2600-CYCLE E1A SINGLE-FREQUENCY SIGNALING CIRCUITS

OUT-OF-SERVICE TESTS USING TESTING CIRCUITS SD-56335-01 AND SD-95874-01

1. GENERAL

1.01 This section describes a method of making out-of-service tests of 2600-cycle single-frequency signaling circuits per SD-96499-01, using testing circuits SD-56335-01 and SD-95874-01. It also describes a method of making potentiometer adjustments to compensate for variations in the characteristics of some circuit elements. The E1A signaling units are factory tested and ready for service except for adjustment of the REC potentiometer. The tests and adjustments described in this section need be made only if trouble is indicated after making "over-all" pulsing and supervisory tests or "in-service" tests per Section 179-314-501 or by some other means. This section should not be used for performance requirements but can be used for an approximate setting of the REC potentiometer. On new units, failure to meet test limits of this section does not necessarily indicate that the unit is not suitable for service. 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.

Caution: Adjustments specified in this section should not be attempted during periods of power supply irregularities. Observe that springs of wire-spring relays are not crossed and that the covers and cards do not interfere with their proper operation. Also, 291-type relays shall be maintained in an upright position not less than 1 minute before beginning any tests.

1.02 The tests covered are:

*A. **Pulsing of Transmitter M Relay:*** This test checks that the M relay is properly following pulses.

*B. **Hold of HL Relay:*** This test checks that the HL relay releases in the desired time limit.

*C. **Transmitted Tone Level:*** This test checks the level of the transmitted single-frequency tone.

*D. **Bias of Q83 Transistor:*** This test checks the base bias and emitter current of this transistor for no signal input.

*E. **Test of 4-Wire Terminating Circuit, Gain of Receiver Voice Amplifier, Blocking of Amplifier and Insertion of Band-Elimination Network:*** The following features are checked. (1) Transmission loss from 2-wire to 4-wire transmit. (2) Transmission loss from 4-wire receive to 2-wire and approximate adjustment of REC potentiometer. (3) Trans-hybrid loss from 4-wire receive to 4-wire transmit. (4) Blocking of the voice amplifier by the received signal frequency and insertion of band-elimination network.

*F. **Operate Sensitivity of Receiver Signaling Amplifier:*** This test checks the receiver sensitivity and describes a method of adjusting the SS potentiometer to obtain the required operation.

*G. **Timing of Receiver R and RG Relays:*** This test checks the operate and release time of the R and RG relays and describes a method of adjusting the OT and RT potentiometers to meet requirements.

*H. **Receiver Guard Action and Permanent Signal:*** This test checks efficiency of the receiver guard circuit in preventing operation by voice signals and conditions on the permanent signal lead.

1.03 The transmission measuring set is referred to in this section as TMS.

1.04 The No. 2B signaling test set is referred to in this section as No. 2B test set.

1.05 Make per cent break adjustments of the No. 2B test set slowly above 70 per cent 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 PULSE PER SECOND meter pointer. To restore correct per cent break values, turn the ADJ % BK control counterclockwise until both pointers are vibrating at the same rate, then turn the control more slowly clockwise until the desired per cent break value is obtained. It may also be necessary to change the coarse ADJ % BK control from S, M, or L setting to obtain the desired range on the PER CENT BREAK meter.

1.06 It is anticipated that tests will be made in the order specified in this section.

1.07 The J68602CS test panel (SD-56335-01) is referred to in this section as CS panel. KEYERS switch 1 and RECEIVER switch 2 on this panel are referred to as SW 1 and SW 2, respectively. Jacks and keys associated with this circuit are located on the jack strip just below the unit.

1.08 The J98613N test panel (SD-95874-01, FS1) is referred to in this section as N panel. Jacks and keys associated with this circuit are located on the jack strip just above the CS panel. The folding test fixture, J98613AC, is mounted alongside the CS panel.

1.09 The J98613P test panel (SD-95874-01, FS2) is referred to in this section as P panel. The jacks and keys associated with this circuit are located on the jack strip just below the CS panel.

1.10 The LEV switch on the signaling unit, when in the +7 position, provides 7 db attenuation to the "line receive" level. The tests in this section are made with the LEV switch in the +7 position except where noted. If the switch was in the 0 position when the unit was removed from service, return it to that setting if the unit is to be placed in the same service as before.

1.11 ***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.

2. APPARATUS

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

TABLE A

APPARATUS	TESTS							
	A	B	C	D	E	F	G	H
Test Circuit (2.02)	1	1	1	1	1	1	1	1
No. 2B Test Set (2.03)	1	1	—	1	—	—	1	—
TMS (2.04)	—	—	1	—	1	1	1	1
Cord (2.05)	1	1	—	1	—	—	1	—
Cord (2.06)	1	1	—	1	—	—	1	—
Cord (2.07)	—	—	1	—	1	1	1	1
Cord (2.08)	—	—	—	1	1	—	—	—
Cord (2.09)	—	—	—	—	2	—	—	—
Tool (2.10)	1	1	1	1	1	1	1	1
No. 258D (dummy) Plug	1	1	—	1	—	—	1	—
Screwdriver, R-8210	—	—	—	—	1	1	1	—
Tool (2.11)	—	—	—	—	—	—	1	—
Tool (2.12)	—	—	√	—	√	—	—	—

√As required.

2.02 Testing circuit includes J68602CS (SD-56335-01), J98613N, and J98613P (SD-95874-01) and includes folding test fixture J98613AC.

2.03 No. 2B test set, J64730B (SD-56134-02) "W" option or later, includes power cords and patch cords for E and M leads (No. 2P1D and 2P3B cords).

2.04 No. 13A or 21A TMS, or equivalent, with the same dynamic characteristic. (No. 6A set is not satisfactory.)

2.05 Patching cord, P2A cord, 6 feet long, equipped with two No. 347A plugs (No. 2P1D cord).

2.06 Patching cord, P2A cord, 6 feet long, equipped with two No. 347B plugs (No. 2P3B cord).

2.07 Testing cord for TMS, W2BP cord, 6 feet long, equipped with No. 241A plug and two No. 35 cord tips (No. 2W15B cord).

2.08 Patching cord, P3E cord, 6 feet long, equipped with two No. 310 plugs (No. 3P7A cord).

2.09 Patching cord, P2AA cord, 6 feet long, equipped with two No. 241A plugs (No. 2P13B cord).

2.10 Disengaging tool, P-43C851, for removing signaling unit from working position.

2.11 Tool, 603A, for removing 291-type relays. Use in accordance with Section 040-263-501.

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

3. PREPARATION

3.01 The 552A twist keys in the testing circuit are operated when the white line is in the vertical position, and normal when the white line is in the horizontal position. The 552E twist keys are normal when the white arrow is pointing up.

STEP	ACTION	VERIFICATION
	Calibration of No. 2B Test Set for Tests A, B, D, and G	
1	Using No. 2P3B, 2P1D cords — Patch E, M jacks on P panel to E, M jacks of No. 2B test set.	
2	On No. 2B test set — Check that all keys are in normal position.	
3	On No. 2B test set — Set SCALE SEL switch to PPS.	
4	Plug power cords on No. 2B test set into A, B jacks on P panel.	After 1 minute, PULSES PER SECOND meter reads other than 0.
5	On No. 2B test set — Operate CONT PLS key to DIAL PLS.	PER CENT BREAK meter reads 0 on ***black*** scale. See Step 6a.
6a	If requirement of Step 5 is not met — Adjust pointer adjustment screw of PER CENT BREAK meter to obtain 0 reading.	
7	On No. 2B test set — Insert No. 258D plug into P jack. *Note:* Repeat Steps 7, 8b, and 9 if test extends beyond 30 minutes.	PER CENT BREAK meter reads 100 on ***black*** scale. See Step 8b.
8b	If requirement of Step 7 is not met — Unlock CAL % BK control, adjust to obtain reading of 100, relock.	

STEP	ACTION	VERIFICATION
9	On No. 2B test set — Remove No. 258D plug.	
10	On No. 2B test set — Restore CONT PLS key to normal.	
	Calibration of TMS and Test of SF Tone Supply Level for Tests C, and E Through H	
11	Connect No. 2W15B cord to IN terminals of TMS.	
12	Calibrate TMS in accordance with appropriate practice making sure to allow time for warmup (see Section 103-213-100 for No. 13A TMS).	
13	Connect TMS to SF SUP jack on P panel.	TMS reads −15.6 ± 0.5 db. See Step 14c.
14c	If requirement of Step 13 is not met — Check 2600-cycle oscillator supply circuit.	
15	Disconnect TMS from SF SUP jack. Connect to TMS jack.	
	All Tests	
16	Obtain release of signaling circuit in usual manner as required.	
17	Remove signaling unit from its service position, using disengaging tool.	
18	Plug signaling unit into folding test fixture.	
19	Plug folding test fixture cord into A2 connector on N panel.	
20	On P panel — Set SF key to 2600 (horizontal position).	
21	On P panel — Set 2-WIRE key to 2-WIRE.	
22	Set LEV switch on signaling unit to +7, record it if switch is in 0 position.	

4. METHOD

STEP	ACTION	VERIFICATION
	A. Pulsing of Transmitter M Relay	
23	On No. 2B test set — Adjust ADJ PPS control to obtain 10 pps reading on PULSES PER SECOND meter (0 to 20 scale).	

STEP	ACTION	VERIFICATION
24	On No. 2B test set — Adjust ADJ % BK control to minimum, then to obtain 45 reading on ***black*** scale of PER CENT BREAK meter, coarse ADJ % BK control to M.	
25	On CS panel — Set KEYERS SW 1, RECEIVER SW 2 to position 1 (see 1.07).	
26	On No. 2B test set — Operate TWD L key to OFF HK; PLS, MEAS % BK keys to LINE.	M relay pulses. PER CENT BREAK meter reads minimum 42 on ***black*** scale. See Step 27d.
27d	If requirement of Step 26 is not met — See following note. ***Note:*** An increase in per cent break can be obtained by increasing the armature back tension of the M relay (maximum 80 grams). If the relay has been changed in any way, the mechanical and electrical requirements must still be met and Steps 32e to 37e, inclusive, must be performed.	
28	On No. 2B test set — Set all keys to normal.	
29	On No. 2B test set — Adjust ADJ % BK control to obtain 70 reading on ***black*** scale of PER CENT BREAK meter.	
30	On No. 2B test set — Operate TWD L key to OFF HK; PLS, MEAS % BK keys to LINE.	PER CENT BREAK meter reads no more than 73 on ***black*** scale. See Step 31e.
31e	If requirement of Step 30 is met — Proceed to Step 38, otherwise see following note. ***Note:*** A decrease in per cent break can be obtained by decreasing the armature back tension of the M relay (minimum 30 grams). If the relay has been changed in any way, the mechanical and electrical requirements must still be met, and Steps 32e to 37e, inclusive, must be performed.	
32e	On No. 2B test set — Set all keys to normal.	

STEP	ACTION	VERIFICATION
33e	On No. 2B test set — Adjust ADJ % BK control to obtain 45 reading on ***black*** scale of PER CENT BREAK meter.	
34e	On No. 2B test set — Operate TWD L key to OFF HK; PLS, MEAS % BK keys to LINE.	PER CENT BREAK meter reads minimum 43 on ***black*** scale.
35e	On No. 2B test set — Set all keys to normal.	
36e	On No. 2B test set — Adjust ADJ % BK control to obtain 70 reading on ***black*** scale of PER CENT BREAK meter.	
37e	On No. 2B test set — Operate TWD L key to OFF HK; PLS, MEAS % BK keys to LINE.	PER CENT BREAK meter reads no more than 73 on ***black*** scale.
38	When requirements of Steps 26, 30 or Steps 34e, 37e have been met — On No. 2B test set — Restore all keys to normal.	
39f	If no other tests are to be made — Remove all cords, restore all keys to normal, set LEV switch to proper position (Step 22), return signaling unit to service or spare position.	
	B. Hold of HL Relay	
23	On No. 2B test set — Adjust ADJ PPS control to obtain reading of 10 pps on PULSES PER SECOND meter.	
24	On No. 2B test set — Adjust ADJ % BK control to minimum, then to obtain reading of 55 on ***black*** scale of PER CENT BREAK meter.	
25	On No. 2B test set — Adjust ADJ PPS control for lower pps reading until reading of 22 on ***black*** scale of PER CENT BREAK meter is obtained.	PULSES PER SECOND meter reads approximately 4 pps.
26	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 38 on ***black*** scale of PER CENT BREAK meter, coarse ADJ % BK control on L.	
27	On CS panel — Set SW 1 to position 2, SW 2 to position 1.	

STEP	ACTION	VERIFICATION
28	On No. 2B test set — Operate TWD L key to OFF HK.	M, HL relays operate —
29	On No. 2B test set — Operate PLS key to LINE.	M relay pulses. HL relay should remain operated. See Step 30d.
30d	If requirement of Step 29 is not met — Check Test A if M relay does not pulse; mechanical and electrical requirements for HL relay should be checked if HL relay pulses or does not operate.	
31d	Repeat Steps 23 to 29, inclusive, beginning with all keys of No. 2B test set in normal position.	
32	On No. 2B test set — Slowly turn ADJ % BK control in clockwise direction until HL relay just pulses.	
33	On No. 2B test set — Restore all keys to normal.	PER CENT BREAK meter reads between 39 and 74 on ***black*** scale.
34	On No. 2B test set — Restore coarse ADJ % BK control to M.	
35e	If no other tests are to be made — Remove all cords, restore all keys to normal, set LEV switch to proper position (Step 22), return signaling unit to service or spare position.	
	C. Transmitted Tone Level	
23	On CS panel — Set SW 1 to position 3, SW 2 to position 1.	
24	Set dial switch of TMS to 30.	TMS reads -34 ± 1.5 db.
25	Set dial switch of TMS to 15.	
26	Block operated HL relay of signaling unit.	TMS reads -20 ± 1.5 db.
27	On CS panel — Set SW 1 to position 4.	TMS reads less power than -45 dbm after M relay operates.
28	Remove block from HL relay.	HL relay remains operated, same reading as in Step 27.
29	Set dial switch of TMS to 20.	
30	On CS panel — Set SW 1 to position 5.	M, HL relays release.
31d	If no other tests are to be made — Remove all cords, restore all keys to normal, set LEV switch to proper position (Step 22), return signaling unit to service or spare position.	

STEP	ACTION	VERIFICATION
	D. Bias of Q83 Transistor	
23	Patch SENS jack of P panel to VM jack of No. 2B test set.	
24	On No. 2B test set — Set SCALE SEL switch to 20 volts.	
25	On CS panel — Set SW 1 to position 5.	On No. 2B test set — VOLTS meter reads between 1.2 and 1.7 volts.
26	Remove patch cord.	
27	On No. 2B test set — Set SCALE SEL switch to PPS.	
28d	If no other tests are to be made — Remove all cords, restore all keys to normal, set LEV switch to proper position (Step 22), return signaling unit to service or spare position.	
	E. Test of 4-Wire Terminating Circuit, Gain of Receiver Voice Amplifier, Blocking of Amplifier, and Insertion of Band-Elimination Network	
23	Set dial switch of TMS to 0.	
24	Disconnect TMS from TMS jacks, connect to T, R jacks on P panel.	
25	Using No. 3P7A cord, patch between T & R jack on P panel and 0-1000~ jack on N panel.	TMS reads exactly 0 db. See Step 26d.
26d	If requirement of Step 25 is not met — Verify calibration of TMS.	
27	Disconnect TMS from T, R jacks, connect to LINE TRANS jacks on P panel.	
28	Using No. 2P13B cord, patch between T, R jacks and TMS jacks on P panel.	
29	On CS panel — Set SW 1 to position 5, SW 2 to position 2.	M, HL relays operate.
30	Set dial switch of TMS to 15.	TMS reads -15.8 ± 0.3 db.
31	Disconnect one end of No. 2P13B cord from TMS jacks, connect it to SF TONE TST jacks on P panel.	
32	On CS panel — Set SW 1 to position 6, SW 2 to position 1.	M, HL relays release.
33	Set dial switch of TMS to 0.	
34	Disconnect TMS from LINE TRANS jacks, connect to TMS jacks.	

STEP	ACTION	VERIFICATION
35	On CS panel — Set ATT attenuator to 25.6.	TMS reads 0 db. See Step 36e.
36e	If requirement of Step 35 is not met — Adjust ATT attenuator to obtain 0 ± 0.1 db, then adjust V3 test amplifier for exactly 0 db.	
37	On CS panel — Set SW 2 to position 2.	M, HL relays operate.
38	Set dial switch of TMS to 5 or 10 depending on reading in Step 39.	
39	Set LEV switch of signaling unit to position as found in Step 22. ***Note:*** Minor readjustment of the REC potentiometer of less than 1 db may be necessary to meet over-all trunk net loss requirements.	TMS reads specified value for signaling unit shown on trunk circuit layout record plus 0.2 db (additional 0.2 db is due to measuring a 900Ω circuit using a 600Ω TMS). ***Example:*** Specified value shown for signaling unit is 8.8 db, 8.8 db + 0.2 db = 9 db. See Step 40f.
40f	If the requirement of Step 39 is not met and if no tests of the 4-Wire Terminating Circuit return loss (Steps 41 to 46 inclusive) or Voice Amplifier blocking and Band Elimination Network insertion (Steps 47 to 60 inclusive) are to be made, proceed to Step 68.	
41	With LEV switch in +7 position, adjust REC potentiometer of signaling unit under test to full clockwise position.	TMS reads −6 dbm or greater power.
42	Set LEV switch on signaling unit to 0 position.	TMS reads 7 ± 0.4 db more power than reading in Step 41.
43	Return LEV switch to + 7 position.	
44	Disconnect TMS from TMS jacks, connect to LINE TRANS jacks on P panel.	TMS reading drops to between −17 and −25 db.
45	Using another No. 2P13B cord, patch between TMS jacks, 2W TERM jacks on P panel.	
46	Set dial switch of TMS to 40.	TMS reads −45 dbm or less power.
47	Set dial switch of TMS to 0.	
48	Disconnect patch between TMS, 2W TERM jacks.	
49	Disconnect TMS from LINE TRANS jacks, connect to TMS jacks on P panel.	
50	Disconnect patches between 0-1000~, T & R and T, R, SF TONE TST jacks.	
51	On CS panel — Set SW 1 to position 6, SW 2 to position 4.	
52	On CS panel — Set ATT attenuator to 10.	TMS reads 0 ± 0.2 db. See Step 53g.

STEP	ACTION	VERIFICATION
53g	If requirement of Step 52 is not met — Adjust gain potentiometer of V3 test amplifier to obtain 0.	
54	On CS panel — Set SW 1 to position 5, SW 2 to position 3.	
55	Set dial switch of TMS to 40.	
56	Block nonoperated RG relay of signaling unit.	
57	On CS panel — Set SW 1 to position 6.	TMS reads −40 dbm or less power.
58	On CS panel — Set SW 2 to position 2.	M, HL relays operate. TMS reads −42 dbm or less power.
59	Remove block from RG relay. *Note:* Operation of RG relay depends on sensitivity adjustment. If RG relay does not operate do test F, then come back to this test.	RG relay operates. TMS reads −40 dbm or less power.
60	On CS panel — Set SW 2 to position 3.	M, HL relays release. TMS reads the same as in Step 59.
61	Set dial switch of TMS to 0.	
62	On CS panel — Set SW 1 to position 6, SW 2 to position 4.	RG relay releases.
63	On CS panel — Set ATT attenuator to 25.6.	
64	Using No. 2P13B cord, patch between T & R jacks, SF TONE TST jacks on P panel.	
65	Using No. 3P7A cord, patch between T & R jacks on P panel and 0-1000~ jack on N panel.	TMS reads 0 db. See Step 66h.
66h	If requirement of Step 65 is not met — Adjust ATT attenuator to obtain 0 ±0.2 db, then adjust V3 test amplifier for exactly 0 db.	
67	On CS panel — Set SW 2 to position 2.	M, HL relays operate. TMS reads −6 dbm or greater power.
68	Adjust REC potentiometer of signaling unit under test to specific 4-wire to 2-wire loss with LEV switch of signaling unit set to position required for proper circuit requirements. *Note:* Minor readjustment of the REC potentiometer of less than 1 db may be necessary to meet over-all trunk net loss requirements.	TMS reads specified value for signaling unit shown on trunk layout record plus 0.2 db (additional 0.2 db is due to measuring a 900Ω circuit using a 600Ω TMS). *Example:* Specified value shown for signaling unit is 8.8 db, 8.8 db + 0.2 db = 9 db.

STEP	ACTION	VERIFICATION
69	On CS panel — Set SW 2 to position 4.	M, HL relays release.
70	Disconnect patches between 0-1000~, T & R and T, R, SF TONE TST jacks.	
71i	If no other tests are to be made — Remove all cords, restore all keys to normal, set LEV switch to proper position (Step 22), return signaling unit to service or spare position.	
	F. Operate Sensitivity of Receiver Signaling Amplifier	
23	On CS panel — Set SW 1 to position 6, SW 2 to position 4.	
24	Set dial switch of TMS to 0.	
25	On CS panel — Set ATT attenuator to 10.	TMS reads 0 ± 0.2 db. See Step 26d.
26d	If reading in Step 25 is not met — Adjust gain control of V3 TEST AMPL in test panel for 0 db.	
27	On CS panel — Set ATT attenuator to 34.	
28	On CS panel — Change SW 2 to position 3.	RG relay should not operate. See Step 29e.
29e	If RG relay does operate — Change SW 2 to position 4, then adjust SS potentiometer slightly counterclockwise.	RG relay releases.
30e	On CS panel — Set SW 2 to position 3.	RG relay remains released.
31f	If RG relay operates again — Repeat Steps 29e, 30e until requirement of Step 30e is met.	
32	On CS panel — Set ATT attenuator to 32.	RG relay should operate. See Step 33g.
33g	If RG relay does not operate — Adjust SS potentiometer slightly clockwise until it just operates.	
34g	Repeat Steps 27 to 32, inclusive, starting with SW 2 in position 4, until requirements of these steps are met.	
35h	If no other tests are to be made — Remove all cords, restore all keys to normal, set LEV switch to proper position (Step 22), return signaling unit to service for spare position.	

STEP	ACTION	VERIFICATION
	G. Timing of Receiver R and RG Relays	
	Note: It is preferable to do Test F before performing any parts of this test.	
23	On No. 2B test set — Adjust ADJ PPS control to obtain reading of 10 pps on PULSES PER SECOND meter (0 to 20 scale).	
24	On No. 2B test set — Adjust ADJ % BK control for reading of 55 on ***black*** scale of PER CENT BREAK meter, coarse ADJ % BK control to M.	
25	On CS panel — Set SW 1 to position 7.	
26	On No. 2B test set — Set PLS, MEAS % BK keys to LINE; TWD L key to OFF HK.	PER CENT BREAK meter reads 55 on ***black*** scale. See Step 27d.
27d	If requirement of Step 26 is not met — Adjust M potentiometer of testing circuit to obtain reading of 55 on ***black*** scale of PER CENT BREAK meter.	
28	On CS panel — Set ATT attenuator to 11.	
29	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 33 on ***black*** scale of PER CENT BREAK meter.	
30	On CS panel — Set SW 1 to position 8, SW 2 to position 3.	RG relay may pulse, but not uniformly as indicated by approximately 0 on PER CENT BREAK meter ***red*** scale. Occasional kicks up to 25 per cent are permissible. See Steps 34e to 38f, inclusive.
31	On CS panel — Set SW 1 to position 7.	
32	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 37 on ***black*** scale of PER CENT BREAK meter.	
33	On CS panel — Set SW 1 to position 8.	RG relay should pulse uniformly as indicated by 42 or more on PER CENT BREAK meter ***red*** scale. See Steps 34e to 38f, inclusive.
34e	If requirements of Steps 30, 33 are met — Proceed to Step 39.	

STEP	ACTION	VERIFICATION
35f	If requirements of Step 30 or 33 are not met — Set SW 1 to position 7, proceed with following steps.	
36f	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 35 on ***black*** scale of PER CENT BREAK meter.	
37f	On CS panel — Set SW 1 to position 8.	
38f	Adjust OT potentiometer of signaling unit first fully clockwise and then counterclockwise until RG relay just pulses uniformly. ***Note:*** There is interaction between the OT and RT potentiometers. If the requirement of this step cannot be met, check that the RT potentiometer is in approximately mid-position and gives a reading of between 49 and 52 on ***red*** scale of PER CENT BREAK meter.	RG relay pulses uniformly as indicated by 42 or more on PER CENT BREAK meter ***red*** scale.
39	On CS panel — Set SW 1 to position 7.	
40	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 45 on ***black*** scale of PER CENT BREAK meter.	
41	On CS panel — Set SW 1 to position 8.	PER CENT BREAK meter reads 51 on ***red*** scale. See Step 42g.
42g	If requirement of Step 41 is not met — Turn RT potentiometer of signaling unit fully counterclockwise, then rotate clockwise until reading of 51 is obtained.	
43g	Repeat Steps 29 to 38f, inclusive, starting with SW 1 in position 7. ***Note:*** Repeat Steps 39 to 42g, inclusive, if any adjustment is made to the OT potentiometer.	
44	On CS panel — Set SW 1 to position 7.	
45	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 70 on ***black*** scale of PER CENT BREAK meter.	
46	On CS panel — Set SW 1 to position 8.	PER CENT BREAK meter reads at most 70 on ***red*** scale.

STEP	ACTION	VERIFICATION
Rering Response		
47	On CS panel — Set SW 1 to position 7.	
48	On No. 2B test set — Adjust ADJ % BK control to obtain a reading of 55 on ***black*** scale of PER CENT BREAK meter.	
49	On No. 2B test set — Adjust ADJ PPS control to obtain reading of 4 pps on PULSES PER SECOND meter.	PER CENT BREAK meter reads 22 on ***black*** scale. See Step 50h.
50h	If requirement of Step 49 is not met — Adjust ADJ PPS control until reading of 22 on ***black*** scale of PER CENT BREAK meter is obtained.	
51	On CS panel — Set SW 1 to position 8, SW 2 to position 2.	PER CENT BREAK meter reads between 22 and 30 on ***red*** scale.
52	On CS panel — Set SW 2 to position 4.	
53	On No. 2B test set — Restore keys to normal.	
54i	If no other tests are to be made — Remove all cords, restore all keys to normal, set LEV switch to proper position (Step 22), return signaling unit to service or spare position.	

H. Receiver Guard Action, Permanent Signal

Note: It is preferable to do Test F before performing any parts of this test.

23	On CS panel — Set SW 1 to position 5, SW 2 to position 6.	
24	On CS panel — Set TL key to +7.	
25	Set dial switch of TMS to 15.	TMS reads 19 ± 0.5 db.
26	On CS panel — Set ATT attenuator to 31.	
27	On CS panel — Set SW 2 to position 5.	RG relay should be released. P lamp should be lighted.
28	On CS panel — Move SW 1 to position 6.	RG relay remains released.
29	On CS panel — Change ATT attenuator to 26.	RG relay operates, extinguishing P lamp.

STEP	ACTION	VERIFICATION
30	On CS panel — Move SW 1 to position 5.	RG relay releases.
31	On CS panel — Set SW 2 to position 7.	M, HL relays operate.
32	On CS panel — Change ATT attenuator to 28.	
33	On CS panel — Move SW 1 to position 6.	RG relay remains released. F lamp should be lighted.
34	On CS panel — Change ATT attenuator to 20.	RG relay operates, extinguishing F lamp.
35	On CS panel — Set SW 1 to position 5, SW 2 to position 4.	RG, M, HL relays release.
36d	If no other tests are to be made — Remove all cords, restore all keys to normal, set LEV switch to proper position (Step 22), return signaling unit to work or spare position.	