

2600-CYCLE E1D SINGLE-FREQUENCY SIGNALING CIRCUITS

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

1. GENERAL

1.01 This section describes methods of making out-of-service tests of 2600-cycle single-frequency signaling circuits per SD-98087-01, using testing circuits per SD-95874-01 and SD-56335-01. It also describes methods of making potentiometer adjustments to correct for changes in the characteristics of some circuit elements. The E1D signaling units are factory tested and ready for service except for the REC potentiometer adjustment. The tests and adjustments described in this section, with the above exception, need be made only if trouble is indicated after making over-all test calls or in-service tests per Section 179-314-501 or by some other means. This section should be used for adjusting the REC potentiometer, but should not be used for performance requirements. 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. **Operation of Transmitter CS Relay:** This test checks that the CS relay is properly following off-hook and on-hook loop signals.

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

C. **Bias of Q78 Transistor:** This test checks the base bias and emitter current of this transistor for 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. (2) Transmission loss from 4-wire receive to 2 wire and adjustment of REC potentiometer. (3) Trans-hybrid loss from 4-wire receive to 4-wire transmit. (4) Blocking of the voice amplifier by received signal frequency. (5) Final adjustment of REC potentiometer.

E. **Operate Sensitivity of Receiver Signaling Amplifier:** This test checks the receiver sensitivity and tells how to adjust the SS potentiometer to get the required operation.

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 how effective the receiver guard circuit is in preventing operation by voice signals.

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 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.

1.06 The J98613N test panel (SD-95874-01, FS1) is referred to in this section as N panel. Jacks and keys associated with this circuit

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are located on the jack strip just above the CS panel.

1.07 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.

1.08 The J98613BA auxiliary test unit (SD-95874-01, FS3) is referred to in this section as BA panel. Jacks and keys associated with this circuit are mounted on the mounting plate with associated inductor and other apparatus. It is most likely located below the jack strip of the P panel.

1.09 Make 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 half that of the PULSES 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 switch from S, M, or L setting to obtain the desired range of the PER CENT BREAK meter.

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

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 paragraph indicated by the number in parentheses.

TABLE A

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

√As required.

2.02 Testing circuit includes J68602CS (SD-56335-01), J98613N, J98613P, and J98613BA (SD-95874-01), and includes folding test fixture J98613AC.

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

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

2.05 Testing cord, W2BP cord, 6 feet long with two No. 35 cord tips, equipped with a No. 241A plug (No. 2W15B cord).

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

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

2.08 Patching cord, P3N cord, 6 feet long, equipped with one No. 241A plug and one No. 310 plug (No. 3P17B cord).

2.09 Testing cord, 2 feet long, equipped with 8-pin (male) Jones plug KS-8585, L10, and No. 347 plug (P1P cord).

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

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

3. PREPARATION

STEP	ACTION	VERIFICATION
Calibration of TMS for Tests B, D, E, and G		
1	Calibrate TMS in accordance with appropriate practice (see Section 103-213-100 for No. 13A TMS, allow warmup time).	
2	Connect No. 2W15B cord to TMS.	
All Tests		
3	Obtain release of signaling circuit in usual manner as required.	
4	Remove signaling unit from its service position connector using disengaging tool.	
5	Plug unit to be tested into folding test fixture.	
6	Plug folding test fixture cord into A2 connector on N panel.	
7	Using No. 2P3B cord, patch from E jack of No. 2B test set to No. 2B E jack on P panel. <i>Note:</i> The individual tests specify to which jack the M lead should be connected. If it is not mentioned, do not connect it.	
8	On P panel — Turn 2-WIRE key to 2 WIRE.	
Tests A, F, and G		
	<i>Note:</i> If the No. 2B test set has been recently calibrated and the person performing the tests has reason to believe that it is in good adjustment, Steps 9 through 13 and 17 can be eliminated. Steps 14, 15, and 16 should be repeated at 30-minute intervals.	
9	On No. 2B test set — Set SCALE SEL switch to PPS.	
10	On No. 2B test set — Restore all lever keys to normal.	
11	Plug power cords of No. 2B test set into A, B jacks on P panel.	After 1 minute, PULSES PER SECOND meter reads other than 0.
12	On No. 2B test set — Operate CONT PLS key to DIAL PLS.	PER CENT BREAK meter reads 0 on <i>black</i> scale. See Step 13a.
13a	If requirement of Step 12 is not met — Adjust pointer adjustment screw of PER CENT BREAK meter to obtain 0 reading.	

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STEP	ACTION	VERIFICATION
14	Insert No. 258D plug into P jack. <i>Note:</i> If test extends beyond 30 minutes, repeat Steps 14, 15b, and 16.	PER CENT BREAK meter reads 100 on <i>black</i> scale. See Step 15b.
15b	If requirement of Step 14 is not met — Unlock CAL % BK control, adjust to obtain reading of 100, relock control taking care not to change 100 reading.	
16	Remove No. 258D plug.	
17	Restore CONT PLS key to normal.	

4. METHOD

STEP	ACTION	VERIFICATION
	A. Operation of Transmitter CS Relay	
18	On No. 2B test set — Set SCALE SEL switch to PPS.	
19	On No. 2B test set — Restore all keys to normal.	
20	Connect P1P test cord from S socket of signaling unit to M1 jack on P panel.	
21	Using No. 2P1D cord, connect M jack of No. 2B test set to LP-M jack on P panel.	
22	On CS panel — Set SW 1, SW 2 in position 1.	
23	On No. 2B test set — Adjust ADJ PPS control to obtain 10 pps reading on PULSES PER SECOND meter (0 to 20 scale).	
24	On No. 2B test set — Operate PLS, MEAS % BK keys to LINE, TWD-L key to OFF-HOOK.	
25	On P panel — Turn E1D key to E1D.	
26	On P panel — Turn CAL key to CAL.	
27	On No. 2B test set— Adjust ADJ % BK control to obtain reading of 30 on <i>black</i> scale of PER CENT BREAK meter, set coarse ADJ % BK switch to M.	
28	Turn CAL key to normal position.	
29	On P panel — Turn ON-HOOK PULSE key to PULSE.	CS relay pulses. PER CENT BREAK meter reads 35 ±5 on <i>black</i> scale. See Step 30c.

STEP	ACTION	VERIFICATION
30c	If requirement of Step 29 is not met — It may be caused by improper mechanical electrical, adjustments of the CS relay on unit under test. Check relay per Circuit Requirement Table.	
31c	Restore ON-HOOK PULSE key to normal.	CS relay releases.
32c	Repeat Steps 25 to 29, inclusive, if any adjustments have been made on the CS relay.	
33	Restore E1D, ON-HOOK PULSE keys to normal.	
34	Remove patch cord between S socket, M1 jack.	
35	On No. 2B test set — Restore all keys to normal.	
36d	If no other tests are to be made — Remove all cords, restore 2-WIRE key to normal, return signaling unit to service or spare position.	
B. Transmitted Tone Level		
9	Set dial switch of TMS to 35.	
10	Connect TMS to TMS jack of P panel.	
11	On CS panel — Set SW 1 to position 3, SW 2 to position 1.	
12	Connect M jack of No. 2B test set to LP-M jack on P panel.	
13	On P panel — Turn E1D key to E1D.	
14	On P panel — Turn ON-HOOK PULSE key to PULSE.	
15	On No. 2B test set — Operate TWD-L key to ON-HOOK.	TMS reads -35.5 ± 1.5 db.
16	Set dial switch of TMS to 40.	
17	On No. 2B test set — Operate TWD-L key to OFF-HOOK.	CS relay should operate. TMS reads less power than -45 dbm.
18	Disconnect TMS from TMS jack.	
19	On No. 2B test set — Restore all keys to normal.	
20	Restore E1D, ON-HOOK keys to normal.	CS relay releases.
21	Remove patch cord from LP-M jack.	

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STEP	ACTION	VERIFICATION
22a	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. Bias of Q78 Transistor		
9	On CS panel — Set SW 1 to position 5, SW 2 to position 1.	
10	Using No. 3P7A cord, patch SENS jack on P panel to VM jack of No. 2B test set.	
11	On No. 2B test set — Set SCALE SEL switch to 20V.	VOLTS meter reads between 0.5 and 1.7 volts.
12	Remove patch from SENS jack to VM jack.	
13a	If no other tests are to be made — Remove all cords, restore 2-WIRE key 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		
9	Set dial switch of TMS to 0.	
10	Connect TMS to 0-1000~ jack on N panel.	TMS reads 0 db. See Step 11a.
11a	If requirement of Step 10 is not met — Verify calibration of TMS.	
12	Disconnect TMS from 0-1000~ jack, connect to LINE TRANS jack on P panel.	
13	Patch TMS jack on P panel to 2-WIRE A jack on BA panel.	
14	On CS panel — Set SW 1 to position 5, SW 2 to position 3.	
15	Set dial switch of TMS to 15.	
16	Patch TMS-A jack on BA panel to 0-1000~ jack on N panel.	
17	On BA panel — Turn E1D-A key to E1D-A.	
18	On BA panel — Turn REV-A key to REV-A.	CS relay operates. TMS reads -15.5 ±0.5 db.
19	Restore E1D-A, REV-A keys to normal.	
20	Disconnect patch between 0-1000~, TMS-A jacks.	
21	Disconnect TMS from LINE TRANS jack.	
22	Connect TMS to TMS-A jack on BA panel.	

STEP	ACTION	VERIFICATION
23	On CS panel — Set SW 1 to position 6, SW 2 to position 4.	CS relay releases.
24	On CS panel — Set ATT to 25.6.	
25	Set dial switch of TMS to 0.	
26	Patch SF TONE TEST jack on CS panel to 0-1000~ jack on N panel.	TMS reads 0 db. See Step 27b.
27b	If requirement in Step 26 is not met — Adjust ATT to obtain 0 ± 0.1 db, then ad- just V3 test amplifier for exactly 0 db.	
28	On CS panel — Set SW 2 to position 3.	
29	On BA panel — Turn E1D-A key to E1D-A.	
30	On BA panel — Turn REV-A key to REV-A.	CS relay operates. 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 900 Ω circuit using a 600 Ω TMS.)
	<i>Note:</i> Minor readjustment of REC poten- tiometer of less than 1 db may be necessary to meet over-all trunk net loss requirements.	<i>Example:</i> Specified value shown for sig- naling unit is 8.8 db. $8.8 + 0.2 = 9$ db.
31	Set dial switch of TMS to +0.	
32	Turn REC potentiometer to full clockwise position.	TMS reads +1.5 dbm or greater power.
33	Disconnect TMS from TMS-A jack, connect to LINE TRANS jack on P panel.	
34	Set dial switch of TMS to 10.	
35	On BA panel — Insert No. 258D plug into TMS-A jack.	TMS reads between -10 and -20 db.
36	Remove No. 258D plug.	TMS reads -40 dbm or less power.
37	Disconnect TMS from LINE TRANS jack, connect to TMS-A jack on BA panel.	
38	Remove patch between 0-1000~, SF TONE TEST jacks.	
39	On CS panel — Set SW 1 to position 6, SW 2 to position 4.	CS relay releases.
40	Set dial switch on TMS to 0.	
41	On CS panel — Set ATT to 10.	TMS reads 0 ± 0.2 db. See Step 42c.
42c	If requirement of Step 41 is not met — Adjust gain potentiometer of V3 test am- plifier to obtain this reading.	

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STEP	ACTION	VERIFICATION
43	Block nonoperated RG relay.	
44	On CS panel — Set SW 2 to position 3.	CS relay operates. TMS reads -40 dbm or less power.
45	Remove blocking tool, allowing RG relay to operate.	CS relay releases.
46	Restore E1D-A, REV-A keys to normal.	TMS reads -45 dbm or less power.
47	Set dial switch of TMS to 0.	
48	On CS panel — Set SW 1 to position 6, SW 2 to position 4.	RG relay releases.
49	On CS panel — Set ATT to 25.6.	
50	Patch SF TONE TEST jack on P panel to 0-1000~ jack on N panel.	TMS reads 0 db. See Step 51d.
51d	If requirement of Step 50 is not met — Adjust ATT to obtain 0 ± 0.1 db, then adjust V3 test amplifier for 0 db.	
52	On BA panel — Turn E1D-A key to E1D-A.	
53	On BA panel — Turn REV-A key to REV-A.	
54	On CS panel — Set SW 2 to position 3.	TMS reads +1.5 dbm or greater power.
55	Adjust REC potentiometer of signaling unit under test to specific 4-wire to 2-wire loss. <i>Note:</i> 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 900 Ω circuit using a 600 Ω TMS). <i>Example:</i> Specified value shown for signaling unit is 8.8 db. $8.8 + 0.2 = 9$ db.
56	Remove patch between 0-1000~, SF TONE TEST jacks.	
57	Restore E1D-A, REV-A keys to normal.	
58	Remove patch between TMS jack, 2-WIRE A jack.	
59	Disconnect TMS from TMS-A jack.	
60e	If no other tests are to be made — Remove all cords, restore 2-WIRE key to normal, return signaling unit to service or space position.	

E. Operate Sensitivity of Receiver Signaling Amplifier

9	On CS panel — Set SW 1 to position 6, SW 2 to position 4.
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STEP	ACTION	VERIFICATION
10	Connect TMS to TMS jack on P panel.	
11	On CS panel — Set ATT to 10.	TMS reads 0 ± 0.2 db. See Step 12a.
12a	If reading in Step 11 is not met — Adjust gain control of V3 amplifier in CS panel for 0 db.	
13	Disconnect TMS from TMS jack.	
14	Set ATT to 34.	
15	Change SW 2 to position 3.	RG relay should not operate. See Step 16b.
16b	If RG relay does operate — Change SW 2 to position 4, adjust SS potentiometer of signaling unit slightly counterclockwise.	
17	Set SW 2 to position 3.	RG relay should not operate.
18c	If requirement of Step 17 is still not met — Repeat Steps 16, 17 until requirement is met.	
19	Change SW 2 to position 4.	RG relay should remain released.
20	Set ATT to 32.	
21	Change SW 2 to position 3.	RG relay should operate. See Step 22d.
22d	If RG relay does not operate — Increase setting of SS potentiometer until it just operates.	
23d	Repeat Steps 14 to 21, inclusive, until these requirements are met.	
24e	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

18	On No. 2B test set — Set all keys to normal.
19	Connect M jack of No. 2B test set to 2B M jack on P panel.
20	On No. 2B test set — Set SCALE SEL switch to PPS.
21	On No. 2B test set — Adjust ADJ PPS control to obtain reading of 10 pps on PULSES PER SECOND meter (0 to 20 scale).

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STEP	ACTION	VERIFICATION
22	On No. 2B test set — Adjust ADJ % BK control for reading of 55 on <i>black</i> scale of PER CENT BREAK meter, set coarse ADJ % BK control to M.	
23	On CS panel — Set SW 1 to position 7.	
24	On No. 2B test set — Set PLS, MEAS % BK keys of signaling test set to LINE, TWD-L key to OFF-HOOK.	
25	Adjust M potentiometer of testing circuit to obtain reading of 55 on <i>black</i> scale of PER CENT BREAK meter.	
26	On CS panel — Set ATT to 11.	
	<i>Note:</i> When the unit is stamped J98613F or J98613F, L1, proceed with the following steps. When it is stamped J98613F, L2, proceed to Step 57.	
27	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 33 on <i>black</i> scale of PER CENT BREAK meter.	
28	On CS panel — Set SW 1 to position 8, SW 2 to position 3.	RG relay should not fully operate as indicated by approximately 0 on PER CENT BREAK meter <i>red</i> scale. See Step 32c.
29	Set SW 1 to position 7.	
30	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 37 on <i>black</i> scale of PER CENT BREAK meter.	
31	Set SW 1 to position 8.	RG relay should pulse uniformly as indicated by steady reading on PER CENT BREAK meter of 45 or more on <i>red</i> scale. See Step 32c.
32c	If requirements of Steps 28, 31 are met — Proceed to Step 37, otherwise set SW 1 to 7, proceed to Step 33.	
33	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 35 on <i>black</i> scale of PER CENT BREAK meter.	
34	Set SW 1 to position 8.	
35	Adjust OT potentiometer of signaling unit until RG relay just pulses steadily.	PER CENT BREAK meter reads approximately 45 or more on <i>red</i> scale.

STEP	ACTION	VERIFICATION
36	Repeat Steps 27 to 32c, inclusive, starting with SW 1 to position 7.	
37	Set SW 1 to position 7.	
38	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 45 on <i>black</i> scale of PER CENT BREAK meter.	
39	Set SW 1 to position 8.	PER CENT BREAK meter reads 51 on <i>red</i> scale. See Step 40d.
40d	If requirement of Step 39 is not met — Turn RT potentiometer of signaling unit fully counterclockwise, then rotate clockwise until reading of 51 is obtained.	
41d	Repeat Steps 27 to 36, inclusive, starting with SW 1 in position 7 then proceed to Step 41.	
42	Set SW 1 to position 7.	
43	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 70 on <i>black</i> scale of PER CENT BREAK meter.	
44	Set SW 1 to position 8.	PER CENT BREAK meter reads 70 at most on <i>red</i> scale.
Rering Response		
45	Set SW 1 to position 7.	
46	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 55 on <i>black</i> scale of PER CENT BREAK meter.	
47	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 <i>black</i> scale. See Step 48e.
48e	If requirement of Step 46 is not met — Adjust ADJ PPS control until reading of 22 on <i>black</i> scale of PER CENT BREAK meter is obtained.	
49	Patch TMS jack on P panel to 2-WIRE-A jack on BA panel.	
50	On BA panel — Turn E1D-A key to E1D-A, REV-A key to REV-A.	
51	Set SW 1 to position 8.	PER CENT BREAK meter reads between 20 and 30 on <i>red</i> scale.

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STEP	ACTION	VERIFICATION
52	Remove patch between TMS, 2-WIRE-A jacks.	
53	Restore E1D-A, REV-A keys to normal.	
54	On No. 2B test set — Restore all keys to normal.	
55f	If other tests are to be made on this list 1 unit — Proceed to Test G.	
56g	If no other tests are to be made on this list 1 unit — Remove all cords, restore all keys to normal, return signaling unit to service or space position.	
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57	Patch TMS jack on P panel to 2-WIRE-A jack on BA panel.	
58	On BA panel — Turn E1D-A key to E1D-A, REV-A key to REV-A.	
59	On No. 2B test set — Adjust ADJ PPS control to obtain reading of 4 PPS on PULSES PER SECOND meter (0 to 20 scale).	
60	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 48 on <i>black</i> scale of PER CENT BREAK meter.	
61	Set SW1 to position 8, SW 2 to position 3.	CS relay operated. RG relay remains released.
62h	If requirement of Step 61 is not met — Perform Test A if CS relay is not operated or verify that all of list 2 has been provided including OT potentiometer set at extreme clockwise position if RG relay is pulsing or operated.	
63	Set SW 1 to position 7.	
64	On No. 2B test set — Adjust ADJ % BK control to obtain reading of 60 on <i>black</i> scale of PER CENT BREAK meter. Set coarse ADJ % BK switch to L.	
65	Set SW 1 to position 8.	RG relay pulses causing CS relay to pulse.
66i	If requirement of Step 65 is not met — Verify that all of list 2 has been provided if RG relay does not pulse.	
67	Remove patch between TMS, 2-WIRE-A jacks.	

STEP	ACTION	VERIFICATION
68	Restore E1D-A, REV-A keys to normal.	
69	On No. 2B test set — Restore all keys to normal.	
70j	If other tests are to be made on this list 2 unit — Proceed to Test G.	
71k	If no other tests are to be made on this list 2 unit — Remove all cords, restore all keys to normal, return signaling unit to service or spare position.	
G. Receiver Guard Action		
18	Connect TMS jack on P panel to 2-WIRE-A jack on BA panel.	
19	On BA panel — Connect TMS to TMS-A jack.	
20	On BA panel — Turn E1D-A key to E1D-A.	
21	On CS panel — Set SW 1 to position 5, SW 2 to position 6, TL key to position 7.	TMS reads -19 ± 0.5 db. See Step 22c.
22c	If requirement of Step 21 is not met — Verify calibration of TMS.	
23	On CS panel — Set ATT to 32.	
24	Set SW 2 to position 5.	RG relay remains released.
25	On No. 2B test set — Operate MEAS % BK key to LINE.	PER CENT BREAK meter reads 0 on <i>red</i> scale.
26	Move SW 1 to position 6.	RG relay remains released.
27	Change ATT to 27.	RG relay operates. PER CENT BREAK meter reads 100 on <i>red</i> scale.
28	On BA panel — Turn REV-A key to REV-A.	
29	Move SW 1 to position 5.	RG relay should release. CS relay should operate. PER CENT BREAK meter reads 0 on <i>red</i> scale.
30	Move SW 1 to position 6.	RG relay remains released.
31	Change ATT to 17.	RG relay operates. CS relay releases. PER CENT BREAK meter reads 100 on <i>red</i> scale.
32	Remove all cords, restore all keys to normal, return signaling unit to service or spare position.	