

MULTIFREQUENCY TRANSMITTER (SD-2H121) AND RECEIVER (SD-2H124) CIRCUIT

TEST

NO. 2 AND NO. 2B ELECTRONIC SWITCHING SYSTEMS

1. GENERAL

1.01 This section describes the method of testing the multifrequency transmitter (SD-2H121) and the multifrequency receiver (SD-2H124) circuits used in the No. 2 and No. 2B Electronic Switching Systems (ESS).

1.02 This section is reissued to accomplish the following:

- (1) Add TTY messages that are unique to No. 2B ESS
- (2) Add diagrams of the test circuits
- (3) Correct existing information.

1.03 The multifrequency (MF) transmitter circuit (Fig. 1) generates voice frequency signals in the MF code. These code signals are used to transmit the directory number of the called customer or other information to distant central offices. This circuit also checks the continuity of loop trunk and observes start pulsing signals.

1.04 The MF receiver circuit (Fig. 2) is used to receive voice band MF signals from operator key sets or senders in distant offices. The circuit also recognizes what frequencies are present, and converts the signaling frequencies into dc signals suitable for operating associated scan points.

1.05 The test in this section is to be performed on a periodic basis as prescribed by local equipment test list procedures or when malfunction of one of the circuits is suspected.

1.06 The test will be performed from the trunk test panel (TTP) in conjunction with the

maintenance display buffer and teletypewriter (TTY). The keys on the TTP may be either a locking or a nonlocking type. In order to differentiate between the two types of keys, the use of a locking type key shall be identified by the words "operate" and "release" and the use of a nonlocking type key shall be identified by the word "depress" in the ACTION column. For more detailed information about the TTP and its operation, refer to Section 232-130-301, Trunk Test Panel—Method of Operation.

Note: Nonlocking relays require a depression of at least one-half second to ensure system recognition.

1.07 Lettered Steps: A letter a, b, c, etc, added to a step number in Part 3 or 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.

1.08 Whenever the term TOUCH-TONE® telephone service is used, it refers to the equipment required to provide this service to the customer.

2. APPARATUS

2.01 A 2P4A patch cord assembly consisting of a P2B cord 3 feet long with a 310 plug on each end.

NOTICE

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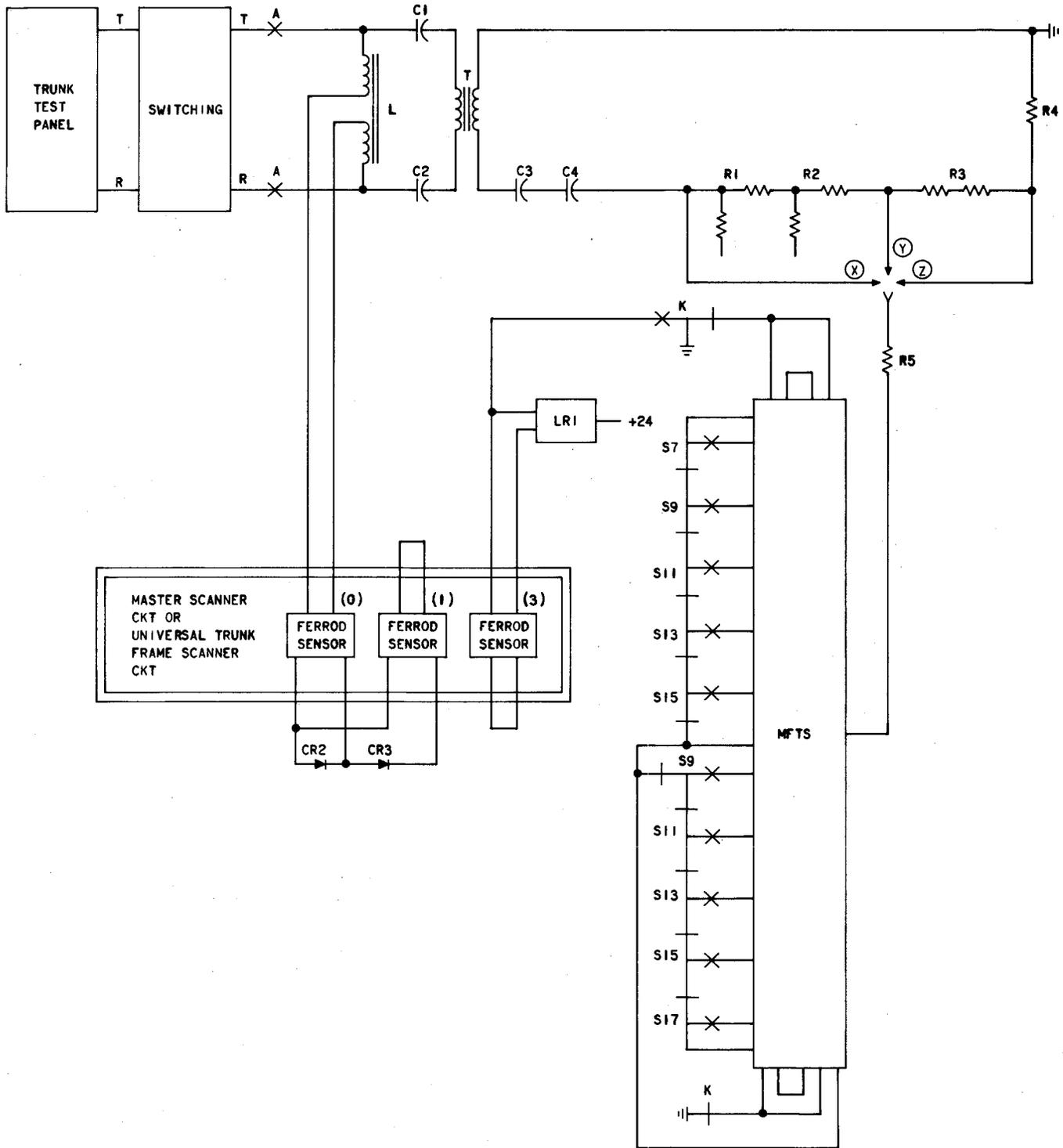


Fig. 1—Multifrequency Transmitter Test Circuit (SD-2H121)

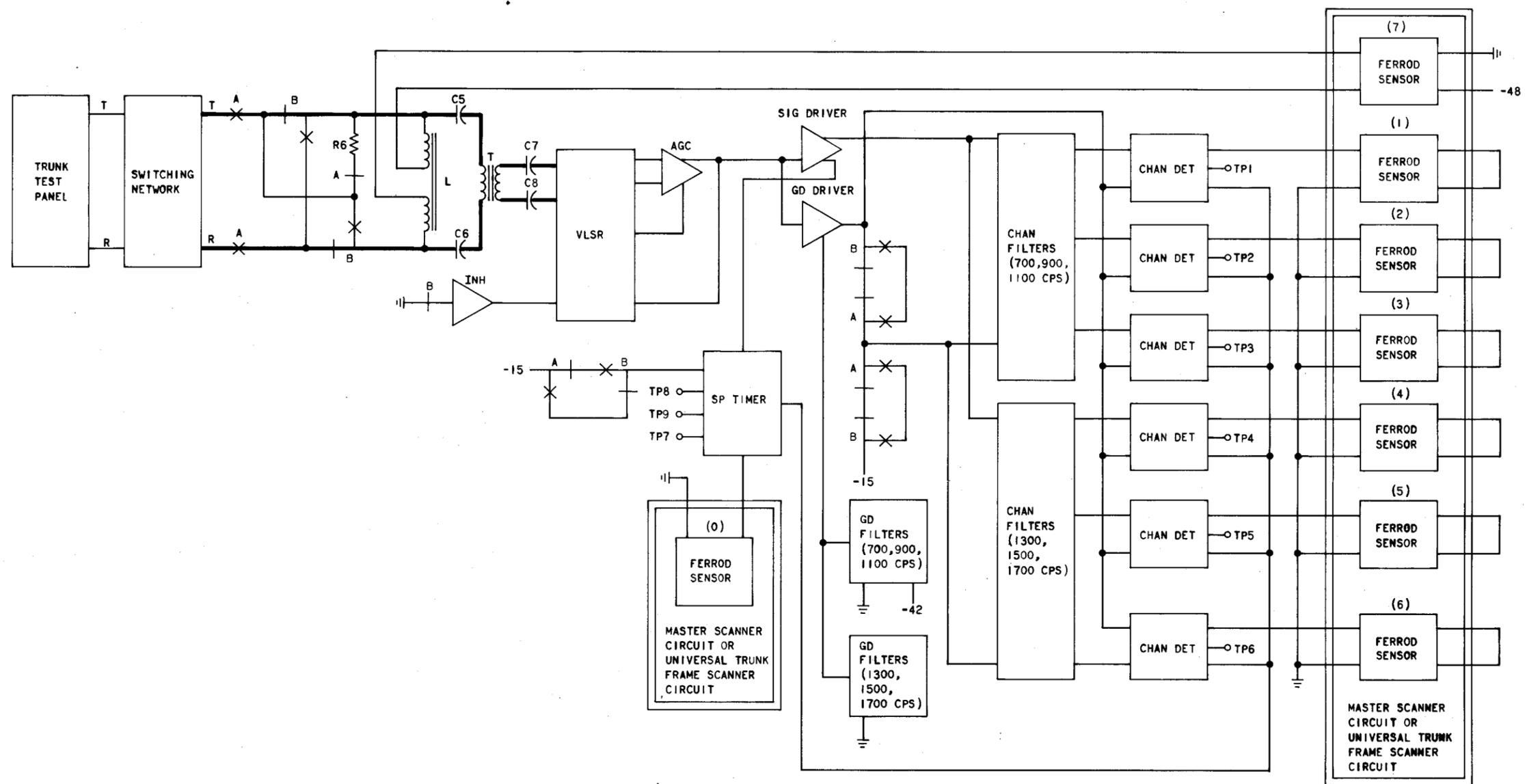


Fig. 2—Multifrequency Receiver Test Circuit (SD-2H124)

3. PREPARATION

3.01 Refer to office records to obtain the trunk group number (TGN), member number (MEMN), and directed scan point number (DSP) of the multifrequency transmitter and receiver circuits.

3.02 Verify DSP for MF transmitter circuit obtained from office records as follows:

At maintenance TTY type in:

A VY:SVC:aaa bbb!

where: aaa = TGN

bbb = MEMN

The system response is as follows:

AR VY SVC aaa bbb

TEN nn gesl
PDB cxzy b
DSP ss rrbb

ss = scanner number

rr = row number

bb = bit in row

The bb field represents the first ferrod (0) in the scanner row; all other ferrods follow in consecutive order, i.e., (0, 1, 2, etc). Refer to input message manual (IM-2H200) and output message manual (OM-2H200) for interpretation of machine language.

3.03 Repeat 3.02 to verify DSP for MF receiver circuit obtained from office records.

3.04 Use the following procedure for gaining access to the Multifrequency Receiver Test Circuit (SD-2H124) and the Multifrequency Transmitter Test Circuit (SD-2H121).

STEP	ACTION	VERIFICATION
1	At telephone set on TTP— Operate access trunk 1 key.	
2	Lift handset off-hook or operate TRFR key at TEL CKT on TTP if using headset.	At telephone set— Access trunk 1 lamp lighted. At ACCESS TRUNK 1 CONTROL— SUPV lamp lighted. At TEL CKT— TRFR lamp lighted if TRFR key is operated.
3	At TOUCH-TONE dial— Dial 1 + TGN + MEMN + ST to gain access to MF transmitter.	At ACCESS TRUNK 1 CONTROL— EQPT ST lamp lighted steadily or flashing at a rate of 120 interruptions per minute. At MISC TEST CONTROL— P & E lamp lighted if connection was successful.
	<i>XMTR = 005 000 thru 10</i> <i>RCVRS = 003 000 thru 12</i>	
4a	If the P & E lamp is not lighted steadily— At ACCESS TRUNK 1 CONTROL— Depress RLS key.	Note: If the EQPT ST lamp is flashing and the P & E lamp is not lighted steadily, the TTP is not connected to the circuit to be tested.
5a	Repeat Steps 3 and 4a until connection is successful.	

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STEP	ACTION	VERIFICATION
6	Place handset on-hook or release TRFR key.	At telephone set— Access trunk 1 lamp extinguished. At TEL CKT— TRFR lamp extinguished.
7	At telephone set— Operate access trunk 2 key.	At MISC TEST CONTROL— P & E lamp remains lighted.
8	Lift handset off-hook or operate TRFR key at TEL CKT on TTP if using headset.	At telephone set— Access trunk 2 lamp lighted. At ACCESS TRUNK 2 CONTROL— SUPV lamp lighted. At TEL CKT— TRFR lamp lighted if TRFR key is operated.
9	At TOUCH-TONE dial— Dial 1 + TGN + MEMN + ST to gain access to the MF receiver.	At ACCESS TRUNK 2 CONTROL— EQPT ST lamp lighted steadily or flashing at a rate of 120 interruptions per minute.
10b	If the P & E lamp is flashing— At ACCESS TRUNK 2 CONTROL— Depress RLS key.	<i>Note:</i> If the EQPT ST lamp and the P & E lamp are flashing, the TTP is not connected to the circuit to be tested.
11b	Repeat Steps 9 and 10b until connection is successful.	
12	Place handset on-hook or release TRFR key.	At telephone set— Access trunk 2 lamp extinguished. At TEL CKT— TRFR lamp extinguished.

4. METHOD

4.01 If the verification procedure fails or if a malfunctioning circuit is indicated during any part of these tests, proceed as follows.

- (1) Discontinue the test.

- (2) Troubleshoot the circuit which failed.
- (3) Replace faulty circuit components using standard repair procedures.
- (4) Repeat the test that failed. If verification is successful, continue the test.

MF Transmitter and Receiver Test

STEP	ACTION	VERIFICATION
13	At ACCESS TRUNK 2 CONTROL— Depress VM key.	At ACCESS TRUNK 2 CONTROL— VM lamp lighted. At VOLTMETER CONTROL— 100K lamp lighted.

STEP	ACTION	VERIFICATION
14	At VOLTMETER CONTROL— Operate GRD key.	At VOLTMETER CONTROL— GRD lamp lighted At VOLTMETER— Meter indicates 0. A deflection on voltmeter indicates a resistance between the tip and ring leads.
15	Operate TR REV key.	At VOLTMETER CONTROL— TR REV lamp lighted. At VOLTMETER— Meter indicates 0.
16	Depress FEMF key.	At VOLTMETER CONTROL— FEMF lamp lighted. 100K lamp extinguished. At VOLTMETER— Meter indicates 0.
17	Release GRD key.	At VOLTMETER CONTROL— GRD lamp extinguished. FEMF lamp remains lighted.
18	At STATE CHANGE CONTROL— Set PD GROUP switch to 0-5 position.	
19	At PERIPHERAL DECODER POINTS— Operate 0 key.	At PERIPHERAL DECODER POINTS— 0 lamp lighted.
20	Depress AT 2 key.	At VOLTMETER— Meter indicates between 42.75 and 52.5 volts on 120-volt scale. At circuit under test— Relay A operated.
21	At PERIPHERAL DECODER POINTS— Release 0 key.	At PERIPHERAL DECODER POINTS— 0 lamp extinguished.
22	Depress AT 2 key.	At VOLTMETER— Meter indicates 0. At circuit under test— Relay A released.
23	At VOLTMETER CONTROL— Release TR REV key.	At VOLTMETER CONTROL— TR REV lamp extinguished.
24	At PERIPHERAL DECODER POINTS— Operate 0 and 1 keys.	At PERIPHERAL DECODER POINTS— 0 and 1 lamps lighted.
25	Depress AT 2 key.	At VOLTMETER— Meter indicates between 42.75 and 52.5 volts on 120-volt scale.

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STEP	ACTION	VERIFICATION
		At circuit under test— Relays A and B operated.
26	At PERIPHERAL DECODER POINTS— Release 0 and 1 keys.	At PERIPHERAL DECODER POINTS— 0 and 1 lamps extinguished.
27	Depress AT 2 key.	At VOLTMETER— Meter indicates 0. At circuit under test— Relays A and B released.
28	Use TTY printout information from 3.02 for input to the message in Step 29.	
29	At maintenance TTY— ◆For No. 2 ESS offices type in:◆ UBRL TS:RSN:ssrr! ss = Number of trunk scanner in decimal (0-11). rr = Number of scanner row to be displayed. ◆For No. 2B ESS offices type in: MON:TSSN ssrr;RDT LAMPS! ss = Number of trunk scanner in decimal (0-11) rr = Number of scanner row in decimal (0-63) RDT LAMPS = Direct the result to the DISPLAY BUFFER.◆	At DISPLAY BUFFER— Lamps associated with ferrod sensors for MF transmitter displayed on DISPLAY BUFFER are lighted.
30	At front of writing shelf on TTP— Plug patch cord into ACCESS TRK-1 and ACCESS TRK-2.	
31	At STATE CHANGE CONTROL— Set PD GROUP swtich to 6-11 position.	
32	At PERIPHERAL DECODER POINTS— Operate 6 key.	At PERIPHERAL DECODER POINTS— 6 lamp lighted.
33	Depress AT 1 key.	At DISPLAY BUFFER— Lamps associated with ferrod sensors 2 and 3 extinguished. At MF transmitter circuit— Relays A and K operated.
34	At STATE CHANGE CONTROL— Set PD GROUP switch to 0-5 position.	
35	At PERIPHERAL DECODER POINTS— Operate 0 key.	At PERIPHERAL DECODER POINTS— 0 lamp lighted.

STEP	ACTION	VERIFICATION
36	Depress AT 2 key.	At DISPLAY BUFFER— Lamps associated with ferrod sensors 0 and 1 extinguished; lamps 2 and 3 remain extinguished. At MF receiver circuit— Relay A operated.
37	At PERIPHERAL DECODER POINTS— Operate 0 and 1 keys.	At PERIPHERAL DECODER POINTS— 0 lamp lighted. 1 lamp lighted.
38	Depress AT 2 key.	At DISPLAY BUFFER— Lamp associated with ferrod sensor 1 lighted. At MF receiver circuit— Relay B operated. Relay A remains operated.
39	At maintenance TTY— ◆For No. 2 ESS offices type in:◆ UB SY:CLB! ◆For No. 2B ESS offices type in: STOP:UTIL!◆	At DISPLAY BUFFER— Ferrod sensor display for MF transmitter is cleared.
40	Use TTY printout information from 3.03 for input to the message in Step 41.	
41	At maintenance TTY— ◆For No. 2 ESS offices type in:◆ UBRL TS:RSN:ssrr! ss = Number of trunk scanner in decimal (0-11) from Step 7. rr = Number of scanner row in decimal (0-63) from Step 7. ◆For No. 2B ESS offices type in: MON:TSSN ssrr;RDT LAMPS! ss = Number of trunk scanner in decimal (0-11) from Step 7. rr = Number of scanner row in decimal (0-63) from Step 7. RDT LAMPS = Direct the result to the DISPLAY BUFFER.◆	At DISPLAY BUFFER— Lamps associated with ferrod sensors for MF receiver displayed on DISPLAY BUFFER and are as follows: 0 and 7 extinguished. 1 through 6 lighted.
42	At PERIPHERAL DECODER POINTS— Operate 0 and 1 keys.	At PERIPHERAL DECODER POINTS— 0 and 1 lamps lighted.
43	Depress AT 1 key.	At DISPLAY BUFFER— Lamps associated with ferrod sensors as outlined in Table A extinguished.
	Note: Refer to Table A for testing sequence.	

STEP

ACTION

VERIFICATION

TABLE A
MULTIFREQUENCY TESTING SEQUENCE

MULTIFREQUENCY KEY SET REPRESENTATION	PD POINTS OPERATED	FERROD SENSORS SATURATED	RELAYS OPERATED
1	0 & 1	7, 1 & 2	S7 & S9
2	0 & 2	7, 1 & 3	S7 & S11
3	1 & 2	7, 2 & 3	S9 & S11
4	0 & 3	7, 1 & 4	S7 & S13
5	1 & 3	7, 2 & 4	S9 & S13
6	2 & 3	7, 3 & 4	S11 & S13
7	0 & 4	7, 1 & 5	S7 & S15
8	1 & 4	7, 2 & 5	S9 & S15
9	2 & 4	7, 3 & 5	S11 & S15
0	3 & 4	7, 4 & 5	S13 & S15
R	0 & 5	7, 1 & 6	S7 & S17
SPARE	1 & 5	7, 2 & 6	S9 & S17
KP/CR	2 & 5	7, 3 & 6	S11 & S17
SPARE	3 & 5	7, 4 & 6	S13 & S17
ST	4 & 5	7, 5 & 6	S15 & S17

R = Ring or ringback

KP/CR = Key pulse/coin return

ST = Start

Operate and release appropriate PD points and depress AT 1 after each step. Observe DISPLAY BUFFER lamps associated with saturated ferrod sensors as outlined in Table A.

- | | | |
|----|---|---|
| 44 | At PERIPHERAL DECODER POINTS—
Release all keys. | At PERIPHERAL DECODER POINTS—
Lamps extinguished. |
| 45 | Depress AT 1 key. | At DISPLAY BUFFER—
Lamps associated with ferrod sensors for MF receiver displayed on DISPLAY BUFFER and are as follows:
0 and 7 extinguished.
1 through 6 lighted. |
| 46 | At STATE CHANGE CONTROL—
Set PD GROUP switch to 6-11 position. | |
| 47 | At PERIPHERAL DECODER POINTS—
Release 6 key. | |

STEP	ACTION	VERIFICATION
48	Operate AT 1 key.	At MF transmitter circuit— Relays A and K released. At DISPLAY BUFFER— Lamp associated with ferrod sensor 7 lighted.
49	At STATE CHANGE CONTROL— Set PD GROUP switch to 0-5 position.	
50	At PERIPHERAL DECODER POINTS— Depress AT 2 key.	At MF receiver circuit— Relays A and B released. At DISPLAY BUFFER— Lamps associated with ferrod sensors 1 through 7 lighted.
51	At maintenance TTY— ◆For No. 2 ESS offices type in:◆ UB SY:CLB! ◆For No. 2B ESS offices type in: STOP:UTIL!◆	At DISPLAY BUFFER— Ferrod sensor display for MF receiver circuit cleared from DISPLAY BUFFER.
52	At front of writing shelf on TTP— Remove patch cord from ACCESS TRK-1 and ACCESS TRK-2.	
53	At ACCESS TRUNK 1 CONTROL— Depress RLS key.	At ACCESS TRUNK 1 CONTROL— EQPT ST lamp extinguished.
54	At ACCESS TRUNK 2 CONTROL— Depress RLS key.	At ACCESS TRUNK 2 CONTROL— EQPT ST lamp extinguished. VM lamp extinguished. At VOLTMETER CONTROL— FEMF lamp extinguished.
55	At telephone set— Operate green release key.	At ACCESS TRUNK 1 CONTROL— SUPV lamp extinguished. At ACCESS TRUNK 2 CONTROL— SUPV lamp extinguished. At MISC TEST CONTROL— P & E lamp extinguished.
56	Repeat all step procedures outlined in this section to test remaining multifrequency transmitter and receiver circuits.	