2600-HZ E4D E5D SINGLE-FREQUENCY SIGNALING CIRCUIT OUT-OF-SERVICE TESTS USING TESTING CIRCUIT SD-96519-01 OR SD-96519-02

1. GENERAL

1.01 This section describes methods of making out-of-service tests of 2600-Hz single-frequency signaling circuits per SD-99764-01, using testing circuit per SD-96519-01 or SD-96519-02. It also describes methods of making potentiometer adjustments to correct for changes in the characteristics of some circuit elements. If the requirements of this section cannot be met after readjustment of potentiometers or relays, the units should be returned to a repair center because of special techniques involved in testing and clearing trouble on some of the components.

> ***Note:*** 303-Type relays shall be maintained in an upright position not less than 1 minute before beginning any tests.

1.02 This section is reissued to correct steps in Parts 2, 3, and 4 of the section. This reissue does not affect the Equipment Test List.

1.03 The tests covered are:

A. Operation of Transmitter CS, CS1, and HL Relays: This test checks that the CS relay is properly following off-hook and on-hook loop signals. Also checked are the CS1 and HL relays.

B. Transmitted Tone Level and RMB Check: This test checks the level of the transmitted single-frequency tone and the RMB relay.

C. Cut-Off Voltage of Q9 Transistor: This test checks that Q9 is not conducting when there is no signal input.

D. Test of 4-Wire Terminating Circuit, Gain of Receiver Voice Amplifier, and Blocking of Amplifier: The following features are checked: (1) transmission loss from 2-wire to 4-wire transmit and adjustment of TRNS potentiometer (2) transmission loss from 4-wire receive to 2-wire and adjustment of RCV potentiometer (3) transhybrid loss from 4-wire receive to 4-wire transmit (4) blocking of the voice amplifier by received signal frequency.

E. Operate Sensitivity of Receiver Signaling Amplifier: This test checks the receiver sensitivity and describes its adjustment by means of the SS potentiometer.

F. Timing of Receiver R and RG Relays: This test checks the operate and release time of the R and RG relays and tells how to adjust the OT and RT potentiometers.

G. Receiver Guard Action: This test checks the receiver guard circuit in limiting operation by voice signals.

1.04 The 13A or the J94021A (21A) transmission measuring set is referred to in this section as the TMS.

1.05 The dial switch on the 13A TMS or the DET INPUT switch on the 21A TMS is referred to in this section as the TMS attenuator switch. The specific settings of the TMS attenuator switch are not given in the procedure unless necessary to prevent overload and possible damage to the instrument. The proper setting will be that which results in an on-scale reading on the TMS meter and will depend upon whether the 13A or 21A TMS is used and the specific value to be measured.

1.06 The 2B signaling test set is referred to in this section as 2B test set.

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

this practice are part of the test circuit unless otherwise specified.

1.08 Make percent break adjustments of the 2B test set slowly above 70 percent to prevent pulsing out incorrect values. Incorrect values will be obtained if the rate of vibration of the PER CENT BREAK meter pointer is not the same as that of the PULSES PER SECOND meter pointer. To restore correct percent break values, turn the ADJ % BK control counterclockwise until both pointers are vibrating at the same rate, then turn the control slowly clockwise until the desired percent break value is obtained. It may also be necessary to change the coarse ADJ % BK switch from S, M, or L setting to obtain the desired range on the PERCENT BREAK meter.

1.09 ***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.

1.10 A brief test may be used to check new or modified units prior to placing them in service. The brief test is to be used only when it is reasonably certain that units have not suffered damage. These limited tests are not extensive enough to ensure that a unit will meet all requirements; however, they provide a reasonable degree of assurance of proper operation. If the unit fails to meet these test requirements, a complete test must be performed. Brief test steps in this section are designated with a bullet mark (●) preceding the steps in Tests A, B, D, E, F, and PREPARATION.

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 Test circuit, J98613AY (SD-96519-01 or SD-96519-02) including folding test fixture, J98613AC.

TABLE A

APPARATUS	TESTS						
	A	B	C	D	E	F	G
Test Circuit (2.02)	1	1	1	1	1	1	1
2B Test Set (2.03)	1		1			1	
TMS (2.04)	1	1		1	1		1
Cord (2.05)	1					1	
Cord (2.06)	1					1	
Cord (2.07)			1				
Cord (2.08)	1	1		1	1		1
Cord (2.09)	1						
258D (dummy) Plug	1					1	
Screwdriver, R-8210				1	1	1	
Tool (2.10)	1	1	1	1	1	1	1
Tool (2.11)				√	√		

√ As required.

2.03 ◗The 2B test set, J64730B (SD-56134-02) W option or later, includes power cords and patch cords for E and M leads (2P1D and 2P3B cords).◖

2.04 The 13A or the J94021A (21A) transmission measuring set (TMS).

2.05 Patching cord, P2A cord, 6 feet long, equipped with two 347A plugs (2P1D cord).

2.06 Patching cord, P2A cord, 6 feet long, equipped with two 347B plugs (2P3B cord).

2.07 Patching cord, P3E cord, 6 feet long, equipped with two 310 plugs (3P7A cord).

2.08 Testing cord: for 13A TMS, W2DL cord, 6 feet long, equipped with 310 plug and two 35 cord tips (2W42A cord); for 21A TMS, P3N cord, 6 feet long, equipped with a 241A plug and a 310 plug (3P17B cord).

2.09 Testing cord, 2 feet long, equipped with 8-pin (male) Jones plug KS-8585 L10 and 347 plug (P1P cord).

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

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

3. PREPARATION

STEP	ACTION	VERIFICATION
All Tests		
● 1	At test circuit— Set all keys to normal position before starting any tests. ***Note:*** 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.	
● 2	Obtain release of signaling circuit in accordance with approved procedures.	
● 3	Using 725A tool as shown in Fig. 1 or 2, remove signaling unit from its in-service position.	
● 4	Plug signaling unit into folding test fixture.	
● 5	Set SF key of testing circuit to 2600.	
● 6	Operate 2-WIRE key.	
● 7a	If test circuit is mounted in a REVERTIVE-TERMINATING bay, J98613AP— Turn CT key to operate position.	
Tests A, B, D, E, and G		
	Note: The tip or ring of line transmit terminals must not be connected to ac or dc ground.	
● 8	Connect 2W42A cord to IN terminals of 13A TMS or 241A plug of 3P17B cord to DET IN jack of 21A TMS.	
● 9	TMS should be known to be correctly calibrated.	
● 10	Connect TMS cord to SF SUP jack of test circuit.	▶TMS indicates between −14.6 and −16.1 dB.◀

STEP	ACTION	VERIFICATION

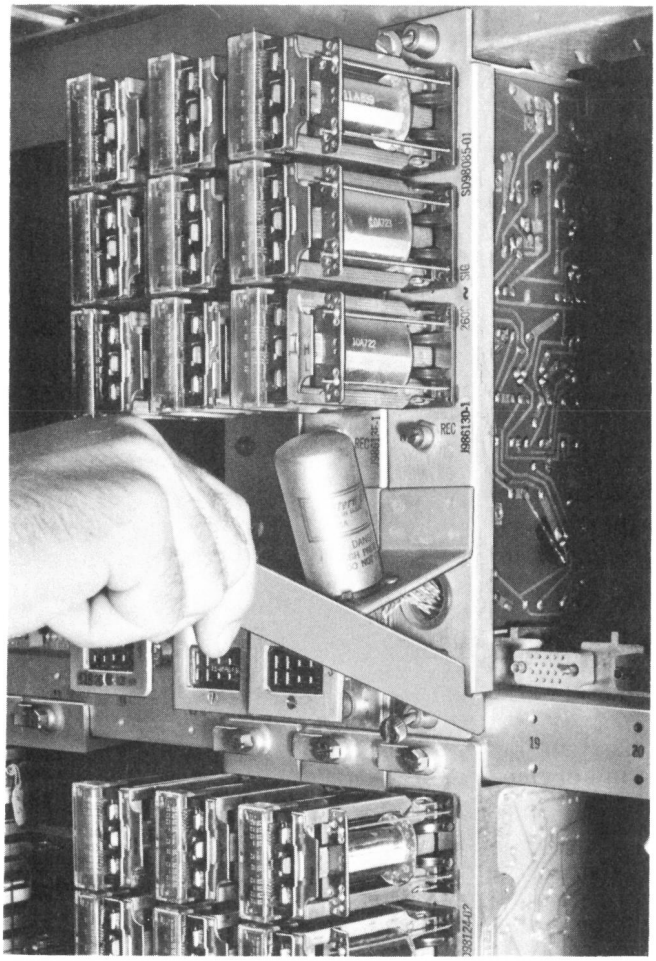

Fig. 1—Method of Removal of Fabricated Chassis

● 11 Set TMS attenuator switch to 0.

● 12 Disconnect plug from SF SUP jack, connect to AMP OUT jack of test circuit.

● 13 Set SW2 to position 2. TMS indicates 0 dB. See Step 14b.

● 14b If requirement of Step 13 is not met— Adjust gain control of MON AMPL to give a reading of exactly 0 dB.

● 15 Disconnect plug from AMP OUT jack, connect to TMS jack of test circuit.

STEP	ACTION	VERIFICATION

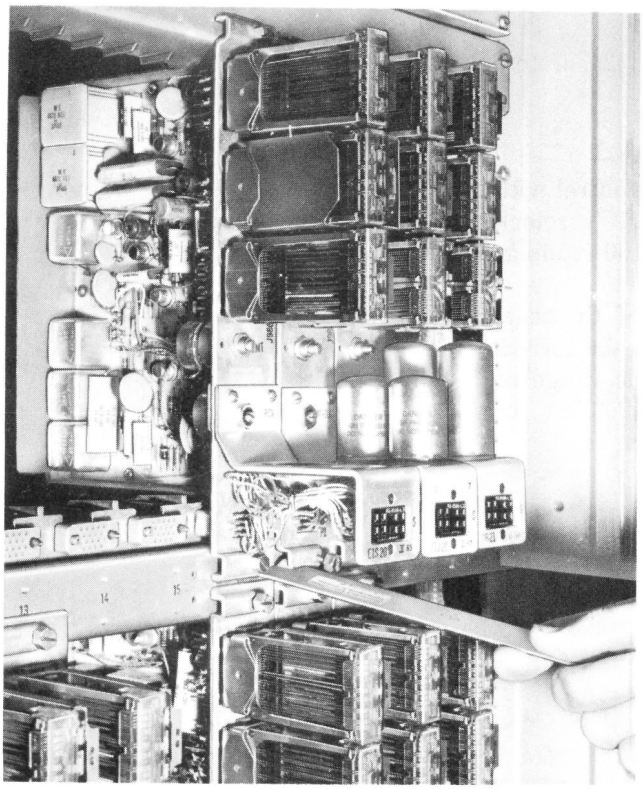

Fig. 2—Method of Removal of Die-Cast Chassis

Tests A, C, and F

●	16	Patch E and M jacks of test circuit to E and M jacks of 2B test set, using 2P3B and 2P1D cords.	
●	17	On 2B test set— Set all keys to normal position.	
●	18	Set SCALE SEL switch to PPS.	
●	19	Plug power cords of 2B test set into A and B jacks of test circuit.	After 1 minute, PULSES PER SECOND meter indicates other than 0.
●	20	Operate CONT PLS key to DIAL PLS.	PERCENT BREAK meter indicates 0 on ***black*** scale. See Step 21c.
●	21c	If requirement of Step 20 is not met— Adjust pointer adjustment screw of PERCENT BREAK meter to obtain 0 reading.	

STEP	ACTION	VERIFICATION
● 22	Insert 258D plug into P jack. ***Note:*** Repeat Steps 22, 23d, and 24, if test extends beyond 30 minutes.	PERCENT BREAK meter indicates 100 on ***black*** scale. See Step 23d.
● 23d	If requirement of Step 22 is not met— Unlock CAL % BK control, adjust control with screwdriver to obtain reading of 100, relock control taking care not to change 100 reading. ***Note:*** The proper performance of the tests covered in this section depends upon the correct pulse-per-second calibration and the range of the 2B test set. See Section 100-263-501 for calibration if accuracy is not known.	
● 24	Remove 258D plug.	
● 25	Restore CONT PLS key to normal.	

4. METHOD

STEP	ACTION	VERIFICATION
	A. Operation of Transmitter CS, CS1, and HL Relays	
● 26	On 2B test set— Adjust ADJ PPS control to 10 pps on PULSES PER SECOND meter (0 to 20 scale).	
● 27	With coarse ADJ % BK switch on M— Adjust ADJ % BK control to 55 on ***black*** scale of PERCENT BREAK meter.	
● 28	On test circuit— Set SW1 to position 7.	
● 29	On 2B test set— Operate TWD L key to OFF-HK, then PLS and MEAS % BK keys to LINE.	PERCENT BREAK meter indicates 55 on ***black*** scale. See Step 30e.
● 30e	If requirement of Step 29 is not met— Adjust M potentiometer of testing circuit to 55 on ***black*** scale of PERCENT BREAK meter.	
● 31	Adjust ADJ % BK control to 70 on ***black*** scale of PERCENT BREAK meter.	
● 32	Adjust ADJ PPS control until 21 on ***black*** scale of PERCENT BREAK meter is obtained.	PULSES PER SECOND meter indicates between 2.6 and 3.4 pps.

STEP	ACTION	VERIFICATION
● 33	Patch P1P test cord from S socket of signaling unit to M1 jack.	
● 34	On test circuit— Set SW1 and SW2 to position 1.	
● 35	On test circuit— Operate E1D 1 and E1D 2 keys.	CS and CS1 relays pulse. PERCENT BREAK meter indicates between 20 and 24 on ***black*** scale. See Step 36f.
● 36f	If requirement of Step 35 is not met— Adjust CS1 potentiometer until 21 is obtained.	
● 37f	If requirement of Step 36f is not met— Mechanical and electrical requirements of CS and CS1 relays on unit under test should be checked. Steps 26 and 31 through 35 should be repeated if any adjustments are made.	
● 38	On 2B test set— Operate course ADJ % BK control to L.	
● 39	Adjust ADJ % BK control to 80 on ***black*** scale of PERCENT BREAK meter.	CS and CS1 relays pulse. HL relay remains operated. See Step 40h.
● 40h	If the requirement of Step 39 is not met— Mechanical and electrical requirements of CS and CS1 relays on unit under test should be checked. Steps 26 and 31 through 35, 38, and 39 should be repeated if any adjustments are made.	
● 41	Restore PLS key to normal.	CS and HL relays are operated; CS1 relay is released.
● 42	Restore TWD L key to normal.	CS relay is released; CS1 relay operates releasing HL relay in less than 1 second. ***Note:*** In order to confirm verification, this step may be repeated by operating the TWD L key to OFF HK and then to normal.
● 43	Set attenuator switch of TMS to 20.	
● 44	Insert dummy plug into SF SUP jack.	
● 45	Set SW1 to position 2.	
● 46	Press TMS A and TMS B keys simultaneously.	

STEP	ACTION	VERIFICATION
● 47	On 2B test set— Operate TWD L key to OFF HK and PLS key to LINE.	
● 48	Adjust ADJ % BK control counterclockwise unitl 50 on ***black*** scale of PERCENT BREAK meter is obtained. ***Note:*** The indications in Verification depend upon setting the TRNS potentiometer for a −16 dBm TLP. See Test D, Step 16-21 inclusive.	Indications on TMS pulsate at 3-pps rate. See Step 50i.
● 49	Adjust ADJ % BK control slowly clockwise until TMS stops pulsating.	PERCENT BREAK meter indicates less than 80 on ***black*** scale. See Step 50i.
50i	If the requirements of both Steps 48 and 49 are not met— Cut circuit is not operating properly and unit must be returned to a repair center.	
51	Release TMS A and TMS B keys.	
52	Remove dummy plug from SF SUP jack.	
53	Restore E1D 1 and E1D 2 keys to normal.	
54	Remove test cord between S socket and M1 jack.	
55	On 2B test set— Restore keys to normal.	
56j	If no other tests are to be made— Remove all cords, restore all keys to normal, return signaling unit to service or spare position.	

B. Transmitted Tone Level and RMB Check

● 16	On test circuit— Operate E1D 1 and E1D 2 keys.	
● 17	Set SW1 to position 3, SW2 to position 1.	
● 18	Press TMS A and TMS B keys simultaneously.	TMS reads between −35 and −37 dB.
● 19	With TMS A and TMS B keys still pressed, set SW1 to position 4.	CS relay is operated; CS1 relay releases, operating HL relay. Reading of TMS should indicate less power than −45 dBm.

STEP	ACTION	VERIFICATION
	RMB Check	
● 20	Manually operate relay RG.	◗CS relay releases. TMS indicates less power than −45 dBm. When testing E4D— CS1 relay may momentarily operate but then releases. When testing E5D— CS1 relay operates.◖
● 21	Manually release relay RG.	
● 22	Release TMS A and TMS B keys.	
● 23	Set attenuator switch of TMS to 20.	
● 24	Block CS relay operated.	
● 25	Press TMS A and TMS B keys.	
● 26	Set SW1 to position 3.	
● 27	Remove blocking tool from CS relay. ***Note:*** In order to confirm verification, this step may be repeated by manually operating the CS relay and then allowing it to release.	CS relay is released; CS1 relay operates, releasing HL relay. Peak (kick) indication of TMS should be between −22 and −27 dB.
28	Release TMS A and TMS B keys.	
29	Restore E1D 1 and E1D 2 keys to normal.	
30	Set attenuator switch of TMS to 0.	
31c	If no other tests are to be made— Remove all cords, restore all keys to normal, return signaling unit to service or spare position.	
	C. Cut-Off Voltage of Q9 Transistor	
26	On test circuit— Set SW1 to position 5, SW2 to position 1.	
27	Using 3P7A cord, patch between SENS 1 jack and VM jack of 2B test set.	
28	On 2B test set— Set SCALE SEL switch to 20V.	VOLTS meter of 2B test set indicates not more than 0.7 volt.
29	Remove patch between SENS 1 jack and VM jack.	

STEP	ACTION	VERIFICATION
30	On 2B test set— Set SCALE SEL switch to PPS.	
31e	If no other tests are to be made— Remove all cords, restore all keys to normal, return signaling unit to service or spare position.	

D. Test of 4-Wire Terminating Circuit, Gain of Receiver Voice Amplifier, and Blocking of Amplifier

2-Wire to 4-Wire Loss

●	16	Operate 1000~A key.	
●	17	Set SW1 to position 5, SW2 to position 2.	
●	18	Verify that BAT LP key is in BAT position.	
●	19	Operate LP CUR 1 key.	CS relay is operated; CS1 relay releases, operating HL relay.
●	20	Set attenuator switch of TMS to 10 or 15, as required, depending upon value specified for signaling unit.	
●	21	Press TMS A and TMS B keys simultaneously.	TMS indicates specified values shown for signaling unit on trunk layout record minus 0.2 dB.
	22	Adjust TRNS potentiometer of signaling unit fully counterclockwise.	TMS indicates −40 dBm or less power.
	23	Set attenuator switch of TMS to 10.	
	24	Adjust TRNS potentiometer fully clockwise.	TMS indicates −13 dBm or greater power.
	25	Adjust TRNS potentiometer of signaling unit for specific 2-wire to 4-wire loss.	TMS indicates specified value shown for signaling unit on trunk layout record minus 0.2 dB.
●	26	▶While observing TMS reading, with TMS A and TMS B keys operated, restore LP CUR 1 key to normal.◀	▶Indication in Step 25 is removed, but reappears in about 1 second. See Step 28c.◀
●	27	▶Step 26 may be repeated until requirement is observed but first operate LP CUR 1 key.◀	
●	28c	▶If requirement of Step 26 is not met— The out circuit is not operating properly and the unit under test must be returned to a repair center.◀	

STEP	ACTION	VERIFICATION
● 29	▶Operate LP CUR 1 key.◀	
30	Release TMS A and TMS B keys.	
31	Restore 1000~ A key to normal.	
	RCV Potentiometer	
32	Set attenuator switch of TMS to 5 or 10, depending upon specified value for signaling unit.	
● 33	Operate 1000~B key. ***Note:*** Minor readjustments of the RCV potentiometer of less than 1 dB may be made to meet overall trunk net loss requirements.	TMS indicates specified value shown for signaling unit on trunk layout record plus 0.2 dB.
34d	If 2-wire loss is to be tested— Set RCV potentiometer fully counterclockwise.	TMS indicates −39 dBm or less power.
35d	Set attenuator switch of TMS to 0, ***red*** scale.	
36d	Adjust RCV potentiometer to full clockwise position.	TMS indicates +1 dBm or greater power.
37d	Adjust RCV potentiometer to obtain exactly 0-dB reading on TMS.	
	2-Wire Loss	
38d	Press TMS A and TMs B keys simultaneously.	TMS indication drops to between −11 and −18 dB.
39d	▶Operate 2W TER key.◀	▶TMS indication drops at least 15 dB below reading of Step 38d.◀
40d	▶Restore 2W TER key to normal.◀	
41d	Release TMS A and TMS B keys.	
42d	Set attenuator switch of TMS to 0.	
43d	Restore LP CUR 1 and 1000~ B keys to normal.	
44d	Set SW1 to position 6, SW2 to position 4.	
45d	Set ATT attenuator to 10.	TMS indicates 0 ±0.2 dB. See Step 46e.

STEP	ACTION	VERIFICATION
	Note: See Step 7a of Preparation.	
46e	If requirement of Step 45d is not met— Adjust gain potentiometer of TEST AMPL to obtain 0 dB.	
47	Set SW1 to position 5, SW2 to position 3.	▶CS relay is released. CS1 relay is operated.◀
48	Operate LP CUR 1 key.	CS relay is operated. ▶CS1 relay is released.◀
	Electronic Cut	
49	Block RG relay nonoperated.	
50	Set SW1 to position 6.	TMS indicates −40 dBm or less power.
51	Remove blocking tool from RG relay.	RG relay is operated. ▶When testing E4D— CS and CS1 relays are released. When testing E5D— CS relay is released. CS1 relay is operated.◀ *Note:* Operation of RG relay depends upon sensitivity adjustment. If RG relay does not operate, perform Test E, then repeat Steps 44d through 51 of this test.
52	▶Restore LP CUR 1 key.◀	▶TMS indicates −45 dBm or less power.◀
53	Set SW1 to position 5, SW2 to position 2.	
54	Operate 1000~A key.	
55	Block RG relay nonoperated.	
56	Set attenuator switch of TMS to 10 or 15.	
57	Press TMS A and TMS B keys simultaneously.	TMS indicates between −12 and −17 dB.
58	Set SW1 to position 6.	TMS indicates −40 dBm or less power.
59f	If requirement of Step 58 is not met— The cut circuit is not operating properly and the unit under test must be returned to a repair center.	
60	Release TMS A and TMS B keys.	

STEP	ACTION	VERIFICATION
61	Remove blocking tool from RG relay.	
62	Restore 1000~ A key to normal.	
63g	If Steps 34d through 42d were performed and requirements met— Set SW1 to position 5, SW2 to position 2.	RG relay is released.
64g	Set attenuator switch of TMS to 0 (***black*** scale).	
65g	Operate LP CUR 1 key.	CS relay is operated.
66g	Operate 1000~ B key.	TMS indicates 0 dB.
67g	Adjust RCV potentiometer of signaling unit for specific 4-wire to 2-wire loss. ***Note:*** Minor readjustments of the RCV potentiometer of less than 1 dB may be necessary to meet overall trunk net loss requirements.	TMS indicates specified value shown for signaling unit on trunk layout record plus 0.2 dB.
68g	Restore LP CUR 1 and 1000~ B keys to normal.	
69g	Operate, then release LP CUR 2 key.	
70	Set SW2 to position 4.	
71h	If no other tests are to be made— Remove all cords, restore all keys to normal, return signaling unit to service or spare position.	

E. Operate Sensitivity of Receiver Signaling Amplifier

● 16	On test circuit— Set SW1 to position 6, SW2 to position 4.	
● 17	Set attenuator switch of TMS to 0.	
● 18	Set ATT attenuator to 10.	TMS indicates 0 $\pm$0.2 dB. See Step 19c.
● 19c	If requirement of Step 18 is not met— Adjust gain control of TEST AMPL for 0-dB reading on TMS.	
● 20	Set ATT attenuator to 34.	

STEP	ACTION	VERIFICATION
● 21	Set SW2 to position 3.	RG relay should not operate. See Step 22d.
22d	If RG relay does operate— Adjust SS potentiometer of signaling unit slightly counterclockwise until RG relay releases.	RG relay is released.
● 23	Set ATT attenuator to 32.	RG relay is operated. See Step 24e.
24e	If RG relay does not operate— Increase setting of SS potentiometer until RG relay just operates.	
25e	Repeat Steps 20 through 24e, until requirements of Steps 21 and 23 are met, starting with SW2 in position 4.	
26	Set ATT attenuator to 40.	RG relay is released.
27	Set SW1 to position 5, SW2 to position 3.	RG relay is released.
28	Operate LP CUR 1 key.	CS relay is operated.
29	Set ATT attenuator to 26.	
30	Set SW1 to position 6.	RG relay remains released.
31	Set ATT attenuator to 20.	RG relay operates, releasing CS relay.
32	Set SW2 to position 1.	RG relay is released.
33	Restore LP CUR 1 key to normal.	
34f	If no other tests are to be made— Remove all cords, restore all keys to normal, return signaling unit to service or spare position.	

F. Timing of Receiver R and RG Relays

Note: The requirements of this test depend upon the setting of the SS potentiometer. Perform Test E first, if setting of SS potentiometer is unknown.

● 26 On 2B test set—
Adjust ADJ PPS control to 10 pps on PULSES PER SECOND meter (0 to 20 scale).

STEP	ACTION	VERIFICATION
● 27	With coarse ADJ % BK switch on M— Adjust ADJ % BK control for 55 on ***black*** scale of PERCENT BREAK meter.	
● 28	On test circuit— Set SW1 to position 7.	
● 29	➧On 2B test set— Operate TWD L key to OFF-HK, PLS and MEAS % BK keys to LINE.➧	PERCENT BREAK meter indicates 55 on ***black*** scale. See Step 30e.
● 30e	If requirement of Step 29 is not met— Adjust M potentiometer of testing circuit to 55 on ***black*** scale of PERCENT BREAK meter.	
● 31	Set ATT attenuator to 11.	
● 32	On 2B test set— Adjust ADJ % BK control to 33 on ***black*** scale of PERCENT BREAK meter.	
● 33	Turn ADJ PPS control counterclockwise to 3 pps on PULSES PER SECOND meter.	
● 34	On test circuit— Set SW1 to position 8, SW2 to position 3.	RG relay should not operate, as indicated by PERCENT BREAK meter ***red*** scale indication of between 0 and 6. See Steps 40f through 45f.
● 35	Set SW1 to position 7.	
● 36	On 2B test set— Adjust ADJ PPS control to 10 pps on PULSES PER SECOND meter.	
● 37	Adjust ADJ % BK control to 37 on ***black*** scale of PERCENT BREAK meter.	
● 38	Turn ADJ PPS control counterclockwise to 3 pps on PULSES PER SECOND meter.	
● 39	On test circuit— Set SW1 to position 8.	RG relay should pulse uniformly, as indicated by steady reading on PERCENT BREAK meter of 8 or more on ***red*** scale. See Steps 40f through 45f.

Adjust OT

40f	If requirement of Step 34 or 39 is not met— Set SW1 to position 7.	

STEP	ACTION	VERIFICATION
41f	On 2B test set— Adjust ADJ PPS control to 10 pps on PULSES PER SECOND meter.	
42f	Adjust ADJ % BK control to 35 on ***black*** scale of PERCENT BREAK meter.	
43f	Turn ADJ PPS control counterclockwise to 3 pps on PULSES PER SECOND meter.	
44f	On test circuit— Set SW1 to position 8.	
45f	Adjust OT potentiometer of signaling unit until RG relay just pulses steadily.	PERCENT BREAK meter indicates 8 or more on ***red*** scale.
Adjust RT		
46	On test circuit— Set SW1 to position 7.	
47	On 2B test set— Adjust ADJ PPS control to 10 pps on PULSES PER SECOND meter.	
48	Adjust ADJ % BK control to 45 on ***black*** scale of PERCENT BREAK meter.	
49	On test circuit— Set SW1 to position 8.	PERCENT BREAK meter indicates 50 to 52 on ***red*** scale. See Step 50g.
50g	If requirement of Step 49 is not met— Turn RT potentiometer of signaling unit fully counterclockwise; then, rotate clockwise until 51 is obtained.	
51	Set SW1 to position 7.	
52	On 2B test set— Adjust ADJ % BK control to 70 on ***black*** scale of PERCENT BREAK meter.	
53	On test circuit— Set SW1 to position 8.	PERCENT BREAK meter indicates between 55 and 70 on ***red*** scale.
54	Set SW1 to position 7.	
55	On 2B test set— Adjust ADJ PPS control to 12 pps on PULSES PER SECOND meter.	

STEP	ACTION	VERIFICATION
56	Adjust ADJ % BK control to minimum and then to 50 on ***black*** scale of PERCENT BREAK meter.	
57	Set SW1 to position 8.	Unit pulses uniformly with PERCENT BREAK meter indication between 54 and 64 on ***red*** scale.
58	Set SW1 to position 7.	
59	On 2B test set— Adjust ADJ % BK control to 75 on ***black*** scale of PERCENT BREAK meter.	
60	Set SW1 to position 8.	Unit pulses uniformly with PERCENT BREAK meter indication between 59 and 72 on ***red*** scale.
Rering Response		
61	On 2B test set— Adjust ADJ PPS control to 10 pps on PULSES PER SECOND meter.	
62	Set SW1 to position 7.	
63	On 2B test set— Adjust ADJ % BK control to 55 on ***black*** scale of PERCENT BREAK meter.	
64	Adjust ADJ PPS control to 4 pps on PULSES PER SECOND meter.	PERCENT BREAK meter indicates 22 on ***black*** scale. See Step 65h.
65h	If requirement of Step 64 is not met— Adjust ADJ PPS control until 22 on ***black*** scale of PERCENT BREAK meter is obtained.	
66	On test circuit— Operate LP CUR 1 key.	
67	Set SW1 to position 8.	CS and RG relays pulse. PERCENT BREAK meter indicates between 20 and 30 on ***red*** scale.
68	Change ATT attenuator in 2-dB increments from 5 to 17.	Reading in Step 67 should not vary more than ± 2 percent.
69	Set ATT attenuator to 11.	
70	Set SW1 to position 7.	

STEP	ACTION	VERIFICATION
71	On 2B test set— Adjust ADJ % BK control to 50 on ***black*** scale of PERCENT BREAK meter.	
72	Set SW1 to position 8.	PERCENT BREAK meter indication between 39 and 54 on ***red*** scale.
73	Set SW1 to position 7.	
74	Restore LP CUR 1 key to normal.	
75	On 2B test set— Restore all keys to normal.	
76i	If no other tests are to be made on this unit— Remove all cords, restore all keys to normal, return signaling unit to service or spare position.	

G. Receiver Guard Action

16	Set attenuator switch of TMS to 10 or 15.	
17	On test circuit— Set SW1 to position 5, SW2 to position 6.	TMS indicates between −18.5 and −19.5 dB.
18	Set ATT attenuator to 26.	
19	Set SW2 to position 5.	RG relay remains released.
20	Set SW1 to position 6.	RG relay remains released.
21	Set SW1 to position 5.	
22	Change ATT attenuator to 21.	
23	Set SW1 to position 6.	RG relay is operated.
24	Set SW1 to position 5.	RG relay is released.
25	Operate LP CUR 1 key.	CS relay is operated.
26	Set ATT attenuator to 22.	
27	Set SW1 to position 6.	RG relay remains released.
28	Change ATT attenuator to 16.	RG relay is operated. CS relay is released.
29	Set SW2 to position 4.	

STEP	ACTION	VERIFICATION
30	Remove all cords, restore all keys to normal, return signaling unit to service or spare position.	