2600-CYCLE E1F SINGLE-FREQUENCY SIGNALING CIRCUIT (SD-98089-01 OR SD-98089-02) OUT-OF-SERVICE TESTS USING TESTING CIRCUIT (SD-96519-01 OR SD-96519-02)

1. GENERAL

1.01 This section describes a method of making out-of-service tests on a 2600-cycle single-frequency signaling circuit SD-98089-01 or SD-98089-02.

Caution: The 291- or 303-type relays shall be maintained in an upright position for not less than 1 minute before beginning any tests.

1.02 This section is reissued to include tests for both modified and unmodified E1F signaling units.

1.03 The E1F signaling unit REC potentiometer must be adjusted before placing unit in service.

1.04 The tests covered are:

A. Transmitted Tone Level and Operation of CT Relay Circuit: This test checks the level of the transmitted single-frequency tone.

B. Cut-Off Current of Q5 or Q57 Transistor: This test checks the transistor base bias current for no-input tone.

C. Gain of Receiver Voice Amplifier, Blocking of Signal Tone, and 4-Wire Terminating Circuit: This test checks transmission of the voice path through the receiver, a method of adjusting the REC potentiometer, blocking of the signal tone, transhybrid loss, and 2- to 4-wire transmission.

D. Operate Sensitivity of Receiver Signaling Amplifier: This test checks the 2600-cycle receiver sensitivity and describes a method of adjusting the SS potentiometer to get the required operation.

E. Operate Test of RP Relay: This test checks that the RP relay will properly monitor the 2-wire line.

F. Receiver Guard Action: This test checks the effectiveness of the 2600-cycle receiver guard circuit in preventing operation by voice signals.

1.05 Since differences exist between units to be tested, some units require different action and verification procedure. The designations shown below are used to associate the units with steps in the test procedure.

DESIGNATION USED IN BSP	DESIGNATION ON SF UNIT
E1F	E1F
E1F-( )	All stampings except E1F

1.06 *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 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.

2. APPARATUS

2.01 The apparatus required for each test is shown in Table A. The details of each item are covered in the paragraph indicated by the number in parentheses.

TABLE A

APPARATUS	TESTS					
	A	B	C	D	E	F
Testing Circuit (2.02)	1	1	1	1	1	1
13A Transmission Measuring Set (TMS)	1	–	1	1	1	1
KS-14510 Volt-Ohm-Milliammeter (VOM)	–	1	–	1	–	–

TABLE A (Cont)

APPARATUS	TESTS A	B	C	D	E	F
Cord (2.03)	1	–	1	1	1	1
Cord (2.04)	–	1	–	1	–	–
Tool (2.05)	1	1	1	1	1	1
Blocking Tools (2.06)	√	–	√	√	√	√

√ As required.

2.02 Testing circuit, J98613AY (SD-96519-01 or SD-96519-02).

2.03 Testing cord for TMS, W2DL cord, 5-1/2 feet long, equipped with a 310 plug and two 35 cord tips (2W42A).

2.04 Testing cord for VOM, P2CH cord, equipped with a 310 plug and two KS-14530 connectors.

2.05 The 725A tool used to gain mechanical advantage in prying the signaling unit loose from connectors.

→**2.06** Blocking and insulating tools, as required. Use tools and apply as covered in Section 069-020-801.

3. PREPARATION

3.01 The twist keys in the test circuit are operated when the white line is in the vertical position and normal when the white line is in the horizontal position.

STEP	ACTION	VERIFICATION
All Tests		
1	On testing circuit — Set all keys to normal.	
2	Obtain release of signaling circuit in standard manner.	
→ 3	At signaling bay — Remove signaling unit from its jack using disengaging tool. See Fig. 1 and 2.	
4	At testing circuit — Plug signaling unit into testing circuit jack on folding bracket.	
Tests A, C, D, and F		
5	TMS must be known to be correctly calibrated.	
6	Connect TMS to TMS jack using 2W42A cord.	

4. METHOD

Brief Test For New Units and Units Modified or Repaired by WECo

Note: The steps listed below are to be used only when it is reasonably certain that the units have not suffered damage in transit. Otherwise, the full BSP tests must be performed. These limited tests are not extensive enough to assure that a unit will meet all requirements. However, they provide a reasonable degree of assurance of proper operation.

TEST FOR	TEST	
Transmitted Tone Levels and CT Relay	A	All steps.
RCV Pot	C	Steps 1, 4, 6, 15b, 19, 21, 22, 41 through 47.
SS Pot	D	Steps 1, 4, 6, 7 through 15, 18 through 31.
RP Relay	E	All steps.

STEP	ACTION	VERIFICATION
	A. Transmitted Tone Levels and Operation of CT Relay Circuit	
7	Set dial switch of TMS to 30.	
8a	If E1F-( ) unit — Operate C relay manually.	C relay remains operated.
9b	If E1F unit — Block operated C relay.	
10	Set KEYERS switch to 4 and RECEIVER switch to 1 MEAS INPUT.	
11	Operate E1F-LB key.	
12	Depress and hold E1F-1 key.	
13	Depress and hold TMS-A, TMS-B keys.	TMS reads between −30 and −32 db.
14	Release E1F-1 key.	
15a	If E1F-( ) — Set dial switch of TMS to 5.	
16b	If E1F — Set dial switch of TMS to 15.	
17	Set KEYERS switch to 5 SIG OFF.	
18	Operate E1F-2 key.	If E1F-( ) — TMS reads between −9 and −11 db. If E1F — TMS reads between −16 and −18 db.
19	Set dial switch of TMS to 40.	
20	Set KEYERS switch to 4 SIG OFF.	
21	Operate E1F ON-OFF key.	
22	Operate E1F SOAK key.	If E1F-( ) — CT relay operates. AL relay is released.
23	Depress and hold E1F-1 key.	TMS reads less power than −45 db.
24	Release E1F-1, TMS-A, TMS-B keys.	
25	Restore E1F SOAK key.	
26b	If E1F — Remove block from C relay.	
27a	If E1F-( ) unit — Operate AL relay manually.	C relay releases.
28a	Release AL relay manually.	CT relay releases.
29	On testing circuit — Restore all keys to normal.	

STEP	ACTION	VERIFICATION
	B. Cut-Off Current of Q5 or Q57 Transistor	
5	Set selector switch of VOM to 12 volts.	
6	Connect VOM to SENS-1 jack of testing circuit using P2CH cord. *Note:* Red connector of test cord connects to (+) terminal on VOM and black connector of test cord connects to (−) terminal.	
7	Set KEYERS switch to 5 SIG OFF and RECEIVER switch to 2 M OPR.	VOM reads 1.2 to 1.7 volts. On SF unit — AL relay is released.
8	On testing circuit — Remove connection from VOM to SENS-1 jack.	
	C. Gain of Receiver Voice Amplifier, Blocking of Signal Tone, and 4-Wire Terminating Circuit	
7a	If testing and monitoring circuit has CAL MEAS and CAL OUT jacks — Set dial switch of TMS to 20.	
8a	Set KEYERS switch to 5 SIG OFF and RECEIVER switch to 6 MEAS 1 KC IN.	
9a	On SF unit — Block nonoperated AL relay.	
10a	Depress TMS-C key momentarily.	TMS reads between −21.8 and −22.2 db.
11a	Set RECEIVER switch to 2 M OPR.	
12a	Set dial switch of TMS to 0.	
13b	If testing and monitoring circuit does ***not*** have CAL MEAS and CAL OUT jacks — Set dial switch of TMS to 0.	
14b	Disconnect TMS from TMS jack, connect TMS to AMP OUT jack.	
15b	On SF unit — Block nonoperated AL relay.	
16b	On testing circuit — Turn KEYERS switch to 5 SIG OFF and RECEIVER switch to 2 M OPR.	TMS reading should be exactly 0 db.
17c	If requirement of Step 16b is not met — Adjust MON AMP to get 0 db reading.	
18	Disconnect TMS from AMP OUT jack, connect TMS to TMS jack.	

STEP	ACTION	VERIFICATION
19	On SF unit — Block nonoperated C relay.	
20	Operate 1000~ 1 MW B key.	
21	Operate LP CUR-2 key.	
22	Operate 2-WIRE key.	
23	Adjust REC potentiometer to get 0 db reading on TMS.	
24	Set dial switch of TMS to 30.	
25	Operate 2-WIRE TER key.	
26	Depress TMS-A, TMS-B keys momentarily.	TMS reads less power than −30 db.
27	Restore 2-WIRE TER key.	
28	Restore 1000~ 1 MW B key.	
29	Operate 1000~ 1 MW A key.	
30	Set dial switch of TMS to 15.	
31	Depress TMS-A, TMS-B keys momentarily.	TMS reads between −15.4 and −16.2 db.
32	Restore 1000~ 1 MW A key.	
33	Set dial switch of TMS to 0.	
34	Set KEYERS switch to 6 SIG ON and RECEIVER switch to 1 MEAS INPUT.	
35	Set ATTEN to 10 db.	
36	Depress TMS-C key to testing circuit momentarily.	TMS reads 0 db.
37d	If requirement of Step 36 is not met — Adjust GAIN potentiometer of TST AMPL to obtain TMS reading of 0 db.	
38	Set KEYERS switch to 5 SIG OFF.	
39	Set dial switch of TMS to 30.	
40	Set KEYERS switch to 6 SIG ON.	
41	Set RECEIVER switch to 2 M OPR.	TMS reads less power than −30 db.
42	Set KEYERS switch to 5 SIG OFF.	
43	Set dial switch of TMS to 5.	
44	Operate 1000~ 1 MW B key.	

STEP	ACTION	VERIFICATION
45	Adjust REC potentiometer of SF unit.* *Minor readjustment of the REC potentiometer of less than 1 db may be required to meet overall expected measured loss requirements.	TMS reads specified value shown on trunk layout record for SF unit plus 0.2 db, due to measuring 900-ohm circuit using 600-ohm TMS.** ***Example:* Specified value shown for E1F unit is 8.8 db. The 8.8 db plus 0.2 db equals 9 db.
46	On SF unit — Remove block from AL, C relays.	
47	On testing circuit — Restore all keys to normal.	

D. Operate Sensitivity of Receiver Signaling Amplifier

7	Set dial switch of TMS to 20.	
8	Set KEYERS switch to 6 SIG ON and RECEIVER switch to 1 MEAS INPUT.	
9	Set ATTEN to 32 db.	
10	Depress TMS-C key momentarily.	TMS reads between −21.8 and −22.2 db.
11a	If requirement of Step 10 is not met — Adjust GAIN potentiometer of TST AMPL to obtain TMS reading of 22 db.	
12	Move KEYERS switch to 5 SIG OFF and RECEIVER switch to 2 M OPR.	
13	Operate 2-WIRE key.	
14	On SF unit — Block operated C relay.	
15	On testing circuit — Set KEYERS switch to 6 SIG ON and RECEIVER switch to 3 M RLS.	
16	Turn SS potentiometer fully counterclockwise.	On SF unit — AL relay is released.
17	Turn SS potentiometer clockwise until AL relay on SF unit operates.	
18	Set KEYERS switch to 5 SIG OFF.	On SF unit — AL relay releases.
19	Set KEYERS switch to 6 SIG ON.	On SF unit — AL relay operates.
20	Set KEYERS switch to 5 SIG OFF.	On SF unit — AL relay releases.
21	Set selector switch of VOM to X1000 ohms scale.	

STEP	ACTION	VERIFICATION
22	Remove plug from TMS jack.	
23	Using P2CH cord — Connect VOM to TMS jack.	
24	On SF unit — Block nonoperated AL relay.	
25	On testing circuits — Depress and hold TMS-C key.	Record VOM resistance reading.
26	Set KEYERS switch to 6 SIG ON.	VOM reads resistance greater than value recorded in Step 25.
27	Release TMS-C key.	
28	Set KEYERS switch to 5 SIG OFF.	
29	On SF unit — Remove block from AL relay.	
30	On testing circuit — Remove connection from VOM to TMS jack.	
31	On testing circuit — Restore all keys to normal.	
	E. Operate Test of RP Relay	
5a	If E1F-( ) unit — Set dial switch of TMS to 5.	
6a	Set KEYERS switch to 4 SIG OFF and RECEIVER switch to 2 M OPR.	
7a	Connect TMS to TMS jack using 2W42A cord.	
8a	Block operated C relay.	
9a	Operate E1F-2 key.	
10b	If E1F unit — Set KEYERS switch to 5 SIG OFF and RECEIVER switch to 2 M OPR.	
11	Operate E1F-LB key.	If E1F-( ) — TMS reads between −9 and −11 db. If E1F — C Relay Operated.
12	Operate E1F SOAK key.	If E1F-( ) — TMS reads less power than −20 db. If E1F — C Relay Releases.

STEP	ACTION	VERIFICATION
13	Release E1F SOAK key.	If E1F-( ) — TMS reads between −9 and −11 db. If E1F — C Relay Operated.
14	Operate E1F OPR key.	If E1F-( ) — TMS reads less power than −20 db. If E1F — C Relay Releases.
15	Operate E1F RLS key.	
16	Restore E1F OPR key.	If E1F-( ) — TMS reads between −9 and −11 db. If E1F — C Relay Operated.
17	Restore E1F RLS key.	
18	Operate E1F ON-OFF key.	
19	Operate E1F SOAK key.	If E1F-( ) — TMS reads less power than −20 db. If E1F — C Relay Releases.
20	Restore E1F SOAK key.	If E1F-( ) — TMS reads between −9 and −11 db. If E1F — C Relay Operated.
21	Operate E1F OPR key.	If E1F-( ) — TMS reads less power than −20 db. If E1F — C Relay Releases.
22	Operate E1F RLS key.	
23	Restore E1F OPR key.	If E1F-( ) — TMS reads between −9 and −11 db. If E1F — C Relay Operated.
24	Restore E1F RLS key.	
25	Restore E1F-LB key.	
26	Operate E1F HB key.	
27	On SF unit — Remove R relay from signaling unit.	
28	On testing circuit — Operate E1F SOAK key.	If E1F-( ) — TMS reads less power than −20 db. If E1F — C Relay Releases.
29	Restore E1F SOAK key.	If E1F-( ) — TMS reads between −9 and −11 db. If E1F — C Relay Operated.

STEP	ACTION	VERIFICATION
30	Operate E1F OPR key.	If E1F-( ) — TMS reads less power than −20 db. If E1F — C Relay Releases.
31	Operate E1F RLS key.	
32	Restore E1F OPR key.	If E1F-( ) — TMS reads between −9 and −11 db. If E1F — C Relay Operated.
33a	If E1F-( ) — On SF unit — Remove block from C relay.	
34	On SF unit — Replace R relay in signaling unit.	
35	On testing circuit — Restore all keys to normal.	

F. Receiver Guard Action

7a	If testing and monitoring circuit has CAL MEAS and CAL OUT jacks — Set dial switch of TMS to 20.	
8a	Set KEYERS switch to 5 SIG OFF and RECEIVER switch to 6 MEAS 1 KC IN.	
9a	Depress TMS-C key momentarily.	TMS reads between −21.5 and −22.5 db.
10a	Set ATTEN to 34.	
11a	Set KEYERS switch to 6 SIG ON and RECEIVER switch to 4 MEAS INPUT.	
12a	Depress TMS-C key momentarily.	TMS reads between −23.5 and −24.5 db.
13b	If requirement of Step 12a is not met — Adjust GAIN potentiometer of TST AMPL for TMS reading of −24 db.	
14c	If testing and monitoring circuit does ***not*** have CAL MEAS and CAL OUT jacks — Set DIAL switch of TMS to 15.	
15c	Set KEYERS switch to 5 SIG OFF and RECEIVER switch to 6 MEAS 1 KC IN.	
16c	Depress TMS-C key momentarily.	TMS reads between −18.5 and −19.5 db.
17c	Set DIAL switch of TMS to 20.	
18c	Set ATTEN to 31.	
19c	Set KEYERS switch to 6 SIG ON and RECEIVER switch to 4 MEAS INPUT.	
20c	Depress TMS-C key momentarily.	TMS reads between −20.5 and −21.5 db.

STEP	ACTION	VERIFICATION
21d	If requirement of Step 20c is not met — Adjust GAIN potentiometer of TST AMPL for TMS reading of −21 db.	
22	Set KEYERS switch to 5 SIG OFF and RECEIVER switch to 5 M RLS.	
23	Operate 2-WIRE key.	
24	On SF unit — Block nonoperated C relay.	On SF unit — AL relay released.
25	Set KEYERS switch to 6 SIG ON.	On SF unit — AL relay remains released.
26	Turn ATTEN clockwise until AL relay operates.	Attenuator is changed by at least 4 db.
27	On SF unit — Remove block from C relay.	
28	Remove SF unit from testing circuit, install in its signaling bay location.	
29	Restore SF unit to service in accordance with standard procedures.	

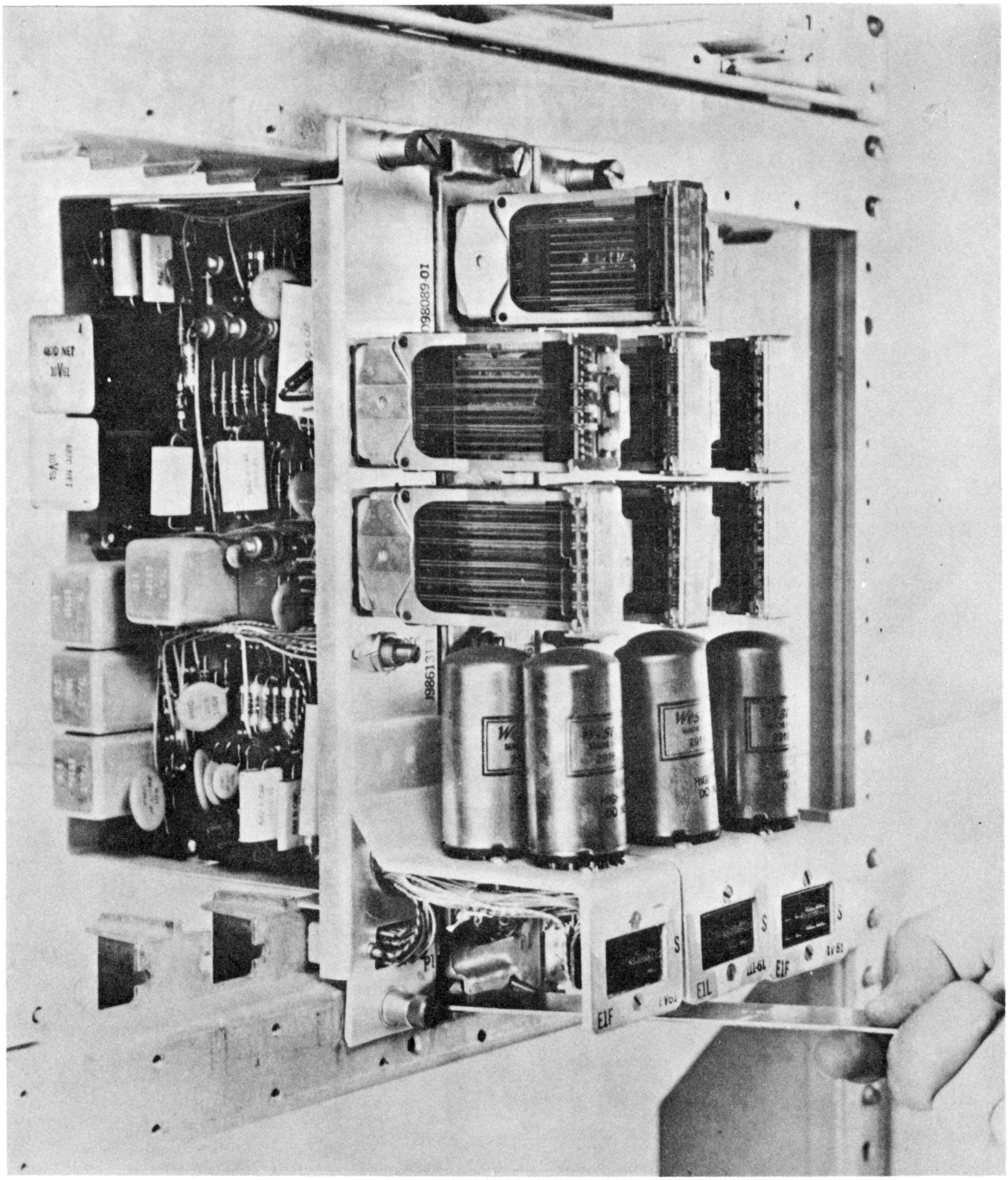

Fig. 1

This shows the tool used on the newer type mountings. The hooked end of tool is inserted under the raised portion of the mounting detail and leverage applied to disengage the unit.

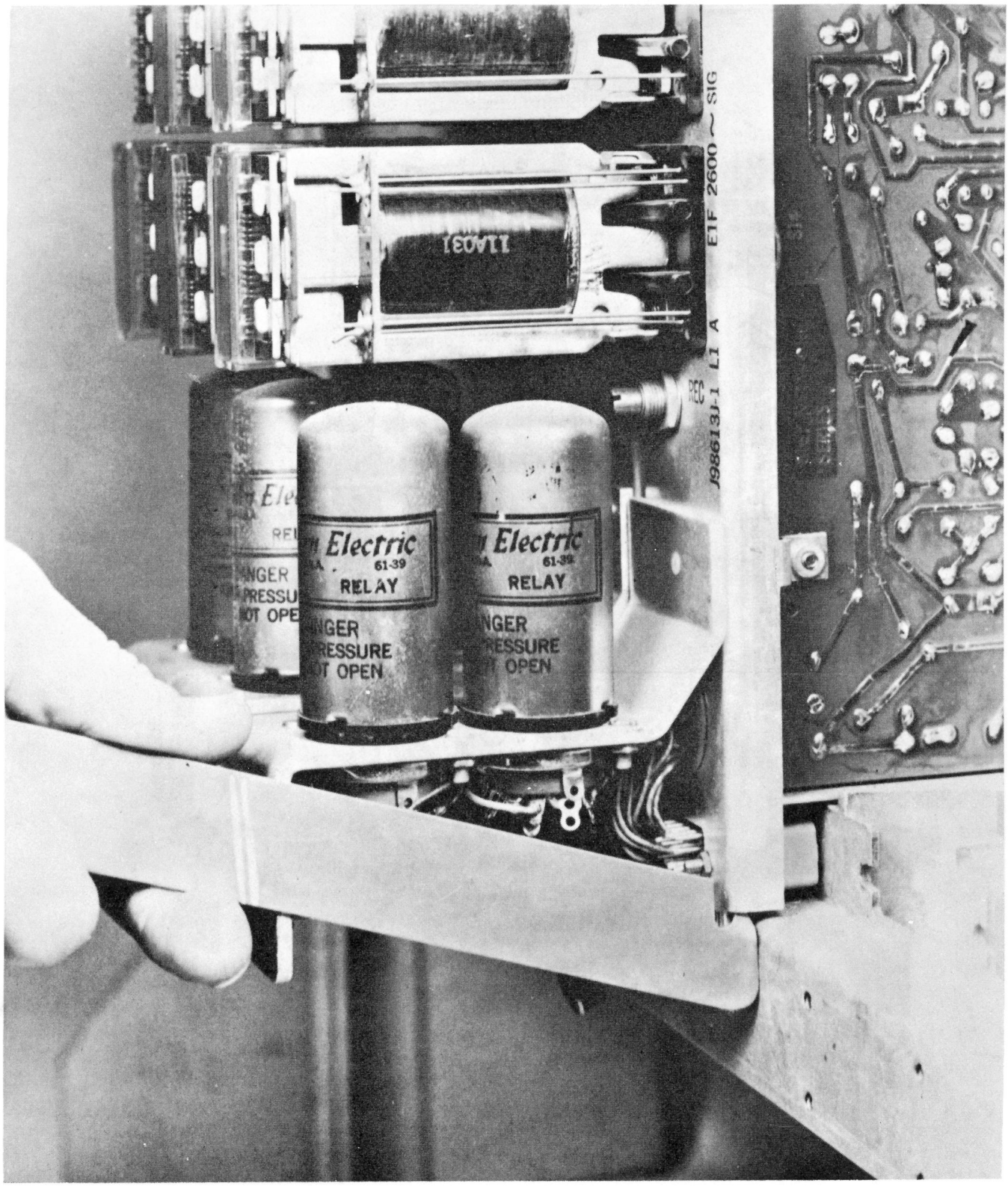

Fig. 2

Using the scribed marking as a guide slide the tool upward until the formed end hooks behind the signaling unit. The projecting bar is then worked against the mounting support to disengage the unit.