

PRIVATE LINE TELEPHONE SERVICE
SS-1 SELECTIVE SIGNALING SYSTEM
PULSING-COUNTING AND INTERDIGITAL
CONTROL CIRCUIT

1. GENERAL

1.01 This section describes a method of making tests on the decoder and keyer circuits in the SS-1 selective signaling system, per SD-98093-0100. This section also describes a method of testing station units.

1.02 The tests covered are:

A. Decoder Time Base and Digit "ONE" Cancellation Feature: This test checks that the time-out circuit, composed of TB thermal relay and TA control relay, shall release the decoder circuit if the time between digits exceeds 6 seconds. This test also checks the immediate release of the decoder circuit upon reception of the digit "ONE".

B. Decoder Busy Tone Verification: This test checks the application of 2600-cycle busy tone to the receiving loop upon seizure and throughout the dialing interval.

C. Pulse Counting and Translation: This test checks the operation of the decoder.

D. SF Guard Transfer Circuit: This test checks that upon circuit seizure and throughout the off-normal period, the associated SF unit shall be changed from high to low guard.

E. Keyer Circuit Pulsing Test: This test checks that M (pulse repeating relay), PA (delay stage A), and PB (delay stage B) relays are properly following pulses and tells how to adjust the M, PA, and PB potentiometers to meet requirements.

F. Permanent Signal: This test checks the keyer circuit fail-safe feature. This feature prevents continuous SF tone transmis-

sion by the keyer circuit in the event of a permanent signal on the KEYER "M" lead.

G. Keyer Frequency Test: This test checks the output frequencies of the key circuit SD-98093-01, Fig. 3, and provides an adjustment procedure to follow. This test must be satisfactorily met before proceeding to Test H.

H. Single-Frequency Sensitivity: This test checks the SF receiver for proper operation with minimum power input and tells how to adjust the SS potentiometers to meet a sensitivity of +4db for 2-wire operation.

1.03 The 13A transmission measuring set is referred to in this section as 13A TMS.

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

1.05 Counterclockwise and clockwise are referred to in this section as ccw and cw, respectively.

1.06 Make per cent break adjustments of the 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 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 from S, M, or L setting to obtain the desired range on the PER CENT BREAK meter.

1.07 The tests outlined in this section should be made in the order specified.

1.08 When the results of these tests indicate the need of a more complete check or readjustment of the SF signaling unit E2B or E3B, the SF signaling circuit should be removed to the 2600-cycle signaling testing position J6802CS, SD-56335-01, or J9813AY for out-of-service tests and readjustments. The over-all system should be adjusted in accordance with SS-1 transmission tests and adjustments per Section 310-425-500.

1.09 It may be necessary to perform any one or all of these tests when clearing trouble.

1.10 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 conditions 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 following test equipment is recommended for use in the tests covered in this

TABLE A

APPARATUS	TESTS							
	A	B	C	D	E	F	G	H
2B Test Set	—	—	—	—	1	1	—	—
52B Test Set	1	1	1	1	—	—	—	—
13A TMS	—	—	—	—	—	—	1	1
Volt-Ohm-Milliammeter (2.03)	—	—	1	1	—	—	—	—
72A Frequency Meter (2.04)	—	—	—	—	—	—	1	—
Cord (2.05)	—	—	—	—	2	2	—	—
Test Receiver (2.06)	—	1	—	—	—	—	—	—
Dummy Plug (2.07)	—	—	—	—	1	1	1	1
Cord (2.08)	—	—	—	—	—	—	—	1
Cord (2.09)	—	—	—	—	—	—	—	1
Cord (2.10)	—	—	—	—	—	—	√	√
Cord (2.11)	—	—	—	—	—	—	√	—
Cord (2.12)	—	—	—	—	—	—	√	—
Tool (2.13)	—	—	1	—	—	—	—	—

√ As required.

section. It should be calibrated in accordance with the sections covering the equipment.

2.02 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.

2.03 KS-14510 L1, volt-ohm-milliammeter or equivalent, equipped with alligator clip test leads.

2.04 72 A frequency meter, J64072 A (SD-59373-01).

2.05 Two patching cords, P3E cord, 6 feet long, equipped with two 310 plugs (3P7A cord).

2.06 Test receiver, 716C receiver, attached to a W2AB cord equipped with two 360A tools (2W21A cord) and two KS-6278 connecting clips.

2.07 258C dummy plug.

2.08 Testing cord, 1W3M cord, 6 feet long, equipped with three 360 tools (3W4A cord), three 364 tools, and one 310 plug.

2.09 Testing cord, W2W cord, 6 feet long, equipped with two 360 tools (2W17A cord), two KS-6278 connecting clips, and one 310 plug.

2.10 Testing cord, W2W cord, 6 feet long, equipped with two 360 tools (2W17A cord), two 364 tools, and one 310 plug.

2.11 Patching cord, 1P3N cord, 6 feet long, equipped with one 310 plug (3P17B cord) and one 241 plug.

2.12 Patching cord, 3P17B cord, 6 feet long, equipped with one 310 plug and one 241 plug.

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

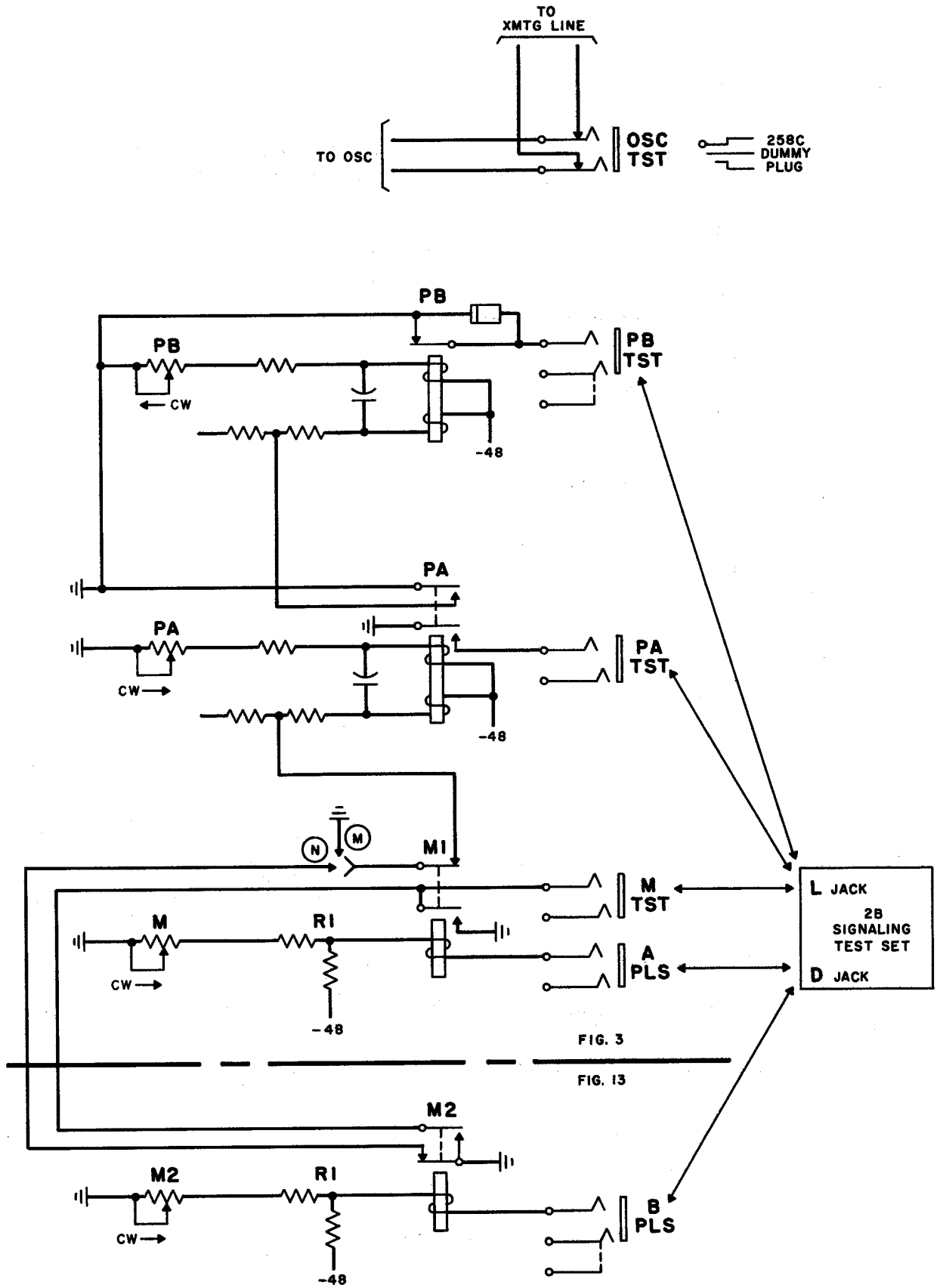


Fig. 1 - Setup for Pulsing - Test E

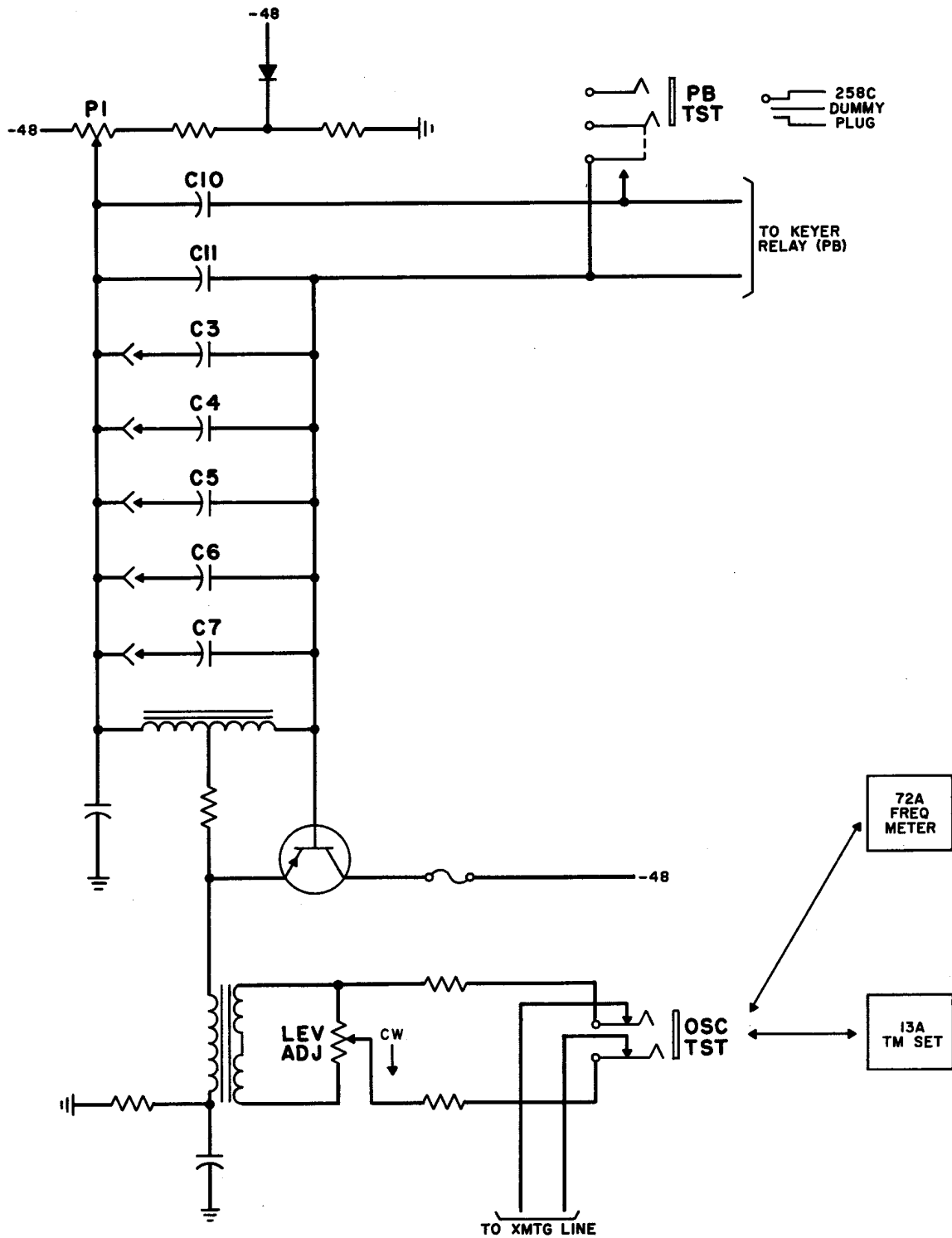


Fig. 2 - Setup for Frequency — Test G

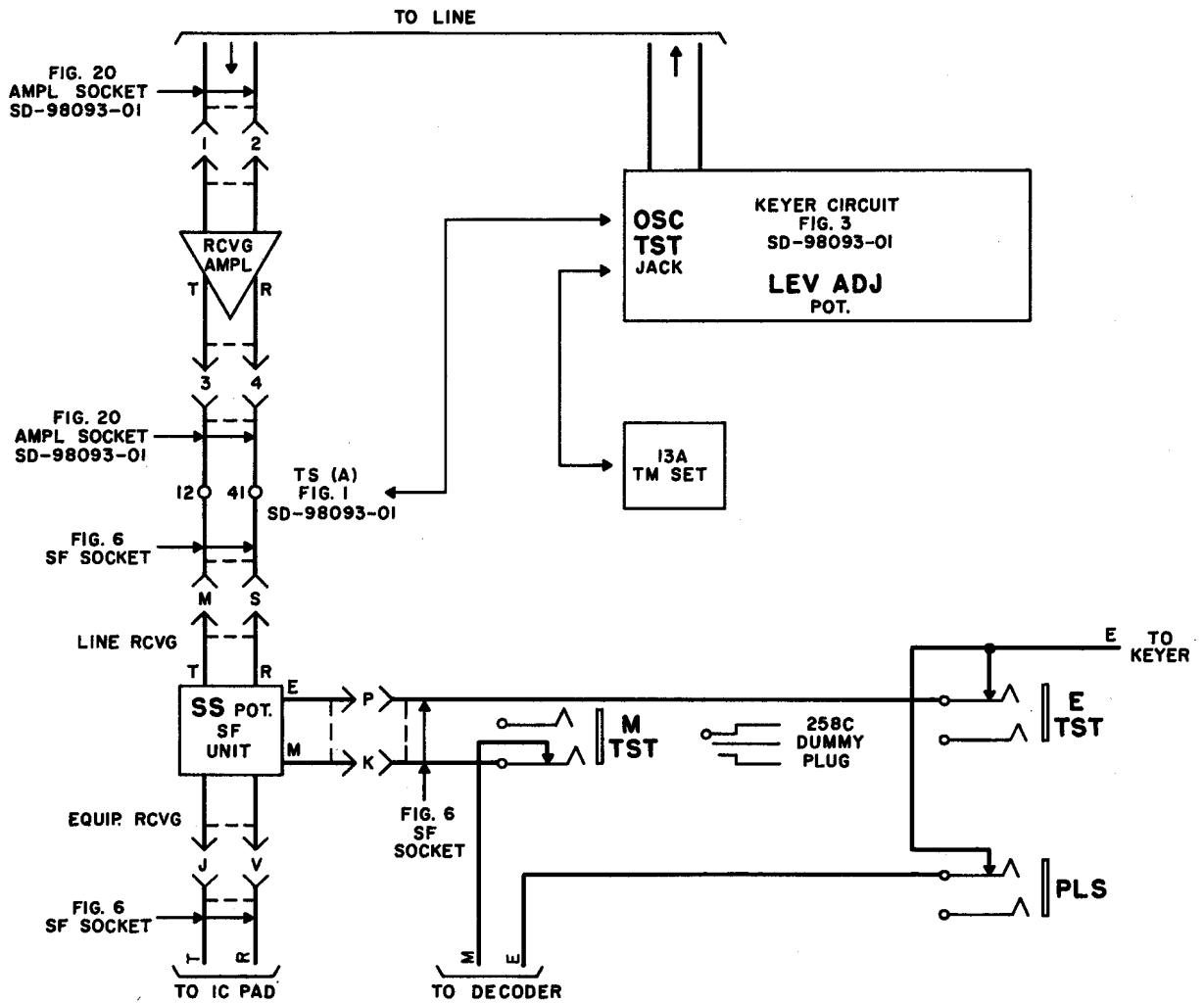


Fig. 3 — Setup for Single-Frequency Sensitivity — Test H

3. PREPARATION

STEP	ACTION	VERIFICATION
All Tests		
1a	When circuits under test are associated with single loop (SD-98093-0100, Fig. 103 or 105) — Insert 258C plugs into REC LP IN, TR LP IN jacks at 4-wire loop terminating circuit jack field.	
2b	When circuits under test are associated with two or three loops (SD-98093-0100, Fig. 107 or 109) — Insert 258C plugs into REC LP IN, TR LP IN jacks in jack fields of each 4-wire loop terminating circuit.	

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STEP	ACTION	VERIFICATION
Tests A Through D		
3	Disconnect station loops, central office equipment from decoder.	
4	Terminate any bridging equipment or loop facilities with 600-ohm resistor.	
5	Connect 52B test set to PLS jack at decoder circuit, operate switch on 52B test set so red marker shows.	P relay locks operated.
Tests E and F		
6	On 2B test set — Set all keys to normal.	
7	Operate OG-BG key to BG.	
8	Set SCALE SEL switch to PPS.	
9	Plug power cords of 2B test set into A, B jacks of battery supply circuit.	After 1 minute, PULSES PER SECOND meter reads other than 0.
10	Operate CONT PLS key to DIAL PLS.	PER CENT BREAK meter reads 0 on <i>black</i> scale.
11c	If requirement of Step 10 is not met — Adjust pointer adjustment screw of PER CENT BREAK meter to obtain 0 reading.	
12c	Insert 258C plug into P jack.	PER CENT BREAK meter reads 100 on <i>black</i> scale.
13c	Unlock CAL % BK control, adjust to obtain reading of 100.	
14c	Remove 258C plug from P jack.	
15	Restore CONT PLS KEY to normal.	
16d	When performing tests using 13A TMS — Calibrate TMS in accordance with appropriate practice.	
17	Obtain release of signaling circuit.	

4. METHOD

STEP	ACTION	VERIFICATION
A. Decoder Time Base and Digit "ONE" Cancellation Feature		
6	Dial digit 2.	ON relay releases. B, TR, TA relays operate. After 4- to 6-second interval, as provided by TB relay — ON relay operates releasing B, TR, RA relays.
7	Dial digit 2, then dial digit 1 within 2 seconds.	After digit 2, ON relay is released. B, TR, TA relays operated. After digit 1 is dialed, ON relay operates, releasing B, TR relays. This restores circuit to normal.
B. Decoder Busy Tone Verification		
6	Connect test receiver headset to terminals 15, 24 terminal strip C.	
7	Dial digit 2.	Observe that tone is applied for 4 to 6 seconds.
8	Dial digit 99.	Observe that tone is applied throughout dialing interval.
9	Remove test receiver.	
C. Pulse Counting and Translation		
6	Block operated RA relay.	RA1, B relays operated. ON relay released.
7	Dial digit 1.	P through P5 relays shall agree with Table B.
8	Remove blocking tool from RA relay.	RA1 relay releases after 136 to 267 milliseconds. TR relay operates upon release of RA1 relay.
9	Dial digit 1 to make decoder normal.	All relays normal.
10	Substitute digits 2 through 0 for digit 1 in Step 7, repeat Steps 6, 7, 8, 9 for each digit substituted.	Same as for Steps 6, 7, 8, and 9.

STEP	ACTION	VERIFICATION
D. SF Guard Transfer Circuit		
6	Set volt-ohm-milliammeter on 60-volt scale.	
7	Connect positive lead to ground and negative lead to terminal 18 on decoder.	Meter reads 48 volts.
8	Dial digit 2.	Meter reads between 0 and 10 volts for 4 to 6 seconds, then restores to 48 volts.
9	Dial digit 2, then dial digit 1.	Meter reads 0 to 10 volts during dialing with immediate restoral to 48 volts after digit 1 is dialed.
10	Disconnect volt-ohm-milliammeter.	

E. Keyer Circuit Pulsing Test

Note: Fig. 1, Setup for Pulsing — Test E, shows the pulse repeating and delay relay circuit elements of the keyer circuit and illustrates the test connections as outlined in Steps 18, 19, 23, 25, 27, 29 to 30, inclusive.

- 18 Disconnect keyer oscillator from circuit by inserting 258C plug into OSC TST jack.

TABLE B							COUNTING RELAYS REMAINING OPERATED
PULSE	P	P1	P2	P3	P4	P5	
1	RLS OPR	O	O				P1, P2
2	RLS OPR	R	R	O			P3
3	RLS OPR	O	O		O		P1, P2, P3, P4
4	RLS OPR	R	R				P3, P4
5	RLS OPR	O	O	R			P1, P2, P4
6	RLS OPR	R	R			O	P4, P5
7	RLS OPR	O	O				P1, P2, P4, P5
8	RLS OPR	R	R	O			P3, P4, P5
9	RLS OPR	O	O		R		P1, P2, P3, P5
10	RLS OPR	R	R				P3, P5

STEP	ACTION	VERIFICATION
19	Connect 2B test set jack to A-PLS jack at keyer circuit, with 3P7A cord.	
20	On 2B test set — Adjust ADJ PPS control to obtain reading of 10 pps on PULSES PER SECOND meter.	
21	Adjust ADJ % BREAK control to obtain reading of 68 on <i>black</i> scale of PER CENT BREAK meter. <i>Note:</i> When loop cut-off feature Fig. 16 of SD-98093-01 is used, the PER CENT BREAK reading will be 32.	
22	Operate TWD D key to OFF HK, MEAS % BK key to LINE, PLS key to DROP, OG-BG key to BG.	
23	Connect L jack of 2B test set to M TST jack at keyer circuit with 3P7A cord.	PER CENT BREAK meter reads 68 on <i>black</i> scale. <i>Note:</i> If the 2B test set was adjusted to read 32 in Step 21, the PER CENT BREAK meter reads 32 on the <i>black</i> scale.
24e	If requirement of Step 23 is not met — Adjust M potentiometer until 2B test set reads 68 or 32 on <i>black</i> scale.	
25	Remove cord from M TST jack, insert into PA jack.	PER CENT BREAK meter reads 67 on <i>black</i> scale.
26f	If requirement of Step 25 is not met — Adjust PA potentiometer until 2B test set reads 67 on <i>black</i> scale. <i>Note:</i> If PA potentiometer does not have sufficient range, remove "A" strap.	
27	Remove cord from PA jack, insert into PB jack.	PER CENT BREAK meter reads 63 on <i>black</i> scale.
28g	If requirement of Step 27 is not met — Adjust PB potentiometer until 2B test set reads 63 on <i>black</i> scale. <i>Note:</i> If PB potentiometer does not have sufficient range, remove "B" strap.	

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STEP	ACTION	VERIFICATION
29	Remove cord from A-PLS jack, insert into B-PLS jack.	
30	Remove cord from PB jack, insert into M TST jack.	PER CENT BREAK meter reads 68 on <i>black</i> scale.
31h	If requirement of Step 30 is not met — Adjust M2 potentiometer until 2B test set reads 68 on <i>black</i> scale.	
32	Remove all patch cords, dummy plug.	

F. Permanent Signal

18	Insert 258C dummy plug into OSC TST jack of keyer circuit.	
19	Connect 2B test set D jack to A-PLS jack of keyer circuit, with 3P7A cord.	
20	Operate 2B test set TWD D key to ON HK.	ON1 relay operates, then releases. M1, AUX, PA relays operated.
21	Operate 2B test set TWD D key to OFF HK.	M1, AUX, PA relays released.
22	Remove patch cords, 258C dummy plug.	

G. Keyer Frequency Test

Note: Fig. 2, Setup for Frequency — Test G, shows the oscillator portion of the keyer circuit and illustrates the test connections as outlined in Steps 3, 4, 6f, and 11g.

Frequency Measurement

3	Connect 72A frequency meter to OSC TST jack of keyer circuit, with 3P17B cord.	Meter reads 2600 \pm 4 cps.
4	Insert 258C dummy plug into PB TST jack of keyer circuit.	Meter reads 2400 +10 -30 cps.
5e	If requirements of Steps 3, 4 are met — At keyer circuit — Remove 258C plug from PB TST jack, cord from OSC TST jack.	

STEP	ACTION	VERIFICATION
Frequency Adjustment		
6f	If requirements of Steps 3, 4 are not met — Connect 13A TMS to OSC TST jack, with 2W17A cord.	
7f	Turn LEV ADJ potentiometer fully cw.	TMS reads +2 dbm maximum.
8g	If requirement of Step 7f is not met — Unlock P1 potentiometer.	
9g	Adjust P1 potentiometer until TMS reads +2 db.	
10g	Lock P1 potentiometer.	
11g	Remove cord between 13A TMS and OSC TST jack.	
12	Connect 600 Ω in jack of 72A frequency meter to OSC TST jack of keyer circuit, with 3P17B cord.	
13	Adjust frequency to 2600 \pm 4 cps by connecting C3 through C7 capacitors as shown in Table C.	

TABLE C

CAPACITOR	FREQUENCY CHANGE CPS
C3	-2
C4	-4
C5	-5
C6	-6
C7	-7

Caution: Before strapping capacitors, disconnect -48 volt potential, apply heat conductors such as pliers, clip leads, etc, to pigtail between the point where the heat is applied and the capacitor body, in order to dissipate the heat generated by soldering iron.

H. Single-Frequency Sensitivity

Note: Fig. 3, Setup for Single-Frequency Sensitivity — Test H, shows in block form the SS1 circuit elements required to adjust the SF sensitivity and illustrates the test connections as outlined in Steps 3, 4, 5, 8, 9, 10, and 12.

Method

- 3 Remove V3 amplifier (Fig. 20) from socket.
- 4 Adjust SS potentiometer on SF unit to maximum ccw.

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STEP	ACTION	VERIFICATION
5	Connect 13A TMS to OSC TST jack of keyer circuit (Fig. 3), with 2W17A cord.	Record KEYER 2600-cycle output level.
6	Adjust LEV ADJ potentiometer of keyer circuit until TMS reads -28 db.	
7	Remove 2W17A cord from OSC TST jack.	
8	Connect OSC TST jack of keyer circuit to terminals 12, 41 of terminal strip "A" at decoder.	
9	Insert 258C dummy plug in M jack of test jack circuit.	M relay releases in SF unit.
10	Adjust SS potentiometer of SF unit cw.	RG relay in SF unit just operates.
11	Remove cord between OST TST jack and terminals 12, 41 of terminal strip "A".	
12	Connect 13A TMS to OSC TST jack of keyer circuit, with 2W17A cord.	
13	Adjust LEV ADJ potentiometer of keyer circuit until TMS reads -30 db.	
14	Remove 13A TMS from OSC TST jack.	
15	Connect OSC TST jack of keyer circuit to terminals 12, 41 of terminal strip "A" at decoder with 2W17A cord.	RG relay should not operate in SF unit.
16e	If requirement of Step 15 is not met — Remove connection established in Step 15, turn SS potentiometer very slightly cw.	
17e	Repeat Step 16 until requirement of Step 15 is met.	
18	Remove all test cords.	
19	Adjust keyer output to level recorded in Step 5.	
20	Insert V3 amplifier in socket.	
21	Remove 258C dummy plug from M test jack.	