2600-HERTZ E1E SINGLE-FREQUENCY SIGNALING CIRCUIT (SD-98088-01 OR SD-98088-02) 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 2600-Hz single-frequency signaling circuit SD-98088-01 or SD-98088-02.

> ***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 add E1F designations to Part 1 and to add requirements to Test D for the unmodified and modified E1E unit when used with an associated unmodified or modified E1F unit.

1.03 The E1E signaling unit REC potentiometer must be adjusted before placing the unit in service.

1.04 The tests covered are:

*A. **Transmitted Tone Level:*** This test checks the levels of the 2600-Hz single-frequency tone.

*B. **Cutoff Current Q6 or Q67 Transistor:*** This test checks the transistor base bias 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 Amplifiers:*** This test checks the 2600-Hz receiver sensitivity and explains the adjustment of the SS potentiometer to get the required operation. It also checks the 2000-Hz receiver sensitivity and explains the adjustment of the RV potentiometer to get the required operation.

*E. **M Relay and Relay Sequence Circuit Operation Test:*** This test checks that the M relay will function properly in the 2-wire line and that the C1A, C1B, and C2 relays function properly.

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

1.05 Since major 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 SECTION	DESIGNATION ON SF UNIT
E1E	E1E
E1F	E1F
E1E-( )	All stampings except E1E
E1F-( )	All stampings except E1F

1.06 The J98613AY test panel (SD-96519-01 or SD-96519-02) is referred to in this section as the testing circuit. KEYERS switch 1 and RECEIVER switch 2 on this panel are referred to as SW1 and SW2, respectively.

1.07 ***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.

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

1.08 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 Level	A	All steps.
RCV Pot.	C	Steps 1, 4, 6, 16, 17, 19, 21, 40, 42, 45 through 49.
SS and RV Pot.	D	Steps 1, 4, 6, 7 through 12, 14, 16, 17 through 30, 36 through 41.
M, C2, C1A, and C1B Relays	E	All steps.

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.

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 one 310 plug and two 35 cord tips (2W42A).

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

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
KS-14510 Volt-Ohm-Milliammeter (VOM)	–	1	–	1	–	–
Cord (2.03)	1	–	1	1	–	1
Cord (2.04)	–	1	–	1	–	–
Tool (2.05)	1	1	1	1	1	1
Blocking Tools (2.06)	–	–	✓	✓	–	✓

✓As required.

2.05 The 725A tool is 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.	

STEP	ACTION	VERIFICATION
2	Obtain release of signaling circuit in standard manner as required.	
3	At signaling bay— Remove E1E signaling unit from its jack using disengaging tool. See Fig. 1 and 2.	
4	At testing circuit— Plug signaling unit into testing circuit jacks on folding bracket.	

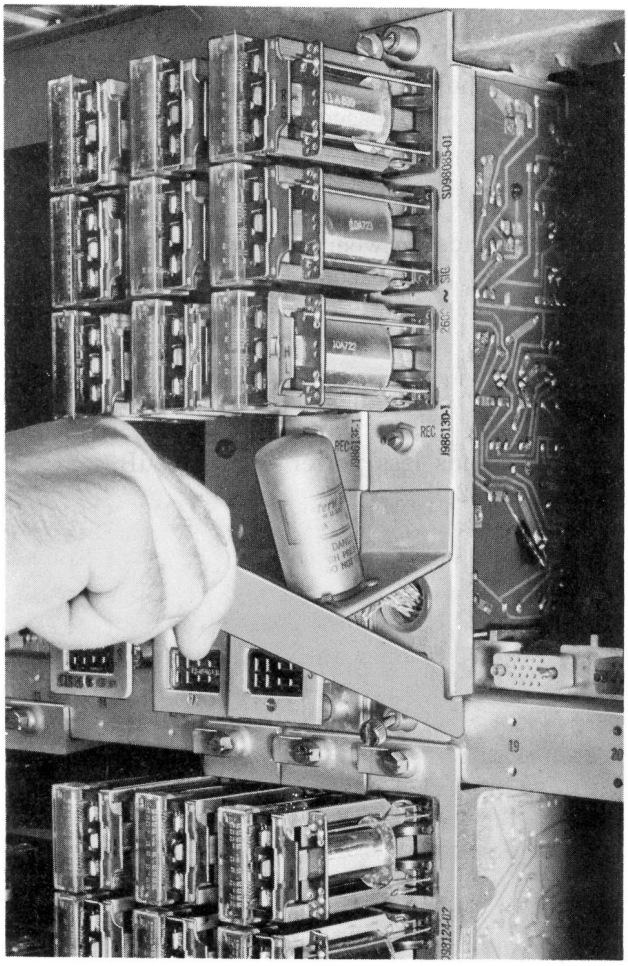

Fig. 1—Method of Removal of Fabricated Chassis

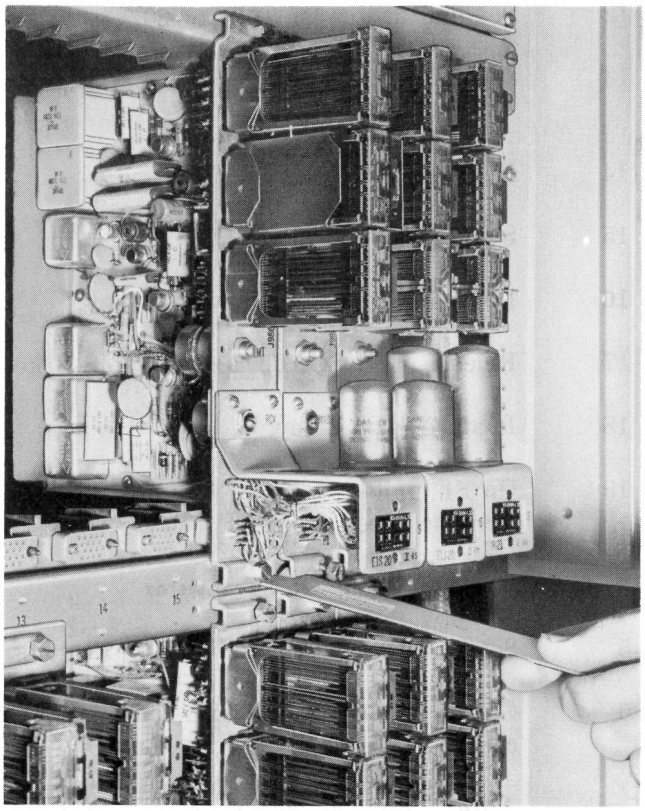

Fig. 2—Method of Removal of Die-Cast Chassis

Tests A, C, D, and F

5	TMS must be known to be correctly calibrated.
6	Connect TMS to TMS jack using 2W42A cord.

STEP	ACTION	VERIFICATION
4. METHOD		
A. Transmitted Tone Level		
7	Set dial switch of TMS to 35.	
8	Set SW1 to 4.	
9	On SF unit— Block RF relay operated.	
10	Operate E1E-1 key.	
11	Depress and hold TMS-A, TMS-B keys.	TMS reads between –35 and –37 dB. On SF unit— C2 relay is released.
12	Set dial switch of TMS to 20.	
13	Operate E1E-2 key.	TMS reads between –20 and –22 dB. C2 relay is released.
14	Restore E1E-2 key.	
15	Set dial switch of TMS to 40.	
16	Depress and hold E1E SOAK key.	TMS reads less power than –45 dB.
17	Release E1E SOAK, TMS-A, TMS-B keys.	
18	Restore E1E-1 key.	
19	On SF unit— Remove block from RF relay.	
B. Cutoff Current Q6 or Q67 Transistor		
5	Set selector switch of VOM to 12 volts.	
6	Connect VOM to SENS-1 jack 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 SW1 to 5 and SW2 to 2.	VOM reads 1.2 to 1.7 volts. On SF unit— R relay is operated.
8	Remove connection from VOM to SENS-1 jack.	

STEP	ACTION	VERIFICATION
	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 of TMS to 20.	
8a	Set SW1 to 5 and SW2 to 6.	
9a	Depress TMS-C key momentarily.	TMS reads between -21.8 and -22.2 dB.
10a	Turn SW2 to 2.	
11b	If testing and monitoring circuit does ***not*** have CAL MEAS and CAL OUT jacks— Set dial switch of TMS to 0.	
12b	Disconnect TMS from TMS jack, connect TMS to AMP OUT jack.	
13b	Turn SW2 to 2.	TMS reading should be exactly 0 dB.
14c	If requirement of Step 13b is not met— Adjust MON AMP to get a 0-dB reading.	
15c	Disconnect TMS from AMP OUT jack, connect TMS to TMS jack.	
16	Operate LP-BAT key.	
17	Operate LP-CUR-1 key.	
18	Operate 1000~ B key.	
19	Operate 2-WIRE key.	
20	Set dial switch of TMS to 0.	
21	On SF unit— Block C2 relay of signaling unit operated.	
22	Adjust REC potentiometer of signaling unit until TMS reads 0 dB.	
23	Set dial switch of TMS to 30.	
24	Operate 2-WIRE TER key.	
25	Depress TMS-A, TMS-B keys momentarily.	TMS reads between -30 and -45 dB.
26	Restore 2-WIRE TER key.	

STEP	ACTION	VERIFICATION
27	Restore 1000~ B key.	
28	Operate 1000~ A key.	
29	Set dial switch of TMS to 15.	
30	Depress TMS-A, TMS-B keys momentarily.	TMS reads between -15.4 and -16.2 dB.
31	Restore 1000~ A key.	
32	Set dial switch of TMS to 0.	
33	Turn SW1 to 6 and SW2 to 1.	
34d	If provided— Operate CT key.	
35	Set ATTEN to 10 dB.	
36	Depress and hold TMS-C key.	TMS reads 0 dB.
37e	If requirement of Step 36 is not met— Adjust GAIN potentiometer of TST AMPL to obtain TMS reading of 0 dB.	
38	Release TMS-C key.	
39	Set dial switch of TMS to 30.	
40	Turn SW2 to 2.	TMS reads less power than -30 dBm. On SF unit— RF relay is operated.
41	On SF unit— Block RF relay nonoperated.	TMS reads less power than -30 dBm.
42	Set SW1 to 5.	
43d	If provided— Restore CT key.	
44	On SF unit— Remove block from RF relay.	
45	Set dial switch of TMS to 5.	
46	Operate 1000~ B key.	

STEP	ACTION	VERIFICATION
47	Adjust REC potentiometer of SF unit. ***Note:*** 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 signaling unit plus 0.2 dB, caused by measuring 900-ohm circuit using 600-ohm TMS. ***Example:*** Specified value shown for signaling unit is 8.8 dB. The 8.8 dB plus 0.2 dB equals 9 dB.
48	On SF unit— Remove block from C2 relay.	
49	On testing circuit— Return all keys to normal.	

D. Operate Sensitivity of Receiver Signaling Amplifiers

7	Set SW1 to 6 and SW2 to 4.	
8	Set testing circuit ATTEN to: 32 for E1E; 36 for E1E-( ).	
9	Set dial switch of TMS to: 20 for E1E; 25 for E1E-( ).	
10	Depress and hold TMS-C key.	TMS reads –22 dB for E1E; –26 dB for E1E-( ).
11a	If requirement of Step 10 is not met— Adjust GAIN potentiometer of TST AMPL to obtain TMS reading of: –22 dB for E1E; –26 dB for E1E-( ).	
12	Release TMS-C key.	
13	Turn signaling unit SS potentiometer fully counterclockwise.	
14	Set SW2 to 3.	
15	Turn SS potentiometer slowly clockwise until RF relay operates on SF unit.	
16	Set SW1 to 5.	On SF unit— RF relay releases. R relay operates.
17	Set SW1 to 6.	On SF unit— RF relay operates. R relay releases.

STEP	ACTION	VERIFICATION
18	On SF unit— Block RF relay operated.	
19	Operate 2000~ key.	
20	Set SW2 to 1.	
21	Set dial switch of TMS to 0.	
22	Depress and hold TMS-C key.	
23	Adjust testing circuit ATTEN until: ▶If E1E-( ) is used with E1F-( )— TMS reads -1 ±0.1 dB If E1E or E1E-( ) is used with E1F— TMS reads +2 ±0.1 dB.◀	
24b	If adjustment of Step 23 is not met— Adjust GAIN potentiometer of TST AMPL to obtain TMS reading.	
25	Release TMS-C key.	
26	Set SW2 to 3.	
27	Set selector switch of VOM to 120 milliamperes.	
28	Operate BAT T R key.	
29	Connect VOM to MA jack using P2CH cord.	
30	Operate E1E-1 key.	
31	Turn RV potentiometer of signaling unit fully counterclockwise.	
32	Depress and hold MA E1E key.	VOM reads greater than 16 milliamperes. C2 relay is released.
33	Turn RV potentiometer of signaling unit very slowly clockwise ▶stopping at the point where the VOM reading just drops below 4 milliamperes.◀	
34	On SF unit— Manually operate C2 relay.	VOM reads greater than 16 milliamperes.
35	Release MA E1E key.	On SF unit— C2 relay releases.
36	Depress and hold MA E1E key.	VOM reads less than 4 milliamperes.

STEP	ACTION	VERIFICATION
37	Set SW1 to 5.	VOM reads greater than 16 milliamperes.
38	Release MA E1E key.	
39	Remove connection from VOM to MA jack.	
40	On SF unit— Remove block from RF relay.	
41	On testing circuit— Restore all keys to normal.	

E. M Relay and Relay Sequence Circuit Operation Test

5	Operate 2000~ key.	
6	Turn testing circuit ATTEN fully clockwise.	
7	Set SW1 to 5 and SW2 to 3.	
8	Operate E1E-1 key.	
9	Operate E1E-2 key.	
10	Depress and hold E1E NON OPR key.	On SF unit— C1A relay is released. C1B relay is released. R relay is operated.
11	Release E1E NON OPR key.	
12	Depress and hold E1E SOAK key.	On SF unit— C1A relay operates. R relay is operated. C1B relay is released.
13	Release E1E SOAK key.	On SF unit— C1B relay operates. C1A relay is operated. R relay is operated.
14	Depress and hold E1E OPR key.	On SF unit— C2 relay operates. C1A, C1B relays release.
15	Release E1E OPR key.	On SF unit— C2 relay releases.

STEP	ACTION	VERIFICATION
16	Depress and hold E1E OPR and E1E HOLD keys.	On SF unit— C1A relay operates.
17	Set SW1 to 6.	
18	Release E1E OPR key.	On SF unit— C1B relay remains released.
19	Depress E1E RLS key.	
20	Release E1E HOLD key.	On SF unit— C1B relay operates.
21	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 SW1 to 5 and SW2 to 6.	
9a	On SF unit— Block RF relay nonoperated.	
10a	Depress TMS-C key.	TMS reads between -21.5 and -22.5 dB.
11a	Set SW1 to 6 and SW2 to 4.	
12a	Set testing circuit ATTEN to 34.	
13a	Depress and hold TMS-C key.	TMS reads between -23.5 and -24.5 dB.
14b	If requirement of Step 13a is not met— Adjust GAIN of TST AMPL for TMS reading of -24 dB.	
15b	Release TMS-C key.	
16c	If testing and monitoring circuit does ***not*** have CAL MEAS and CAL OUT jacks— Set dial switch of TMS to 15.	
17c	Set SW1 to 5 and SW2 to 6.	
18c	On SF unit— Block RF relay nonoperated.	
19c	Depress TMS-C key momentarily.	TMS reads between -18.5 and -19.5 dB.

STEP	ACTION	VERIFICATION
20c	Set dial switch of TMS to 20.	
21c	Set SW1 to 6 and SW2 to 4.	
22c	Set testing circuit ATTEN to 31.	
23c	Depress and hold TMS-C key.	TMS reads between -20 and -22 dB.
24d	If requirement of Step 23c is not met— Adjust GAIN of TST AMPL for TMS reading of -21 dB.	
25c	If testing and monitoring circuit does ***not*** have CAL MEAS and CAL OUT jacks— Release TMS-C key.	
26	Set SW2 to 5.	
27	On SF unit— Remove block from RF relay.	On SF unit— RF relay should not operate.
28	On testing circuit— Turn ATTEN clockwise until RF relay operates.	Attenuator has been changed by at least 6 dB.
29	Remove SF unit from testing circuit jacks, install in its signaling bay location.	
30	Restore SF unit to service in accordance with standard procedures.	