

SS-1 SELECTIVE SIGNALING SYSTEM

DECODER AND KEYER—DETAILED TESTS

PRIVATE LINE TELEPHONE SERVICE

1. GENERAL

1.01 This section provides detailed tests for the decoder and the keyer of the SS-1 system. The tests should be performed when pulsing errors occur in normal use of the SS-1 system or when the tests are scheduled as part of routine maintenance.

1.02 This section is reissued to replace the obsolete 52B test set with the 1014A hand test set. Other miscellaneous changes are included in this issue.

1.03 This issue is based on the following drawing:

SD-98093-01, Issue 17D.

If this section is to be used with equipment or apparatus reflecting later issues of the drawings, reference should be made to the CDs and SDs to determine the extent of the changes and the manner in which the section may be affected.

1.04 The tests covered are:

A. Decoder Time Base and Digit 1 Cancellation:

This test checks the operation of fundamental relays in the decoder and the operation of the 6-second time-out circuit. The digit 1 cancellation feature is then checked to determine that dialing the digit 1 restores the decoder to normal as required.

B. Decoder Busy Tone Verification: This test checks that 2600-Hz busy tone is applied through the decoder when dialing is in progress.

C. Decoder Pulse Counting and Translation:

This test checks that digits are properly registered in the decoder when it is pulsed. A pulse train holdover relay is blocked so that the counting relays are held in a static condition after each digit is dialed to allow time for checking their operation. The counting relays are then allowed to restore to normal so that

further digits may be dialed. This operation is repeated until all digits from 1 through 0 have been properly registered by the decoder.

D. SF Unit Guard Transfer: This test checks that the high guard potential normally placed on the SF unit when signaling is not in progress is removed during the dialing period and is restored after dialing has ceased or the decoder time-out circuit has functioned.

Note: ♦SF units E3B or later are always left in a low guard mode and do not require this test.♦

E. Keyer Pulsing: This test checks the operation of keyer relays for percent break and provides a method of adjusting the pulse repeating and delay circuits when required.

F. Keyer Permanent Signal: This test checks the fail-safe circuit. The fail-safe feature prevents continuous transmission of SF tone in the event that a permanent signal is placed on the keyer input lead.

G. Keyer Frequency Measurement and Adjustment: This test checks the frequency of the keyer oscillator for both signaling (2600 Hz) and guard (2400 Hz) frequencies. An adjustment procedure for setting the 2600-Hz signaling frequency is also included.

1.05 A calibration procedure for the 2B signaling test set is included in this section as Steps 3 through 11 of PREPARATION. Calibration procedures for the 72A frequency meter and for the 21A transmission measuring set are covered in Sections 103-425-100 and 103-221-101, respectively.

1.06 When using the 2B signaling test set, make percent break adjustments slowly to prevent pulsing at an incorrect value. An incorrect value will result if the rate of vibration of the PERCENT BREAK meter pointer is not the same as that of

SECTION 480-621-502

the PULSES PER SECOND meter pointer. To obtain the correct percent break value after the meter pointers have begun to vibrate in an out-of-step manner, turn the ADJ % BK control counterclockwise until the meter pointers vibrate synchronously; then, slowly turn the control clockwise until the desired percent break value is obtained. It may also be necessary to change the coarse ADJ % BK switch from the S, M, or L setting to obtain the desired range on the PERCENT BREAK meter.

1.07 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. Details of each item are covered in the paragraph indicated by the number in parentheses.

- 2.02** 1014A hand test set (used to pulse decoder), or equivalent.
- 2.03** 2B signaling test set, J64730B (SD-56134-02) complete with KS-19653, List 1 power supply, or equivalent.
- 2.04** KS-14510 meter, portable 20,000 ohms per volt volt-ohm-milliammeter (VOM) equipped with KS-14510, List 2 test leads.
- 2.05** 21A transmission measuring set (TMS), J94021A (SD-95115-01), or equivalent
- 2.06** 72A frequency meter, J64072A (SD-59373-01).
- 2.07** Test receiver, 716C receiver equipped with W2AB cord, two 360A tools (2W21A cord), and two KS-6780 connecting clips.
- 2.08** Patching cord, P3E cord, 6 feet long, equipped with a 310 plug at each end (3P7A cord) (used to connect 2B signaling test set to keyer).
- 2.09** Patching cord, P3N cord, 6 feet long, equipped with a 310 plug on one end and a 241A plug on other end (3P17B cord) (used to connect 72A frequency meter or 21A TMS to keyer).

TABLE A

APPARATUS	TESTS						
	A	B	C	D	E	F	G
1014A Hand Test Set (2.02)	1	1	1	1	—	—	—
Signaling Test Set (2.03)	—	—	—	—	1	1	—
KS-14510 Meter (2.04)	—	—	—	1	—	—	—
TMS (2.05)	—	—	—	—	—	—	1
72A Frequency Meter (2.06)	—	—	—	—	—	—	1
Test Receiver (2.07)	—	1	—	—	—	—	—
3P7A Cord (2.08)	—	—	—	—	2	1	—
3P17B Cord (2.09)	—	—	—	—	—	—	1
2W38A Cord (2.10)	1	1	1	1	—	—	—
262B Terminating Plugs (2.11)	✓	✓	✓	✓	✓	✓	✓
258-Type Dummy Plug	—	—	—	—	1	1	1
Tools (2.12)	—	—	✓	—	—	—	—

✓ As required

2.10 ♦Test cord, W2CK cord, equipped with a 310 plug on one end and a 471A jack on other end (2W38A cord) (used to connect 1014A hand test set to decoder).♦

2.11 262B terminating plug, 310 plug equipped with 600-ohm resistor connected across tip and ring terminals.

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

3. PREPARATION

STEP	ACTION	VERIFICATION
All Tests		
1a	If circuit under test is associated with only a single customer location loop— Insert 262B terminating plugs into REC LP IN and TR LP IN jacks of J99252E unit in central office.	
2b	If circuit under test is located in a central office and is associated with more than one customer location loop— Insert 262B terminating plugs into REC LP IN and TR LP IN jacks of each J99252E unit connected to loops.	
Tests A through D		
3	♦Using 2W38A cord— Connect 1014A hand test set♦ to PLS jack of decoder (J99252K) unit.	
Tests E and F (2B Signaling Test Set Calibration)		
3	On 2B signaling test set— Set all keys to normal.	
4	Operate OG-BG key to BG.	
5	Set SCALE SEL switch to PPS.	
6	Connect power cords to jacks of power supply. Operate AC switch of power supply to ON.	After 1 minute— PULSES PER SECOND meter reads other than 0.
7	Operate CONT PLS key to DIAL PLS.	PERCENT BREAK meter reads 0 on black scale.
8c	If requirement of Step 7 is not met— Adjust PERCENT BREAK meter zero adjustment screw for meter reading of 0.	

SECTION 480-621-502

STEP	ACTION	VERIFICATION
9	Insert dummy plug into P jack.	PERCENT BREAK meter reads 100 on <i>black</i> scale.
10d	If requirement of Step 9 is not met— Unlock CAL % BK control, adjust control for reading of 100 on PERCENT BREAK meter and relock control.	
11	Remove dummy plug from P jack.	

4. METHOD

STEP	ACTION	VERIFICATION
A. Decoder Time Base and Digit 1 Cancellation		
4	Dial digit 2.	Relay ON releases. Relays B, TR, and TA operate. After 4 to 6 seconds— Relay ON operates and relays B, TR, and TA release.
5	Dial digit 2, then digit 1 within 2 seconds.	Relay ON releases. Relays B, TR, and TA operate. When digit 1 is dialed— Relay ON operates and relays B, TR, and TA release immediately.
6c	If no further tests are to be performed— Remove #1014A hand test set from PLS jack of decoder; restore SS-1 loops to normal.	
B. Decoder Busy Tone Verification		
4	Connect 716C test receiver to terminals TSC15 and TSC24 of decoder.	
5	Dial digit 2; allow 6 seconds to elapse.	Busy tone heard for 4 to 6 seconds.
6	Dial code 99.	Busy tone heard throughout dialing interval.
7	Remove test receiver.	
8c	If no further tests are to be performed— Remove #1014A hand test set from PLS jack of decoder; restore SS-1 loops to normal.	
C. Decoder Pulse Counting and Translation		
4	Block relay RA operated.	Relays RA1 and B operate. Relay ON releases.

STEP**ACTION****VERIFICATION**

5 Dial digit 1.

Relays P1 through P5 are operated or released in accordance with Table B for digit dialed.

TABLE B

DIGIT	FINAL RELAY STATE*				
	P1	P2	P3	P4	P5
1	1	1	0	0	0
2	0	0	1	0	0
3	1	1	1	1	0
4	0	0	1	1	0
5	1	1	0	1	0
6	0	0	0	1	1
7	1	1	0	1	1
8	0	0	1	1	1
9	1	1	1	0	1
0	0	0	1	0	1

***Legend:** 1 indicates operated relay;
0 indicates released relay.

6 Remove blocking tool from relay RA.

Relay RA1 releases.

7 Dial digit 1 to restore decoder to normal.

Relay ON operates.
Relay B and operated P- relays release.

Note: All decoder relays except P and ON should be released in normal condition.

8 Repeat Steps 4 through 7 for each digit 2 through 0.
Increase by one the number of the digit dialed in Step 5 each time the sequence of steps is repeated.

Relay states shown in Table B.

9c If no further tests are to be performed—
Remove 1014A hand test set from PLS jack of decoder; restore SS-1 loops to normal.

D. SF Unit Guard Transfer

Note: SF units E3B or later do not require this test.

4 Set function switch of VOM to 60 volts DC.

5 Connect positive lead of VOM to ground and negative lead to terminal TSA18 of decoder.

VOM reads approximately 30Vdc.

SECTION 480-621-502

STEP	ACTION	VERIFICATION
6	Dial digit 2.	VOM reads between 0 and 10Vdc for 4 to 6 seconds, then restores to 30Vdc.
7	Dial digit 2, then digit 1 within 2 seconds.	VOM reads between 0 and 10Vdc during dialing, then immediately restores to 30Vdc.
8	Disconnect VOM from decoder.	
9c	If no further tests are to be performed— Remove 1014A hand test set from PLS jack of decoder; restore SS-1 loops to normal.	

E. Keyer Pulsing

12	Insert dummy plug into OSC TST jack of keyer. See Fig. 1 for keyer pulsing test setup.	
13	Using 3P7A cord, connect D jack of 2B signaling test set to A PLS jack of keyer.	
14	On 2B signaling test set— Adjust ADJ PPS control to obtain reading of 10 on PULSES PER SECOND meter.	
15	Adjust ADJ % BK control to obtain reading of 68 on black scale of PERCENT BREAK meter. Note: When loop cutoff relay circuit (Fig. 16 of SD-98093-01) is used, adjust control to obtain a reading of 32 on PERCENT BREAK meter.	
16	Operate TWD D key to OFF HK, MEAS % BK key to LINE, and PLS key to DROP.	
17	Using second 3P7A cord, connect L jack of 2B signaling test set to M TST jack of keyer.	PERCENT BREAK meter reads 68 on black scale. Note: If the 2B signaling test set was adjusted to obtain a reading of 32 on the PERCENT BREAK meter in Step 15, the PERCENT BREAK meter should now read 32 on black scale.
18	If requirement of Step 17 is not met— Adjust M potentiometer until PERCENT BREAK meter reads 68 (or 32) on black scale.	

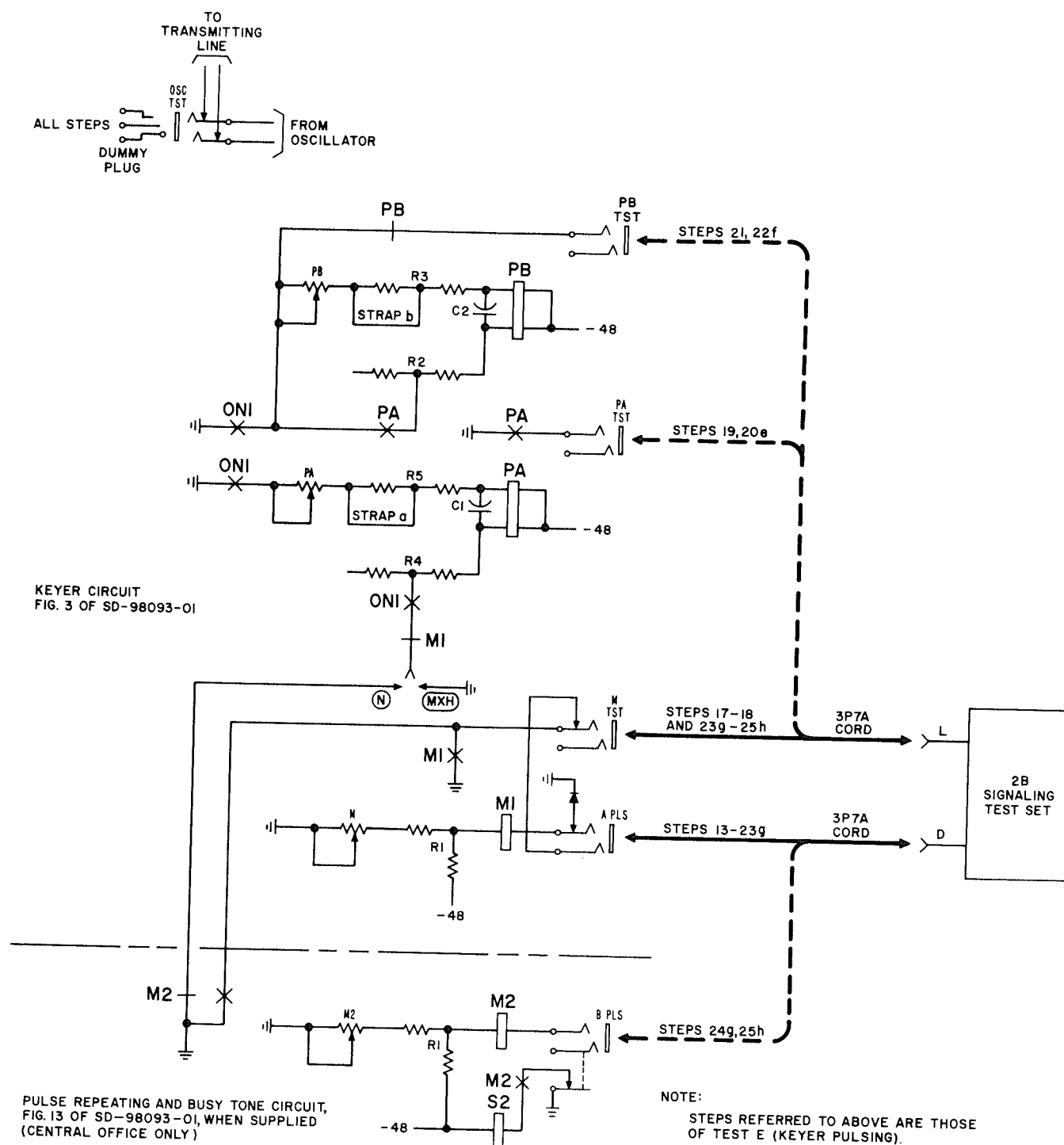


Fig. 1—Keyer Pulsing Test Procedure

SECTION 480-621-502

STEP	ACTION	VERIFICATION
19	Transfer 3P7A cord from M TST jack to PA TST jack of keyer. <i>Note:</i> ♦If 2B signaling test set was set up for a reading of 32 on PERCENT BREAK meter in Step 15, with all keys on the 2B signaling test set normal, readjust the ADJ% BK control to obtain reading of 68 on black scale of PERCENT BREAK meter. Repeat Step 16.♦	PERCENT BREAK meter reads 67 on black scale.
20e	If requirement of Step 19 is not met— Adjust PA potentiometer until PERCENT BREAK meter reads 67 on black scale. <i>Note:</i> ♦On keyer circuits prior to SD-98093-01, Issue 17D,♦ if PA potentiometer has insufficient range, remove strap designated a , which shorts one section of resistor R5 in keyer.	
21	Transfer 3P7A cord from PA TST jack to PB TST jack of keyer.	PERCENT BREAK meter reads 63 on black scale.
22f	If requirement of Step 21 is not met— Adjust PB potentiometer until PERCENT BREAK meter reads 63 on black scale. <i>Note:</i> ♦On keyer circuit prior to SD-98093-01, Issue 17D,♦ if PB potentiometer has insufficient range, remove strap designated b , which shorts one section of resistor R3 in keyer.	
23g	If pulse repeating and busy tone circuit (Fig. 13 of SD-98093-01) is supplied (central office use only)— Transfer 3P7A cord from PB TST jack back to M TST jack of keyer.	
24g	Transfer 3P7A cord from A PLS jack of keyer to B PLS jack of pulse repeating and busy tone circuit.	PERCENT BREAK meter reads 68 on black scale.
25h	If requirement of Step 24g is not met— Adjust M2 potentiometer of pulse repeating and busy tone circuit until PERCENT BREAK meter reads 68 on black scale.	
26i	If no further tests are to be performed— Remove patch cords from test set and SS-1 equipment, restore test set to normal, remove dummy plug from OSC TST jack, and restore SS-1 loops to normal.	

STEP	ACTION	VERIFICATION
F. Keyer Permanent Signal		
12	Insert dummy plug into OSC TST jack of keyer.	
13	Using 3P7A cord, connect D jack of 2B signaling test set to A PLS jack of keyer.	
14	On 2B signaling test set— Operate TWD D key to ON HK.	In keyer circuit— ON1 relay operates, then releases. M1, AUX, and PA relays operate.
15	Operate TWD D key to OFF HK.	M1, AUX, and PA relays release.
16e	If no further tests are to be performed— Remove patch cord from test set and keyer, restore test set to normal, remove dummy plug from OSC TST jack, and restore SS-1 loops to normal.	
G. Keyer Frequency Measurement and Adjustment		
3	Calibrate 72A frequency meter as covered in Section 103-425-100.	
4	Using 3P17B cord, connect 600 Ω IN jacks of 72A frequency meter to OSC TST jack of keyer. See Fig. 2 for keyer frequency and adjustment test setup.	Frequency meter reads between 2596 and 2604 Hz. Note: If this requirement is met, proceed to Step 13.
5c	If requirement of Step 4 is not met— Calibrate 21A TMS as covered in Section 103-221-101.	
6c	Transfer 3P17B cord from 600 Ω IN jacks of 72A frequency meter to DET IN 600 Ω jacks of 21A TMS. Record measured output power of keyer.	
7c	Set LEV ADJ control fully clockwise.	21A TMS reads +2 dBm. Note: If this requirement is not met, adjust potentiometer P1, as required, to obtain +2 dBm reading.
8c	Transfer 3P17B cord from DET IN 600 Ω jacks of 21A TMS to 600 Ω IN jacks of 72A frequency meter.	
9c	Adjust keyer frequency to 2600 \pm 4 Hz by connecting capacitors C3 through C7, as	

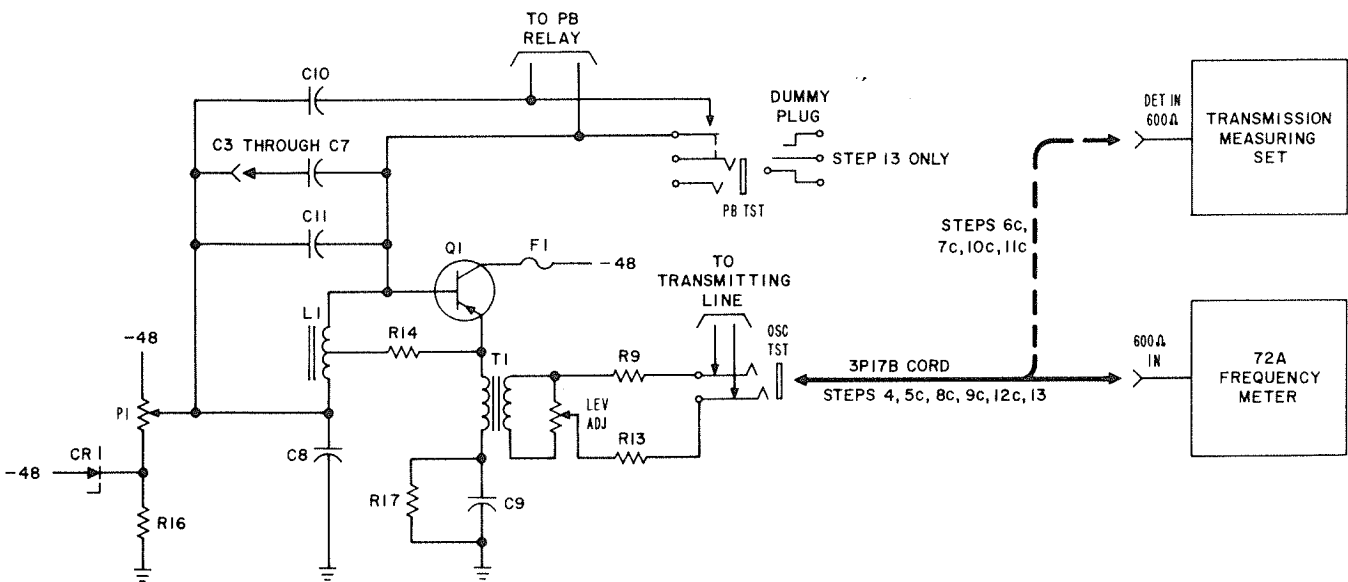


Fig. 2—Keyer Frequency Measurement and Adjustment

STEP	ACTION	VERIFICATION
------	--------	--------------

required, into the oscillator tuning circuit. The frequency change provided by each capacitor is shown in Table C.

TABLE C

CAPACITOR	FREQUENCY CHANGE IN HZ
C3	-2
C4	-4
C5	-8
C6	-16
C7	-32

Caution: When changing capacitor strapping, temporarily disconnect -48Vdc potential from keyer circuit by removing fuse G (check that voltage is no longer present at TSA41). Use heat sinks to prevent damage to capacitors when soldering or unsoldering.

- 10c
- Transfer 3P17B cord from 600Ω IN jacks of 72A frequency meter to DET IN 600Ω jacks of 21A TMS.

STEP	ACTION	VERIFICATION
11c	Adjust LEV ADJ control to obtain keyer output power recorded in Step 6C or as specified on circuit layout card.	
12c	Transfer 3P17B cord from DET IN 600 Ω jacks of 21A TMS to 600 Ω IN jacks of 72A frequency meter.	Frequency meter still reads between 2596 and 2604 Hz, as adjusted in Step 9c.
13	Insert dummy plug into PB TST jack of keyer.	Frequency meter reads between 2370 and 2410 Hz. Note: If requirement of Step 4 or Step 12c is met and the requirement of this step is not met, replace capacitor C10.
14d	If no further tests are to be performed— Remove patch cord from test set and keyer, restore test sets to normal, remove dummy plug from PB TST jack, and restore SS-1 loops to normal.	