-828-502

STEP

ACTION

VERIFICATION

TABLE A

APPARATUS	TESTS																	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Frequency Meter (2.02)		1							1	1								
Frequency Generator (2.03)				1	1								1					
Test Set for Timing Tests (2.04)		1																
400-D VTVM (2.05)				1	1								1					
KS-20599, L4 VOM (2.06)				1														
52-Type Headset (2.07)									1					1			1*	1
1014A Handset (2.08)								1										
Patching Cord (2.09)		2																
Patching Cord (2.10)			1	1	1													
Testing Cord (2.11)										1	1		1					
Testing Cord (2.12)			1	1	1	1												
Testing Cord (2.13)									1									
Connecting Clip (2.14)						2												
Contact Holder (2.16)			1	1	1													
Blocking and Insulating Tools (2.17)	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					

* An additional headset is required at far-end if answering using head telephone set.

✓ As required.

STEP	ACTION	VERIFICATION
3	Block PC1 relay operated.	PTM relay operated 50-70 seconds later.
		CORRECTIVE ACTION
		Check the PTM timer, circuit pack (CP) D3.
4	Remove block from PC1 relay.	
B. TMR Timer		
3	Using 3P15A cord, connect -48 volts and ground to 48V jack of J24753A test set for timing test.	
4	At test set— Operate BAT key.	
5	Set MCF switch at NOR, REC switch at GRD-OC, and MILSEC switch at 0-100.	
6	Adjust ADJ-0 knob for zero indication.	
7	Hold TST key operated at CAL, and adjust CAL knob for indication of 50.	
8	Release TST key.	
9	Using 3P15A cord, connect TMR jack at SD-99310-01, to TST1 jack of J24753A test set.	
10	At J24753A test set— Operate TST key to OPR, and observe meter indication.	J24753A test set indicates between 54 and 56 divisions.
		CORRECTIVE ACTION
		Release TST key and adjust TMR potentiometer in SD-99310-01 for a 54 to 56 indication on the J24753A test set meter.
11a	If TMR potentiometer was adjusted— Operate TST key to OPR and observe meter indication.	J24753A test set meter indicates between 54 and 56 divisions.
		CORRECTIVE ACTION
		Release TST key and readjust TMR potentiometer for correct reading.
12	Remove all cords.	

SECTION 201-828-502

STEP ACTION VERIFICATION

C. Multitone Oscillator

- 3 Set selector of frequency meter at MEAS.
- 4 At SD-99310-01—
Using 3P17B cord, connect frequency meter to CAL jack.
- 5 Using 1W13B cord, 651C holder, and two 639A connectors, short circuit contacts 12B and 12F of TM relay.
- 6 Release all ST and LO relays.
- 7 Block ST16 relay nonoperated.
- 8 Block relays PC and TM operated.
- 9 Block relays TM1 and PTM nonoperated.
- 10a If at No. 14 LTD—
Connect primary cord into remote TST jack.
- 11b If at No.16 LTD—
Operate incoming trunk key associated with remote testing and PR1(C) key.
- 12 At SD-99310-01—
Check that ST16 relay is released and perform operations outlined in Table B.

Frequency indications as listed in Table B.

CORRECTIVE ACTION

If frequency indications are not within ± 4 Hz of values given, adjust the respective transformer or inductor listed in Table B.

Note: Since one adjustment affects more than one frequency, all frequencies listed in Table B having the same adjustment transformer or inductor must be checked when any one is adjusted.

- 13 Remove all short circuits and remove blocks from all relays.

TABLE B

SHORT CIRCUIT CAPACITORS	BLOCK OPERATED RELAY	FREQUENCY Hz	ADJUST TRANSFORMERS AND INDUCTORS
CB, CC	—	600	TA
CB, CC	ST2	697	LA
CB, CC	ST5	770	LA
CB, CC	ST8	852	LA
CB, CC	ST11	941	LA
CA, CC	—	1098	TB
CA, CC	ST1	1209	LB
CA, CC	ST6	1336	LB
CA, CC	ST3	1477	LB
CA, CC	ST4	1633	LB
CA, CB	—	1950	TC
CA, CB	ST1 & RL1	2050	LC
CA, CB	ST15	2150	LC
CA, CB	ST15 & RL15	2250	LC

STEP

ACTION

VERIFICATION

D. Amplifiers

- 3 Set frequency generator at 1100 Hz and turn OSC OUT control to extreme counterclockwise position.
- 4 At SD-99310-01—
Using 3P17B cord, connect OSC OUT jack of the frequency meter to CAL jack of circuit.
- 5 Using 1W13B cord, 651C holder, and two 639A connectors, short circuit contacts 12B and 12F of TM relay.
- 6 Connect 400-type VTVM to LEV pin jack and ground.

SECTION 201-828-502

STEP	ACTION	VERIFICATION
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7	Adjust OSC OUT control of 72A meter until 400-type VTVM indicates 0.094 volts (-20 dBm in 900 ohms).	
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8	Block PC relay operated.	
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9	Connect KS-20599 L4 VOM ungrounded across test points (TP) 1 and 2 per SD-99310-01. (Terminals 5 and 11 front) of Amp 1.	
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KS-20599 L4 VOM indicates $2 \pm 0.1V$ rms.

CORRECTIVE ACTION

If VOM indication is incorrect, adjust potentiometer R6 of AMP 2 for correction.

10	Disconnect meters from the test circuit.	
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11	Remove short on TM relay.	
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12	Release all operated relays.	
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E. Detector

Note: Verify that the mechanical zero on the VMA meter of the associated test desk position is properly adjusted before performing this procedure.

3	Set frequency generator at 1100 Hz and turn OSC OUT control to extreme counterclockwise position.	
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4	At SD-99310-01— Using 3P17B cord, connect OSC OUT jack of the frequency generator to CAL jack of circuit.	
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5	Using 1W13B cord, 651C holder, and two 639A connectors, short circuit contacts 12B and 12F of TM relay.	
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6	Connect 400-type VTVM to LEV pin of jack and ground.	
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7	Adjust OSC OUT control of frequency generator until the 400-type VTVM indicates 0.094 volts (-20 dBm in 900 ohms).	
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8	At SD-95612-01 or SD-1C379-01— Block RT1 relay operated.	
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9	At SD-99310-01— Block relay PC operated.	
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10	Adjust the ZERO potentiometer until the desk potentiometer indicates 0 mA.	
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Desk meter indicates 0 mA.

CORRECTIVE ACTION

Check the ZERO potentiometer.

STEP	ACTION	VERIFICATION
11	At frequency generator— Set meter for 1517 Hz output.	
12	At SD-99310-01— Adjust the DEFL potentiometer until the test desk position meter indicates 1 mA.	Test desk position voltmeter indicates 1 mA (100 on the 120 scale).
	<i>Note:</i> It may be easier to adjust the DEFL potentiometer for a 1 mA increase in current and then adjust the ZERO potentiometer for a zero current reading.	CORRECTIVE ACTION (a) Check DEFL potentiometer. (b) Check detector DET.
13	Disconnect the frequency generator.	
14	Unblock the PC relay.	
15	Remove the short from the TM relay.	
16	At SD-95612-01 or SD-1C379-01— Unblock relay RT1.	

F. Lockout Circuits

3	At SD-99310-01— Block L01 relay nonoperated.	
4	Block PC1 relay operated.	
5	Using 1W13B cord and two KS-6278 clips, ground terminal 58 (ST1) of terminal strip on unit.	ST1 relay operated.
		CORRECTIVE ACTION (a) Check LC circuit packs for opens or shorts. (b) Check keys associated with LC circuit packs. (c) Check wiring from terminals.
6	Remove block from L01 relay.	L01 relay operated. ST1 relay released.
7	Remove ground lead from terminal 58 (ST1).	RL, ST1 relays momentarily operated. L01 relay released.
8	Repeat test (Steps 5 through 7) using data in Table C.	
9	Remove block from PC1 relay.	

TABLE C

LOCKOUT SEL. CIRCUIT NO.	STEP 4	STEP 5	STEP 6		STEP 7	
	BLOCK UNOPERATED RELAY	PLACE GROUND ON TERMINAL	REMOVE BLOCK FROM RELAY	RELAY ACTION	REMOVE GROUND FROM TERMINAL	RELAY ACTION
ST2	L02	48	L02	L02 operates. ST2 releases.	48	RL2, ST2 operate momentarily. L02 releases.
ST3	L03	38	L03	L03 operates. ST3 releases.	38	RL3, ST3 operate momentarily. L03 releases.
ST4	L04	28	L04	L04 operates. ST4 releases.	28	RL4, ST4 operate momentarily. L05 releases.
ST5	L05	18	L05	L05 operates. ST5 releases.	18	RL5, ST5 operate momentarily. L05 releases.
ST6	L06	57	L06	L06 operates. ST6 releases.	57	RL6, ST6 operate momentarily. L07 releases.
ST7	L07	47	L07	L07 operates. ST7 releases.	47	RL7, ST7 operate momentarily. L07 releases.
ST8	L08	37	L08	L08 operates. ST8 releases.	37	RL7, ST8 operate momentarily. L08 releases.
ST9	L09	27	L09	L09 operates. ST9 releases.	27	RL9, ST9 operate momentarily. L09 releases.
ST10	L010	17	L010	L010 operates. ST10 releases.	17	RL10, ST10 operate momentarily. L010 releases.
ST11	L011	58	L011	L011 operates. ST11 releases.	58	RL11, ST11 operate momentarily. L011 releases.
ST12	L012	48	L012	L012 operates. ST12 releases.	58	RL12, ST12 operate momentarily. L012 releases.
ST13	L013	38	L13	L013 operates. ST13 releases.	38	RL13, ST13 operate momentarily. L013 releases.

TABLE C (Contd)

LOCKOUT SEL. CIRCUIT NO.	STEP 4	STEP 5	STEP 6		STEP 7	
	BLOCK UNOPERATED RELAY	PLACE GROUND ON TERMINAL	REMOVE BLOCK FROM RELAY	RELAY ACTION	REMOVE GROUND FROM TERMINAL	RELAY ACTION
ST14	L014	28	L014	L014 operates. ST14 releases.	28	RL14, ST14 operate momentarily. L014 releases.
ST15	L015	18	L015	L015 operates. ST15 releases.	18	RL15, ST15 operate momentarily. L015 releases.
ST16	L16	57	L16	L016 operates. ST16 releases.	57	RL16, ST16 operate momentarily. L016 releases.

Note: Lockout circuit above number 16 shall be numbered sequentially and assigned as required for additional test features desired by the telephone company.

SECTION 201-828-502

STEP	ACTION	VERIFICATION
G. Supervision		
1a	If at No.14 LTD— Connect primary cord to T jack associated with remote testing.	BSY lamp flashes (if nondedicated). At SD-99310-01— SL and SL1 relays momentarily operated. At SD-95612-01— RT and RT1 relays operated.
2b	If at No. 16 LTD— Operate PRI KEY.	BSY lamp flashes (if nondedicated). At SD-99310-01— SL and SL1 relays momentarily operated. At SD-95612-01— RT and RT1 relays operated.
3	At SD-99309-01— Momentarily operate S relay.	At SD-99310-01— S relay momentarily operated.
4	At SD-99309-01— Block S relay operated.	
5	At SD-99310-01— Operate DL relay.	At desk position— P lamp lighted (No. 14 LTD). PRI lamp lighted (No. 16 LTD).
6	At SD-99310-01— Release DL relay.	At desk position— P lamp extinguished (No. 14 LTD). PRI lamp extinguished (No. 16 LTD).
7	At SD-99310-01— Operate RC relay.	At desk position— P lamp lighted (No. 14 LTD). PRI lamp lighted (No. 16 LTD).
8	At SD-99310-01— Release RC relay.	At desk position— P lamp extinguished (No. 14 LTD). PRI lamp extinguished (No. 16 LTD).
9	At SD-99310-01— Operate H relay.	At desk position— P lamp lighted (No. 14 LTD). PRI lamp lighted (No. 16 LTD).
10	At SD-99310-01— Release H relay.	At desk position— P lamp extinguished (No. 14 LTD). PRI lamp extinguished (No. 16 LTD).
11	At SD-99310-01— Operate PR relay.	At desk position— P lamp lighted (No. 14 LTD). PRI lamp lighted (No. 16 LTD).
12	At SD-99310-01— Release PR relay.	At desk position— P lamp extinguished (No. 14 LTD). PRI lamp extinguished (No. 16 LTD).

STEP	ACTION	VERIFICATION
13	At SD-99309-01— Release S relay.	
14	Repeat Steps 5 through 12.	At desk position— P lamp or PRI lamp extinguished in Steps 5 through 12.
15a	If at No. 14 LTD— Remove primary cord from T jack and momen- tarily operate DISC key.	
16b	If at No. 16 LTD— Momentarily operate DIS key.	
H. Dialing		
1	At SD-99310-01— Connect 1014A handset equipped with 2W38A cord to CAL jack.	
2	At SD-99309-01 Block S relay nonoperated.	
3a	If at No. 14 LTD— Connect primary cord into T jack associated with remote testing.	At SD-99310-01— SL and SL1 relays momentarily operated. At SD-95612-01— RT and RT1 relays operated.
4b	If at No. 16 LTD— Operate (IC_) key associated with remote test- ing and operate PRI(C) key.	At SD-99310-01— SL and SL1 relays momentarily operated. At SD-1C379-01— RT and RT1 relays operated.
5	At desk position— Operate DIAL key.	P lamp lighted. At SD-99310-01— DL relay operated. Three tones present at handset.
6	At desk position— Dial the number 2.	At handset— Two interruptions in one of three tones.
7	At desk position— Release DIAL key.	Tone absent at handset. P lamp extinguished.
8	At SD-99310-01— Remove block from S relay.	
9a	If at No. 14 LTD— Remove primary cord from T jack and momen- tarily operate DISC key.	

SECTION 201-828-502

STEP	ACTION	VERIFICATION
10b	If at No. 16 LTD— Momentarily operate DIS key.	
I. Keys Operating Relays		
1a	If a No. 14 LTD— Connect primary cord to T jack associated with remote testing.	BSY lamp flashes (if nondedicated). At SD-99310-01— SL and SL1 relays momentarily operated.
2b	If at No. 16 LTD— Operate (IC_) key associated with remote testing and operate PRI(C) key.	BSY lamp flashes (if nondedicated). At SD-99310-01— SL and SL1 relays momentarily operated.
3	At desk position— Connect 52 type headset to TEL jack.	
4	At SD-99310-01— Short contacts 10 break and 10 fixed of TM relay.	
5	Short contacts 8 break and 8 fixed of TM relay.	
6	Block TM relay operated.	
7	At desk position— Operate T key.	Multifrequency tone present at headset.
8	Release T key.	Tone absent at headset.
9	Operate M key.	Multifrequency tone present at headset.
10	At SD-99310-01— Release TM relay.	Tone absent at headset.
11	At desk position— Release M key.	
12	At SD-99310-01— Remove shorts from TM relay.	
13	At desk position— Operate RCCI key.	At SD-99310-01— RC relay operated.
14	Release RCCI key.	At SD-99310-01— RC relay released.
15c	If TOUCH-TONE® dialing is provided at desk position— Operate TT key.	TTB lamp lighted.(Option B). At SD-99310-01— TT relay operated.

STEP	ACTION	VERIFICATION
16c	At desk position— Release TT key.	TTB lamp extinguished (Option B). At SD-99310-01— TT relay released.
17	At desk position— Operate PS-RLS key.	At SD-99310-01— PR relay operated.
18	At desk position— Release PS-RLS key.	At SD-99310-01— PR relay released.
19	At desk position— Momentarily operate H key.	At SD-99310-01— H relay operated. At SD-95612-01— SR1 relay operated. At desk position— H lamp flashes approximately 60 seconds and then lighted steadily.
20	At desk position— Reoperate H key.	
21	At SD-99310-01— Operate S relay.	H lamp lighted steadily.
22d	If night test coverage (option ZB) is provided— At desk position— Operate an out trunk key and dial telephone number assigned to remote testing circuit in distant office.	SUPV lamp flashes.
23d	Momentarily operate NC key.	At SD-99309-01— NC and NC1 relays operated. In approximately 6 seconds— S and TF relays operated. At desk position— SUPV lamp lighted. BSY lamp extinguished.
24	At desk position— Reoperate NC key.	At SD-99309-01— NC and NC2 relays operated. In approximately 6 seconds— S relay operated. TF relay released. At desk position— BSY lamp lighted. SUPV lamp extinguished.
25	At desk position— Remove headset.	

SECTION 201-828-502

STEP	ACTION	VERIFICATION
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- 26a If at No. 14 LTD—
Remove primary cord from T jack and momentarily operate DISC key.
- 27b If at No. 16 LTD—
Momentarily operate DIS key.

J. Plug-out Oscillator

- 3 Set frequency meter at MEAS.
- 4 At SD-99309-01—
Using 2W3A cord, connect frequency meter to terminals 44 and 54 of unit terminal strip (A).
- 5 Block relay PD operated.
- 6 Block relays TC and D nonoperated.
- 7 Perform operations outlined in Table D.

Frequency indications as listed in Table D, ± 4 Hz.

CORRECTIVE ACTION

Adjust respective transformer and inductor listed in Table D.

- 8 Remove blocks from relays.
- 9 Remove shorts from capacitors.
- 10 Disconnect the frequency meter.

TABLE D

SHORT CIRCUIT CAPACITOR	NORMAL FREQUENCY (Hz)	ADJUST TRANSFORMER	FINE TUNE WITH INDUCTOR
CB, CC	941	TA	LA
CA, CC	1633	TB	LB
CA, CB	2250	TC	LC

K. Disconnect Oscillator

- 3 Set frequency meter to MEAS.

STEP	ACTION	VERIFICATION
4	At SD-99309-01— Using 2W3A cord, connect frequency meter to terminals 44 and 54 of unit terminal strip (A).	
5	Block relay D operated.	
6	Block relay TC nonoperated.	
7	Perform each of the operations outlined in Table E.	Frequencies measured on the frequency meter are as listed in Table E, ± 4 Hz. Frequency indications as listed in Table E.

TABLE E

SHORT CIRCUIT CAPACITOR	NORMAL FREQUENCY (Hz)	ADJUST TRANSFORMER	FINE TUNE WITH INDUCTOR
CB1, CC1	941	TA1	LA1
CA1, CC1	1477	TB1	LB1
CA1, CB1	2250	TC1	LC1

- 8 Remove blocks from all relays.
- 9 Remove shorts from all capacitors.
- 10 Disconnect the frequency meter.

L. Pilot Tone Timer

- 3 At SD-99309-01—
Block H relay operated.
- 50 to 70 seconds later P relay operated.

CORRECTIVE ACTION

Check the PTT timer, circuit pack D3.

- 4 Remove block from H relay.
- P relay released.

M. Plug Out Supervision

- 3 At SD-99309-01—
Remove all cross-connections of T and R leads going to far end office.
- 4 Release S relay.

SECTION 201-828-502

STEP	ACTION	VERIFICATION
5	At frequency generator— Adjust gain control of frequency generator to extreme counterclockwise position and set frequency at 1017 Hz.	
6	Connect 400-type VTVM across OSC OUT jack of frequency generator.	
7	At SD-99309-01— Using 2W3A cord, connect OSC OUT jack of frequency generator to terminals 44 and 54 (T and R leads) of terminal strip (A).	
8	Block SL relay operated.	At SD-99309-01— S relay operated.
9	At frequency generator— Adjust gain control until 400-type VTVM indicates -34 dBm.	At SD-99309-01— S relay released.
10	Adjust gain control of frequency generator until VTVM indicates -22 dBm.	At SD-99309-01— S relay operated.
11	Vary frequency from 985 Hz to 1050 Hz.	At SD-99309-01— S relay remains operated.
		<i>CORRECTIVE ACTION</i>
		At SD-99309-01— (a) Check A filter (b) Check for -18 volts on terminal H of SR circuit pack.
12	Adjust frequency to 980 Hz and to 1060 Hz.	At SD-99309-01— S relays released at each frequency.
		<i>CORRECTIVE ACTION</i>
		Same as Step 11.
13	Remove all meter leads.	
14	At SD-99309-01— Unblock the SL relay.	
15	Return the circuit to normal.	

N. Establish Connection (Nondedicated)

STEP	ACTION	VERIFICATION
1a	If at No. 14 LTD— Insert headset and operate outgoing trunk key.	Lamp associated with outgoing trunk key light- ed. Tone present at headset.
CORRECTIVE ACTION		
Refer to Section 201-828-503 for troubles at No. 14 LTD.		
2a	Dial number assigned to far-end circuit (SD- 99308-01).	Ringing present at headset. At SD-99308-01 dialed— Automatic dialer will dial back to SD-99309-01 under test. At desk position— SUPV lamp flashes at 60 ipm. At SD-99309-01— SL and TR relays operated.
3a	At No. 14 LTD desk position— Restore outgoing trunk key.	
4a	Insert primary test cord into T jack associated with remote testing.	SUPV lamp extinguished. BSY lamp lighted. Voltmeter indicates 100 volts. At SD-99309-01— RT relay momentarily operated. TC, H, PD, PO, and P relays operated. TR relay released. At SD-95612-01— RT and RT1 relays operated.
5b	If at No. 16 LTD— Insert headset and operate talk trunk key.	Associated lamp of talk trunk key lighted. Dial tone present at headset.
CORRECTIVE ACTION		
Refer to Section 201-828-504 for troubles at No. 16 LTD.		
6b	Dial number assigned to far-end circuit (SD- 99308-01).	Ringing present at headset. At SD-99308-01 dialed— Automatic dialer will dial back to SD-99309-01 under test. At desk position— SUPV lamp flashes at 60 ipm. At SD-99309-01— SL and TR relays operated.
7b	At No. 16 LTD desk position— Restore talk trunk key.	

STEP	ACTION	VERIFICATION
8b	Operate (IC__) key associated with remote testing and operate PRI(C) key.	BY lamp lighted. INC and PRI(C) lamps lighted steadily. Voltmeter indicates 100 volts.
9a	If at No. 14 LTD— Disconnect primary test cord and momentarily operate DISC key.	BSY lamp extinguished. At SD-99309-01— D, D1 relays momentarily operated. TC, H, SL, PD, PO relays released.
10b	If at No. 16 LTD— Operate DIS key in C control group.	BY lamp extinguished. At SD-99309-01— D, D1 relays momentarily operated. TC, H, SL, PD, PO, relays released.

O. Establish Connection (Dedicated)

1a	If at No. 14 LTD— Connect primary cord into T jack.	BSY lamp lighted. At SD-99309-01— RT relay momentarily operated. TC, H, SL, PD, PO relays operated.
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CORRECTIVE ACTION

Refer to Section 201-828-503 for troubles at No. 14 LTD.

2b	If at No. 16 LTD— Operate IC__ key.	BY lamp lighted. At SD-99309-01— RT relay momentarily operated. TC, H, SL, PD, PO relays operated.
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CORRECTIVE ACTION

Refer to Section 201-828-504 for troubles at No. 16 LTD.

3a	If at No. 14 LTD— Remove primary cord from T jack and momentarily operate DISC key.	BSY lamp extinguished. At SD-99309-01— D, D1 relays momentarily operated. TC, H, SL, PD, PO relays released.
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4b	If at No. 16 LTD— Operate DIS key in C control group.	BY lamp extinguished. At SD-99309-01— D, D1 relays momentarily operated. TC, H, SL, PD, PO relays released.
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P. Night Test Coverage (Option ZB)

STEP	ACTION	VERIFICATION
Seizure		
3	At SD-99309-01— Block relay H operated.	
4	Momentarily operate NC relay.	NC1 relay locked operated.
5	Momentarily operate S relay.	TF relay operated. NC1 relay released. When provided with No. 14 LTD— BSY lamp extinguished. SUPV lamp lighted. When provided with No. 16 LTD— BY lamp extinguished. SP lamp lighted.

Disconnect

6	Momentarily operate NC relay.	NC2 relay locked operated.
7	Momentarily operate S relay.	TF and NC2 relays released. When provided with No. 14 LTD— SUPV lamp extinguished. BSY lamp lighted. When provided with No. 16 LTD— SP lamp extinguished. BY lamp lighted.
8	Remove block from H relay.	

Q. MDF Telephone and Loudspeaker Circuit (Option YS)**Testing From No. 14 LTD**

1a	If provided with No. 14 LTD associated with nondedicated facilities— Insert headset and operate any available outgoing trunk key.	Lamp associated with outgoing trunk key lighted. Tone present at headset.
CORRECTIVE ACTION		
Refer to Section 201-828-503 for troubles at the No. 14 LTD.		
2a	Dial number assigned to far-end circuit (SD-99308-01).	Ringling present at headset. At SD-99308-01 dialed— Automatic dialer will dial back to SD-99309-01 under test. At desk position— SUPV lamp flashes at 60 ipm. At SD-99309-01— SL and TR relay operated.

SECTION 201-828-502

STEP	ACTION	VERIFICATION
3a	At No. 14 LTD desk position— Restore outgoing trunk key.	
4a	Insert primary cord into jack associated with flashing supervisory lamp.	SUPV lamp extinguished. BSY lamp lighted. Voltmeter indicates 100 volts. At SD-99309-01— RT relay momentarily operated. TC, H, PD, PO, and P relays operated. TR relay released. AT SD-95612-01— RT and RT1 relays operated.
5b	If provided with the No. 14 LTD associated with dedicated facilities— Insert headset.	
6b	Insert primary cord into jack associated with far-end test trunk (SD-99308-01).	BSY lamp lighted. Voltmeter indicates 100 volts. At SD-99309-01— RT relay momentarily operated. TC, H, PD, PO, and P relays operated. TR relay released. AT SD-95612-01— RT and RT1 relays operated.
7c	If loudspeaker circuit (SD-97559-01) is located at extended remote office— At No. 14 LTD— Operate ERT key.	
8c	Operate DIAL Key.	
9c	Dial digit associated with extended remote office to be accessed.	
10	At No. 14 LTD— Operate RTLS key.	RTLS lamp lighted. At SD-99311-01— TK and LS relay operated. At SD-97557-01— LS relay operated. At 97559-01— LS relay operated. When station lamps are provided (Option Y)— All corresponding station lamps at far-end flash at 120 ipm.
11	Speak over loudspeaker to alert personnel at far-end to answer.	

STEP	ACTION	VERIFICATION
Testing From No. 16 LTD		
12d	If provided with No. 16 LTD associated with nondedicated facilities— Insert headset and operate any available talk trunk key.	Lamp associated with talk trunk key lighted. Tone present at headset. CORRECTIVE ACTION Refer to Section 201-828-504 for troubles at the No. 16 LTD.
13d	Dial number assigned to far-end circuit (SD-99308-01).	Ringing present at headset. At SD-99308-01 dialed— Automatic dialer will dial back to SD-99309-01 under test. At desk position— SP lamp flashes at 60 ipm. At SD-99309-01— SL and TR relays operated.
14d	At No. 16 LTD desk position— Restore talk trunk key.	
15d	Operate (IC_) key associated with flashing SP lamp and operated PRI (C) key.	SD lamp extinguished. BY lamp lighted. IC_ and PRI (C) lamps lighted steadily. Voltmeter indicates 100 volts.
16e	If provided with No. 16 LTD associated with dedicated facilities— Insert headset.	
17e	Operate IC_ key associated with remote testing and operate PRI (C) key.	BY lamp lighted. IC_ and PRI (C) lamps lighted steadily. Voltmeter indicates 100 volts.
18f	If loudspeaker circuit (SD-97559-01) is located and extended remote office— At No. 16 LTD— Operate ERT key.	
19f	Operate DIAL key.	
20f	Dial digit associated with extended remote office to be accessed.	
21	At No. 16 LTD— Operate RTLS key.	RTLS lamp lighted. At SD-99311-01— TK and LS relay operated. At SD-97557-01— TK and LS relay operated.

STEP	ACTION	VERIFICATION
		At SD-97559-01— LS relay operated. When station lamps are provided (Option Y)— All corresponding station lamps at far-end flash at 120 ipm.
22	Speak over loudspeaker to alert personnel at far-end to answer.	
<i>Answering at Far End or Extended Remote Office Using Head Telephone Set</i>		
23	At far end— Connect head telephone set into A and B telephone jacks at first station to be tested.	At SD-97559-01— HDA relay operated. C relay operated. When station lamps are provided (Option Y)— All station lamps at far-end lighted steadily. Talking path established between test desk and connected station.
24	Remove headset from station jacks.	When station lamps are provided (Option Y)— All station lamps at far-end flash at 120 ipm.
25	Connect headset to next station to be tested.	When station lamps provided (Option Y)— All corresponding station lamps at far-end flash at 120 ipm. Talking path established between test desk and connected station.
26g	If additional stations are to be tested— Repeat Steps 24 and 25 as required for all equipped stations to be tested.	Same as Steps 24 and 25.
27	Remove headset from station jacks of last station tested.	At SD-97559-01— HDA relay released.
28	At No. 14 or 16 LTD desk position— Release RTLS key.	RTLS lamp extinguished. AT SD-99311-01— TK and LS relay released. At SD-97557-01— TK and LS relay released. At SD-97559-01— LS relay released. When station lamps are provided (Option Y)— All corresponding station lamps at far-end extinguished.
29	Operate DISC key.	All circuits restored to normal.

STEP	ACTION	VERIFICATION
Answering at Far End or Extended Remote Office Using Speakerphone (Option Y)		
30	Operate pull switch or pushbutton key at first station to be checked.	At SD-97559-01— CT relay operated. C relay operated. All station lamps steadily lighted except the connected station lamp which flashes at 60 ipm. Talking path established between test desk and connected station. Note: It may be necessary to adjust R5 potentiometer on SD-97559-01 to provide a suitable volume level for the loudspeaker without feedback. Should feedback occur, it will be necessary to reduce the loudspeaker volume. This arrangement should be tested each with talking station to prevent possible feedback condition.
31	Operate pull switch or pushbutton key at next station to be tested. Note: See Note, Step 30.	Associated CT relay operated. Preceding or succeeding talking station released. All station lamps steadily lighted except the connected station lamp which flashes at 60 ipm. Talking path established between test desk and connected station.
32g	If additional stations are to be tested— Repeat Step 31 as required for all equipped stations to be tested.	Same as Step 31.
33	At No. 14 or 16 LTD position— Release RTLS key.	RTLS lamp extinguished. At SD-99311-01— TK and LS relays released. At SD-9755701— TK and LS relays released. At SD-97559-01— LS relay released. CT relay released. All corresponding station lamps at far-end extinguished.
34c	If loudspeaker circuit (SD-97559-01) is located at extended remote office— At No. 14 or 16 LTD desk position— Release ERT key.	
35b	At No. 14 LTD position— Remove primary cord from jack.	
36	Operate DISC key.	All circuits restored to normal.

STEP	ACTION	VERIFICATION
R. Permanent Signal Holding Trunk Identification Crossbar and Step-by-Step Offices		
1	Insert headset and operate any available outgoing trunk key.	Lamp associated with outgoing trunk key lighted. Tone present at headset.
2	Select a telephone number at far end office to call.	

For Dial Pulse Calling

3a	If number is in extra number series— Operate REV key.	
4	Operate DIAL key.	When No. 14 LTD provided— P lamp lighted. When No. 16 LTD provided— PRI lamp lighted.
5	When P or PRI lamp extinguished— Dial selected telephone number.	
6	Operate T and RCCI keys.	
7	Ring party dialed by operating either +T, -T, +R or -R key, whichever is correct.	
8	Talk to called party when answer occurs.	Voltmeter indicates 100 volts. Voice transmission path established between desk position and called number.

Note: If a sharp burst of tone occurred when called number answered, it is necessary to operate the REX key (if provided to increase transmission level.

For MF Key Pulse Calling

9a	If number is in extra number series— Operate REV key.	
10	Operate KP key.	S lamp lighted.
11	Key selected telephone number.	
12	Operate T and RCCI keys.	
13	Ring party dialed by operating either +T, -T, +R or -R key, whichever is correct.	

STEP	ACTION	VERIFICATION
14	Talk to called party when answer occurs.	Voltmeter indicates 100 volts. Voice transmission path established between desk position and called number.
		Note: If a sharp burst of tone occurred when called number answered, it is necessary to operate the REX key (if provided) to increase transmission level.

Permanent Signal Release (SXS Only)

- 15 Instruct called number at far end to hang-up telephone, lift phone off-hook and listen for permanent signal tone (1000-Hz) which will occur. Hang-up when permanent signal (1000-Hz) tone is removed.
- 16 In approximately 1 minute after performing Step 15—
Repeat Steps 1 through 5 (dial pulsing) or Steps 1, 2, and 9a through 11 (MF pulsing).
- Note:** Do not ring called number.
- 17 Operate M key.
- 18 Operate PS RLS key.
- 19 Release M key.
- 20 Operate T and RCCI key.
- 21 Verify far end called has heard permanent signal tone.

Permanent signal tone heard.

Permanent signal tone removed.

Permanent Signal Release (Crossbar Offices—Option YV)

- 22 Instruct called number at far end to hang-up telephone, lift phone off-hook, and listen for permanent signal tone (1000-Hz) which will occur. Hang-up when permanent signal (1000-Hz) tone is removed.
- 23 In approximately 1 minute after performing Step 22—
Operate NT key.

SECTION 201-828-502

STEP	ACTION	VERIFICATION
24	Repeat Steps 1 through 5 (dial pulsing) or Steps 1, 2, and 9a through 11 (MF pulsing). <i>Note:</i> Do not ring called number.	
25	Operate M key.	Permanent signal tone heard.
26	Operate TTS key.	
27	Operate DIAL key.	
28	Dial to access first permanent signal trunk.	
29	Release DIAL key.	Permanent signal tone is removed if this is proper holding trunk.
30b	If verification of Step 29 does not occur— Operate DIAL key.	
31b	Dial "1" to access next permanent signal trunk.	
32b	Release DIAL key.	
33b	Repeat Steps 30b through 32b as required until permanent signal tone is removed.	
34	Release all keys.	
35	Verify far end called has heard permanent signal tone.	