



TERMINATING SENDER
TEST CIRCUIT SD-25159-01

TESTS
NO. 1 CROSSBAR OFFICES

Handwritten notes: 428, 17, 445, 428, 103, 1284

1. GENERAL

PAGE

1.01 This section describes a method of testing the terminating sender test circuit SD-25159-01. The tests are intended to detect trouble not evident in the normal use of the test frame.

E. Reverse Battery Timing: Verifies critical resistance values and requirements of critical relays used in measuring minimum and maximum reverse battery interval.

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1.02 This section is reissued to reflect change in resistance values in Tests B and D, and add a note to Step 1 of Test Q. This reissue does not affect the Equipment Test List.

F. TTSC Feature: Checks the ability of the test circuit to detect falsely closed contacts in the IB vertical of the sender.

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1.03 The tests covered are:

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A. Busy Timing and Trouble Timing: Checks the busy and trouble timing intervals of test circuit. Also checks time alarm blocking feature.

2

G. L Relay Nonoperate Resistance: Verifies critical resistance values used in L relay nonoperate test. This test also verifies critical resistance values used to test for premature time-out.

6

B. Maximum and Minimum Loop Resistance: Verifies critical resistance values of loop and leak resistances.

4

H. RBT Key Features: Checks operating features of RBT key and requirements of critical relay used in checking delayed reverse battery.

7

C. Maximum and Minimum Time to Reclose Fundamental Circuit: Verifies requirement of critical relay and critical resistance values.

4

I. Minimum and Maximum Interdigital Time-Out Interval: Checks minimum and maximum intervals allowed by the test circuit for the sender to time out on an interdigital time-out basis.

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D. L and STP Relay Operate Resistance: Verifies critical resistance values. If WG option is provided, a check of STP release resistance is made. This test applies only when senders with the unbalanced revertive pulse circuit are tested with the test frame.

5

J. Maximum Dialing Loop Resistance: Verifies resistance values used in maximum dialing loop test of dial pulse senders.

8

K. Start Pulse Timing: Verifies critical resistance values and requirements of critical relays used in measuring start pulse interval.

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	PAGE
L. Pulse Timing: Verifies critical resistance values and requirements of critical relays used in generating KP signals and key pulses.	8
M. Slow Pulse: Verifies critical resistance values used in generating slow key pulses.	9
N. Sender Disconnect: Verifies critical resistance values and requirements of critical relays used in checking sender release time under various conditions.	9
O. A Relay Operate Resistance: Verifies critical resistance values used in checking A relay operate requirements.	10
P. TWT Key Feature: Checks the ability of the test circuit to reduce the power of the 1500-Hz frequency below that of the 700-Hz frequency.	10
Q. High Loss Pad: Verifies dB value of HL pad.	10
1.04 Lettered Steps: A letter a, b, c, etc, added to a step number in Part 3 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.

1.05 Tests B through I are required at test frames where revertive pulse senders are tested. Test J is required where dial pulse senders are tested. Tests K through Q are required where multifrequency senders are tested.

2. APPARATUS

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

2.02 Volt-ohm-milliammeter, KS-14510, List 1. This instrument is referred to throughout the section as VOM.

2.03 716C test receiver equipped with a 2W22A cord, a 411A tool, and a KS-6278 tool.

2.04 35F test set with cords and tools as specified in relay adjustment practices.

2.05 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord) and two 419A tools.

2.06 Pulse checking test set SD-96362-01 (J94723A) with two 3P15A cords.

2.07 J94023A (23A) transmission measuring set, equipped with 3P12H patching cord.

3. METHOD

STEP	ACTION	VERIFICATION
A. Busy Timing and Trouble Timing		
1	At terminating trouble indicator— Make busy any terminating sender.	
2	At terminating sender test frame— Set test frame to sender made busy in Step 1.	
3	Operate APB and ST keys.	BY lamp lighted. After 29 to 59 seconds— Test circuit advanced to another sender. BY lamp extinguished.

STEP

ACTION

VERIFICATION

TABLE A

APPARATUS	TESTS																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Volt-ohm-milliammeter (2.02)		1	1	1	1		1			1		1	1	1	1		
322A Make-busy plug	1																
716C Test receiver (2.03)		1															
35F Test set (2.04)			1		1		1	1			1	1		1			
Test cord (2.05)						1										1	
Stopwatch, KS-3008									1								
310 Plug											1						
J-94723A Test set (2.06)												1					
Blocking tools, as req'd		2		3	2		1	1	1		2	2		1			
23A TMS (2.07)																1	1

4 Release APB and ST keys and restore test circuit to normal.

5 Repeat Step 2.

6 Operate ST key.

BY lamp lighted.
After 60 to 90 seconds—
TA lamp lighted.
Minor alarm sounded.

7 Operate ACO key.

Minor alarm silenced.

8 Operate TA key and restore ACO key.

TA lamp extinguished.

9 At terminating trouble indicator—
Release sender made busy in Step 1.

At terminating sender test frame—
Test circuit proceeds to test sender, then
blocks.

10 Release TA key.

Test circuit advances to next sender.

11 Release ST key and restore test circuit to normal.

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STEP	ACTION	VERIFICATION
B. Maximum and Minimum Loop Resistance.		
1	Restore all lever type keys to normal.	
2	Operate L key.	
3	Block operated BS and FO1 relays.	
4	Connect VOM to 2B and 6T of G relay.	VOM indicates 3125 to 3185 ohms.
5a	If senders are equipped for balanced revertive pulse circuits— Operate BAL key.	VOM indicates 2782 to 2834 ohms if DT resistor is 18BK type (option TV). VOM indicates 3473 to 3543 ohms if DT resistor is 18CR type (option TU).♦
6a	Change VOM connection from 2B of G relay to capacitor side of DS resistor.	
7a	Release BAL key.	VOM indicates approximately 100 ohms.
8	Change VOM connections to AC (18FH) resistor in revertive pulse section.	VOM indicates approximately 56 ohms.
9	Test for presence of ground at AC resistor.	Ground present.
10	Release L key.	
11	Connect VOM to 2B and 6T of G relay.	VOM indicates 898 to 912 ohms.
12	Operate L key.	
13	Release BS and FO1 relays.	
14	Connect VOM to 4T of FO1 relay and 1T of T1 (40 AN) resistor.	VOM indicates 29700 to 30300 ohms.
15	Disconnect VOM.	
16	Test for presence of ground at 1T of T1 resistor.	Ground present.
17	Restore L key to normal.	
C. Maximum and Minimum Time to Reclose Fundamental Circuit		
1	Perform current flow tests of BST relay (revertive pulsing test circuit) using 35F test set and circuit requirement table.	Circuit requirements are met.
2	Connect VOM to 11B of C relay and 2 terminal of BST relay.	VOM indicates 322 to 328 ohms.

STEP	ACTION	VERIFICATION
3	Operate LST key.	VOM indicates 6930 to 7070 ohms.
4	Connect VOM to 11B of C relay and 6B of G relay.	VOM indicates 2869 to 2927 ohms.
D. L and STP Relay Operate Resistance		
1	Operate STP-OPR key.	
2	Block operated C, FTP, and FB relays.	
3	Connect VOM to 1T of LNO relay and bottom side of AA (19PS) resistor.	VOM indicates 4030 to 4110 ohms if DF resistor is 19CU type (option TX). VOM indicates 4455 to 4545 ohms if DF resistor is 18GE type (option TW).♦
4	Insulate 3T, 4T of FRP relay.	
5	Connect VOM to bottom side of BC (18 FR) resistor and 4T of FRP relay.	VOM indicates 4113 to 4197 ohms.
6a	If WG option is provided— Release FTP relay.	
7a	Connect VOM to top side of BD (19RP) resistor and 3T of FRP relay.	VOM indicates 7435 to 7585 ohms if DR resistor is 18DA type (TZ option). VOM indicates 7227 to 7373 if DR resistor is 18BK type (TY option).♦
8	Release C, FTP, and FB relays.	
9	Restore STP-OPR key to normal.	
10	Remove insulation from 3T, 4T of FRP relay.	
E. Reverse Battery Timing		
1	Restore all lever type keys to normal.	
2	Block operated C1 relay.	
3	Insulate 5T, 6T of C1 relay.	
4	Connect VOM to 5T of C1 relay and battery side of BB resistor.	VOM indicates 921 to 939 ohms.
5	Operate LRB key.	VOM indicates 4209 to 4291 ohms.
6	Remove insulator and blocking tool from C1 relay.	

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STEP	ACTION	VERIFICATION
7	Connect VOM to 1T of BS relay and 11B of C relay.	VOM indicates 3960 to 4040 ohms.
8	Release LRB key.	VOM indicates 2772 to 2828 ohms.
9	Perform current flow tests of OF and OF1 relays (revertive pulsing test circuit) using 35F test set and circuit requirement table.	Circuit requirements are met.
F. TTSC Key Feature		
1	At terminating sender test frame— Set up keys TH6, H6, T6, U6, F9, Test Class 2, TT-SC.	
2	Direct test frame to any FS terminating sender and operate REP key.	Test frame makes repeated satisfactory tests of sender.
3	At sender under test— With 893 cord, short circuit three stationary and movable contact terminals at any level at rear of IB vertical.	At test frame— Test circuit blocks.
4	At sender under test— Remove 893 cord.	
5	At test frame— Restore test circuit to normal.	
G. L Relay Nonoperate Resistance		
1	Operate test class key A7.	
2	Block operated LNO relay.	
3	Insulate 3T, 4T of RB' relay.	
4	Connect VOM to 5T of BS relay and 2T of TF relay.	VOM indicates 6148 to 6272 ohms (YH option) or 7757 to 7913 ohms (YG option).
5	Connect VOM to battery side of BB resistor and 4T of CI relay.	VOM indicates 723 to 737 ohms.
6	Connect VOM to 3T and 5T of CI relay.	VOM indicates 5346 to 5454 ohms.
7	Connect VOM to 11B of C relay and 1T of BS relay.	VOM indicates 6603 to 6737 ohms.
8	Release LNO relay, Class Key 7, and disconnect VOM.	
9	Remove insulation from 3T, 4T of RB' relay.	

STEP	ACTION	VERIFICATION
10	Perform current flow test of OF and OF1 relays (revertive pulsing test circuit) using 35F test set and circuit requirement table.	Circuit requirements are met.
	<i>Note:</i> This step may be omitted if performed in Step 9, Test E.	
H. RBT Key Features		
1	Operate RBT key.	
2	Block operated C relay.	
3	Momentarily operate STR relay.	RBT2 relay momentarily operated.
4	Momentarily operate RB' relay.	RB2 relay momentarily operated.
5	Release C relay and RBT key.	
6	Perform current flow tests of RBT-2 relay using 35F test set and circuit requirement table.	Circuit requirements are met.
I. Minimum and Maximum Interdigital Time-Out Interval		
1	Operate TH5, H5, T5, U5, F5, Class Key 0, and IDT keys.	
2	Set up test frame on any FS terminating sender and operate ST key.	Test frame proceeds to test sender, lighting IB, IG, and IDT lamps in succession.
3	With stopwatch, time lighted IDT lamp.	IDT lamp remains lighted for 2 to 2-1/2 seconds minimum.
4	Release ST and IDT keys.	
5	At terminating sender under test— Block nonoperated TM3 relay.	
6	At test frame— Operate IDT1 and ST keys.	Test frame proceeds to test sender, lighting IB, IG, and IDT lamps in succession.
7	With stopwatch, time IDS relay holding time.	IDS relay released in approximately 7 seconds. Test frame blocked.
8	Restore test frame to normal.	
9	At terminating sender under test— Release TM3 relay.	

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STEP	ACTION	VERIFICATION
J. Maximum Dialing Loop Resistance		
1	Operate LTK key.	
2	Connect VOM to 1T of DP3 relay and 3T of DPD relay.	VOM indicates approximately 2550 ohms. <i>Note:</i> VOM indicates 3450 ohms when YA option is provided.
K. Start Pulse Timing		
1	Perform current flow test of RVT and RV2 relays using 35F test set and circuit requirement table.	Circuit requirements are met.
2	Insulate 2B, 3B and 2T, 3T of RV1 relay.	
3	Insert 310 plug into RVT jack.	
4	Connect VOM to FB resistor.	VOM indicates 1584 to 1616 ohms, VS option, or 495 to 505 ohms, VR option.
5	Remove VOM, 310 plug, and insulators used in preceding steps.	
L. Pulse Timing		
1	Perform current flow test of KP1, KP2, KP3, KP4 relays, and pulse output test of KP2, KP3, KP4 relays using 35F test set, pulse checking test set, and circuit requirement tables.	Circuit requirements are met.
2	Insulate 5B and 2T of KA relay.	
3	Connect VOM to 5B of KA relay and 1 terminal of KP4 relay.	VOM indicates 614 to 626 ohms.
4	Connect VOM to terminals of EB, EC, and ED resistors.	VOM indicates 49.5 to 50.5 ohms.
5	Connect VOM to middle terminal of EA resistor and 3T of KPT relay.	VOM indicates 148 to 152 ohms.
6	Connect VOM to terminals of T, U, V, W, X resistors.	VOM indicates 49.5 to 50.5 ohms.
7	Connect VOM to terminals of Y resistor.	VOM indicates 99 to 101 ohms.
8	Connect VOM to midpoint of EE resistor and 1T of KA relay.	VOM indicates 247 to 253 ohms.

STEP	ACTION	VERIFICATION
9	Disconnect VOM.	
10	Remove insulators from contacts of KA relay.	
M. Slow Pulse		
1	Operate SKP key.	
2	Insulate 2B and 5B of KA relay.	
3	Block KP1 relay nonoperated.	
4	Connect VOM to 2B of KA relay and 2B of KS relay.	VOM indicates 297 to 303 ohms.
5a	If MF10 relay is not furnished— Connect VOM to 2T of PR relay and 2B of KS relay.	VOM indicates 6930 to 7070 ohms.
6b	If MF10 relay is furnished— Connect VOM to 2B of KS relay and 7B of MF9 relay.	VOM indicates 6930 to 7070 ohms.
7	Connect VOM to B terminal of KP capacitor and 2B of KS relay.	VOM indicates 3491 to 3527 ohms.
8	Remove insulators from KS relay and blocking tool from KP1 relay.	
9	Restore SKP key to normal.	
N. Sender Disconnect		
1	Perform current flow test of TD-1 and TD-2 relays using 35F test set and circuit requirement table.	Circuit requirements are met.
2	Connect VOM to 3T and 4T of TD5 relay.	VOM indicates 29700 to 30300 ohms.
3	Connect VOM to 2T of TD relay and 1T of TD1 relay.	VOM indicates 49.5 to 50.5 ohms.
4	Operate TFT key.	TD2 relay operated.
5	Block operated D relay (located on Plate E).	TD-2 relay released.
6a	If MF10 relay is not furnished— Connect VOM to 1T of C01 relay (located on Plate A, upper cabinet) and 9T of C relay (located on Plate E, lower cabinet).	VOM indicates 297 to 303 ohms.

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STEP	ACTION	VERIFICATION
7b	If MF10 relay is furnished— Block operated MF10 relay.	
8b	Connect VOM to 5T of TD3 relay (located on Plate D) and 9T of C relay (located on Plate E).	VOM reads 297 to 303 ohms.
9b	Remove blocking tool from MF10 relay.	
10	Release TFT key and remove blocking tool from D relay.	
O. A Relay Operate Resistance		
1	Connect VOM to 400-ohm terminals of EG resistor. <i>Note:</i> Omit this step if ZF option is wired. (400-ohm resistance strapped out.)	VOM indicates 396 to 404 ohms.
2	Connect VOM to 800-ohm terminals of EG resistor. <i>Note:</i> Omit this step if ZG option is wired. (800-ohm resistance strapped out.)	VOM indicates 792 to 808 ohms.
3	Connect VOM to end terminals of EF resistor. <i>Note:</i> Omit this step if ZH option is wired. (1200-ohm resistance strapped out.)	VOM indicates 1188 to 1212 ohms.
4	Connect VOM to end terminals of EY resistor.	VOM indicates 5262 to 5368 ohms.
P. TWT Key Feature		
1	Operate TWT key.	
2	Connect 23A TMS to VI jack.	
3	Operate V17 key.	TMS reading noted.
4	Release V17 key.	
5	Operate V10 key.	TMS indicates 6 to 6.5 dB higher than in Step 3.
6	Release V10 and TWT keys and disconnect 23A TMS.	
Q. High Loss Pad		
1	Connect 23A TMS to 3T and 4B of MF8 relay.	

STEP	ACTION	VERIFICATION
	Note: If test frame is equipped with MF9 and MF10 relays (Fig. 7), connect the 23A TMS to 9T and 9B of the MF10 relay.	
2	Operate LL key.	
3	Operate V17 key.	TMS reading noted.
4	Release LL key.	TMS indicates higher dB value depending on type of HL pad in test frame.
5	Release V17 key and disconnect 23A TMS.	