851S-1 Receiver

Rockwell International

maintenance

Collins Defense Communications

Printed in USA

523-0769215-101218
1 January 1979
Change 1, 1 March 1981

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1. GENERAL

This section contains information necessary to maintain the 851S-1 Receiver. Testing and troubleshooting procedures isolate a fault to a circuit card or chassis-mounted components. Refer to the appropriate circuit card section in this instruction book for fault isolation and repair of components on circuit cards. Figure 1 shows the location of 851S-1 subassemblies.

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be utilized to prevent equipment damage. Refer to paragraph 7.4, Electrostatic Discharge Sensitive Devices Precautions, before performing maintenance on this equipment.

2. TEST EQUIPMENT AND TOOLS

Table 1 lists all test equipment and tools required to test, troubleshoot, align, and repair the 851S-1.

3. TESTING/TROUBLESHOOTING

3.1 Fault Isolation

Some failures that may occur in the 851S-1 can be quickly isolated to a faulty card or assembly by using the front panel control and monitor features. Table 2 contains a brief description of indications and isolation of apparent failures.

3.2 Test Point, Voltage and Signal Levels

As an additional aid in testing and troubleshooting, voltage and signal levels that are easily accessible are given in table 3. These levels, when used with tables 2, 4, and 5, further enable the user to isolate and identify faults.

Note

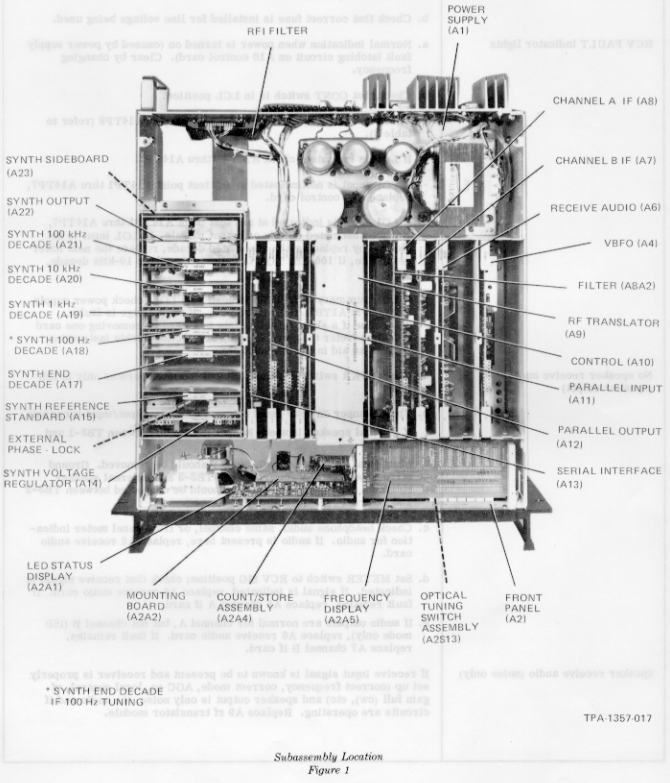
To check signal levels on A1 power supply, the bottom dust cover must be removed from the 851S-1. To check all other signal levels, the top dust cover must be removed from the 851S-1. In addition, to check synthesizer signal levels on cards A14 through A22, the synthesizer top cover must be removed.

Table 1. Test Equipment and Tools.

ITEM	MINIMUM SPECIFICATION	REPRESENTATIVE TYPE
TEST EQUIPMENT		
Vom		Any
Storage oscilloscope		Tektronix 549
Card/module extenders	1-to-1 card/module extenders sufficient to extend card/module above chassis configuration (need 130-pin edge-on extender, 56-pin edge-on extender, rf module extender, synthesizer extender, (7) subminiax coax extenders, and a subminiax to BNC coax extender).	Collins TS-8010 (622-3431-001) includes: (1) 635-0913-001 (1) 635-0915-001 (1) 635-0915-002 (7) 635-9686-001 (1) 635-9686-002 (1) 637-2843-001
6-dB pad		Measurements, Inc., 800P-3
Rf signal generator (2)		HP 8640B-001
Dvm		Fluke 8000A

Table 1. Test Equipment and Tools (Cont).

ITEM	MINIMUM SPECIFICATION	REPRESENTATIVE TYPE
	TEST EQUIPMENT (Cont)	
Rf voltmeter	50-Ω load and high impedance	Boonton 92C
Counter	0 to 110 MHz.	Anadex CF735 with Option C
Multifunction meter		HP 410C
Wave analyzer		HP 3581A
Distortion analyzer		HP 333A
Spectrum analyzer		HP 141T Display
		HP 8552B IF
		HP 8553B RF
Audio oscillator		HP 204C
Combiner		Mini-Circuits Lab, ZSC-2-1
Variable attenuator	0 to 10 dB, 0 to 500 kHz	Daven RFB-551-50
AGC switching device	Capable of reducing 4000.00 kHz signals at 200 μV to 10 μV (AGC switching).	Any (figure 5)
	TOOLS	
Flux	Rosin type	Kester 1544
Solder	0.5 mm (0.020 inch) diameter, 63/37 rosin flux core	Gardiner type QQS571E SN63 WRMA P-2
Solvent	TF/Methylene Chloride Azeotrope	Du Pont, Freon TMC
Soldering iron	40-watt, 0.1588-cm (1/16-inch) tip	Weller model WP-40 with model ST-1 tip
Solder sucker	Plunger type with sufficient vacuum to draw molten solder from work area	Soldavac model SV-026
Needle-nose pliers	10.2 cm (4 inch) long with 3 cm (1.125 inch) nose	Utica model 46
Diagonal cutters	12 cm (4.75 inch) long with 1.3 cm (0.5 inch) cutting edge	Kraeuter model 83
Small brush	Nylon bristles, 1.3 cm (0.5 inch), typical length	Trumball McFall model Keller-Hull No. 1
Pipe cleaners	12.7 cm (5 inch), typical length, industrial quality	B.L. Long, industrial pipe cleaners



Subassembly Location
Figure 1

Table 2. Fault Isolation.

INDICATION	ISOLATION OF APPARENT FAILURE
Meter lights are dim, or fuse fails	a. Check that rear panel power selector switches are set to the line voltage being used. b. Check that correct fuse is installed for line voltage being used.
RCV FAULT indicator lights	a. Normal indication when power is turned on (caused by power supply fault latching circuit on A10 control card). Clear by changing frequency. b. Check that CONT switch is in LCL position. c. Check frequency synthesizer LOL summary at A14TP8 (refer to table 3). If LOL is indicated, check A14TP1 thru A14TP7. If LOL input is not indicated at any test point A14TP1 thru A14TP7, replace A10 control card. If LOL input is indicated at any test point A14TP1 thru A14TP7, replace associated decade or output module. If LOL input is not cleared by replacing the associated decade, replace the next lower decade (ie, if 100-kHz LOL is indicated, replace 10-kHz decade, etc). d. If LOL summary at A14TP8 indicates no LOL, check power supply voltages at A1TB1 (refer to table 3). If any voltage is faulty, determine if a short circuit exists in a card by removing one card at a time (refer to figure 12 in theory section of this instruction book as an aid in power isolation).
No speaker receive audio (speaker output)	a. Check SPKR switch position (channel B audio operates only in ISB mode). b. Check jumper on rear panel between speaker output/input terminals. If internal speaker is used, jumper should be between TB3-1 and TB3-2. If external speaker is used, jumper should be removed. Ground strap should be connected between TB3-3 and external speaker common. External speaker line should be connected between TB3-2 and external speaker audio line. c. Check headphone audio, same channel, or front panel meter indication for audio. If audio is present here, replace A6 receive audio card. d. Set METER switch to RCV SIG position; check that receive signal is indicated. If signal is indicated, replace A6 receive audio card. If fault remains, replace A8 channel A if card. e. If audio outputs are normal for channel A, but not channel B (ISB mode only), replace A6 receive audio card. If fault remains, replace A7 channel B if card.
Speaker receive audio (noise only)	If receive input signal is known to be present and receiver is properly set up (correct frequency, correct mode, AGC on, local control, rf gain full (cw), etc) and speaker output is only noise, the audio and if circuits are operating. Replace A9 rf translator module.

Table 3. Test Points, Voltage and Signal Levels.

CARD/MODULE	TEST POINT	FUNCTION	SIGNAL, DESCRIPTION
Power supply A1	TB1-1	+24 V dc	+24 V dc.
	TB1-2	+18 V dc	+18 V dc.
	TB1-3	+15 V dc	+15 V dc.
	TB1-4	Power supply fault	Fault ≅ +5 V dc (indicates low voltage in +24-, +18-, +15-, +8-, or -15-V dc supplies), no fault ≅ 0 V dc.
	TB1-5	Ground	0 V dc (signal common).
	TB1-6	+8 V dc	+8 V dc.
	TB1-7	+5 V dc	+5 V dc.
	TB1-8	-15 V dc	-15 V dc.
Count/store assy A2A4	TP1	Ground	0 V dc (signal common).
	TP2	Clock A window	100- to 120-μs count window logic 1 pulse when TUNING knob is rotated.
	TP3	WD4G	10- to 30-μs logic 1 pulse width, 100 to 120 μs between pulses when TUNING knob is rotated.
Vbfo A4	TP1	Ground	0 V dc (signal common).
	TB2	Vbfo synth fault	Fault ≅ +5 V dc (out-of-lock), no fault ≅ 0 V dc.
	TP3	Vbfo enable	Enable ≅ +5 V dc, disable ≅ 0 V dc.
	TP4	Rf xmt	Xmt ≅ +5 V dc, $\overline{\text{xmt}}$ ≅ 0 V dc.
	TP5	Clock	5 V p-p clock signal during vbfo tuning.
	TP6	Up/down	Up ≅ +5 V dc, down ≅ 0 V dc.
	TP7	Vbfo parallel load	75 μs pulse (parallel load condition).
	TP8	Vbfo display enable	Enable ≅ +5 V dc, disable ≅ 0 V dc.
	TP9	450 kHz enable	Enable ≅ +5 V dc, disable ≅ 0 V dc.
Receive audio A6	TP1	Ground	0 V dc (signal common).
	TP2	Ch A audio input	10 mV nominal (AM, ch A SSB, or ch A sidetone).
	TP3	Squelch trigger	Normal ≅ +5 V dc, squelch ≅ -15 V dc.
	TP4	Squelch hi channel	Output of upper bandpass filter.
	TP5	Squelch lo channel	Output of lower bandpass filter.
	TP6	Speaker input	150 mV at maximum volume.
	TP7	Headphone input	150 mV for 10 mV at audio input.
	TP8	Ch B audio input	10 mV nominal (ch B rcv af or ch B sidetone).

Table 3. Test Points, Voltage and Signal Levels (Cont).

CARD/MODULE	TEST POINT	FUNCTION	SIGNAL, DESCRIPTION
Channel B if A7	TP1	Ground	0 V dc (signal common).
	TP2	Ch B receive enable	Enable ≅ 0 V dc; disable ≅ -9.5 V dc (ISB rcv only).
	TP3	LSB output amplifier/switch	Enable ≅ 0 V dc; disable ≅ -9.5 V dc (ISB xmt or LSB enable).
	TP4	LSB input amplifier/switch	Enable ≅ 0 V dc; disable ≅ -9.5 V dc (ISB rcv or LSB enable).
Channel A if A8	TP1	Ground	0 V dc (signal common).
	TP2	USB enable	Enable ≅ 0 V dc, disable ≅ -9.5 V dc.
	TP3	Rf xmt	Xmt ≅ +5 V dc, $\overline{\text{xmt}}$ ≅ 0 V dc.
	TP4	Bypass enable (16 kHz)	Enable ≅ 0 V dc, disable ≅ -9.5 V dc.
Control A10	TP1	Ground	0 V dc (signal common)
	TP2	+5 KAV	+4.0 to +7.5 V dc (with external keep-alive only applied); +4.8 to +5.4 V dc (with normal power applied).
	TP3	Parallel enable	0.5- to 2.5-ms pulse when CONT switch in REM position and a remote frequency change is made.
	TP4	3-State control	Enable ≅ 0 V dc, disable ≅ +5 V dc. Enabled when CONT switch is in LCL position and $\overline{\text{clock inhibit}}$ is applied.
	TP5	Variable clock	Clock signal for frequency tuning when DIAL switch in FINE or CRS position and BFO in FIX or HOLD position. Frequency dependent on rotation speed of TUNING knob.
Preset A12	TP1	Ground	0 V dc (signal common).
	TP2	-27 V dc	-27 V dc.
	TP3	Scan clock	0.5 to 1.5 ms logic 1 clock signal, 80 to 120 ms period. When scan is enabled, clock rate dependent on scan rate switch (A12S1) settings as follows:

S1-1	S1-2	S1-3	SCAN CLOCK PERIOD
OFF	OFF	OFF	80 to 120 ms
OFF	OFF	ON	160 to 240 ms
OFF	ON	OFF	240 to 360 ms
OFF	ON	ON	400 to 600 ms
ON	OFF	OFF	800 to 1200 ms
ON	OFF	ON	1600 to 2400 ms
ON	ON	OFF	2400 to 3600 ms
ON	ON	ON	4000 to 6000 ms

(Cont)

Table 3. Test Points, Voltage and Signal Levels (Cont).

<table>
<tr><th>CARD/MODULE</th><th>TEST POINT</th><th>FUNCTION</th><th>SIGNAL, DESCRIPTION</th></tr>
<tr><td>Preset A12 (Cont)</td><td>TP4</td><td>Remote clock</td><td>5 to 15 μs logic 1 clock signal whose leading edge is coincident with the trailing edge of the scan clock pulse.</td></tr>
<tr><td></td><td>TP5</td><td>Local clock</td><td>5 to 15 μs logic 1 clock signal whose leading edge is coincident with the trailing edge of the remote clock pulse.</td></tr>
<tr><td></td><td>TP6</td><td>C1 (memory mode control signal C1)</td><td>Logic 0 for two clock periods after local frequency enable (logic 1) signal is applied. See table below. Logic 1 at all other times.</td></tr>
<tr><td></td><td>TP7</td><td>C2 (memory mode control signal C2)</td><td>Logic 1 for one clock period after local frequency enable (logic 1) signal is applied. See table below. Logic 0 at all other times.
<table>
<tr><th>C1</th><th>C2</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>1</td><td>Erase mode</td></tr>
<tr><td>1</td><td>0</td><td>Read mode</td></tr>
<tr><td>0</td><td>0</td><td>Write mode</td></tr>
</table></td></tr>
<tr><td></td><td>TP8</td><td>CS 1 (chip select 1)</td><td>Logic 1 when preset is enabled. Enables preset frequency control.</td></tr>
<tr><td></td><td>TP9</td><td>CS2 (chip select 2)</td><td>Logic 1 when preset is enabled. Enables preset mode, bandwidth, channel control.</td></tr>
<tr><td></td><td>TP10</td><td>NMIF (Nonmaskable interrupt false)</td><td>When preset is enabled and a change is made to the local frequency enable input (from either logic 1 or logic 0) a logic 0 NMIF pulse generated.

Note
This signal not used in the 851S-1. An external 3-kΩ pullup to +5 V dc is required on this test point to view the signal on an oscilloscope.</td></tr>
<tr><td>Parallel input A11</td><td>TP1</td><td>Ground</td><td>0 V dc (signal common).</td></tr>
<tr><td></td><td>TP2</td><td>WD4G (output)</td><td rowspan="4">Word initiate strobes (gates); initiate ≅ +5 V dc, $\overline{\text{initiate}}$ ≅ 0 V dc.</td></tr>
<tr><td></td><td>TP3</td><td>WD3G (output)</td></tr>
<tr><td></td><td>TP4</td><td>WD1G (output)</td></tr>
<tr><td></td><td>TP5</td><td>WD2G (output)</td></tr>
</table>

Table 3. Test Points, Voltage and Signal Levels (Cont).

CARD/MODULE	TEST POINT	FUNCTION	SIGNAL, DESCRIPTION
Parallel output A12	TP1	Ground	0 V dc (signal common).
	TP2	Data (input)	Serial data from serial interface card (0- or +5-V dc logic levels).
	TP3	Clock (input)	Gated data clock from serial interface card (0- or +5-V dc logic levels).
	TP4	Word 4 load strobe	Load pulse (≅ +5 V dc) generated on reception of word 4 data.
	TP5	Remote RF gain control (output)	Analog dc level (0 to -5.0 V dc), depending on remote RF GAIN setting (MAX ≅ 0 V dc). In local operation ≅ 0 V dc.
	TP6	Word 2 load strobe	Load pulse (≅ +5 V dc) generated on reception of word 2 data.
	TP7	ADRG (output)	Address gate pulse (≅ +5 V dc) generated by a change in the address.
	TP8	Remote frequency change (output)	Load pulse (≅ +5 V dc) generated on reception of word 1 data.
	TP9	Word 3 load strobe	Load pulse (≅ +5 V dc) generated on reception of word 3 data.

Table 3. Test Points, Voltage and Signal Levels (Cont).

CARD/MODULE	TEST POINT	FUNCTION	SIGNAL, DESCRIPTION
Serial interface A13	TP1	Ground	0 V dc (signal common).
	TP2	Strobe (output)	Strobe pulse (≅+5 V dc) to parallel output card.
	TP3	Clock (output)	Gated data clock (0 or +5 V dc logic levels) to parallel output card.
	TP4	Data (output)	Serial data (0- or +5-V dc logic levels) to parallel output card.
	TP5	Serial data (input)	Received serial line data (0- or +5-V dc logic levels). RS-232C or FSK detected data signals.
	TP6	Serial data (output)	Transmitted serial line data (0- or +5-V dc logic levels). Data signals prior to level shifting or FSK modulation.
	TP7*	Microprocessor clock output	921.6 kHz clock output (0- or +5-V dc logic levels) to frequency divider.
	TP8*	Halt input	Ground (0 V dc) applied at this input halts microprocessor program. Normal +5 V dc enables microprocessor.
	TP9*	Reset input	Power supply interrupt reset ≅+5 V dc, reset ≅ 0 V dc; to microprocessor.
	*TP7, TP8, TP9 applicable only to Serial Interface 638-6896-001.		
Synthesizer voltage regulator A14	TP1	1-Hz LOL (input)	Loss of lock ≅ 0 V dc, $\overline{\text{loss of lock}}$ ≅ +5 V dc. Signal received from associated decade card (including output module).
	TP2	10-Hz LOL (input)	
	TP3	100-Hz LOL (input)	
	TP4	1-kHz LOL (input)	
	TP5	10-kHz LOL (input)	
	TP6	100-kHz LOL (input)	
	TP7	MHz LOL (input)	
	TP8	LOL summary (freq synth fault)	Loss of lock ≅ +5 V dc, $\overline{\text{loss of lock}}$ ≅ 0 V dc. Supplied to control card.
	TP9	+5.2-V dc reg (output)	+5.2 V dc.
	TP10	+24-V dc (output)	+24 V dc.
	TP11	+8-V dc (input)	+8 V dc.
(Cont)	TP12	+20-V dc reg (output)	+20 V dc.

Table 3. Test Points, Voltage and Signal Levels (Cont).

CARD/MODULE	TEST POINT	FUNCTION	SIGNAL, DESCRIPTION
Synthesizer voltage regulator A14 (Cont)	TP13	Ground	0 V dc (signal common).
Note The following are fixed injection levels that are accessible by extending the synthesizer reference card A15 and the synthesizer output module A22. All levels are measured out-of-circuit with a 50-ohm load into rf voltmeter except as noted.			
Synthesizer reference A15	J1-6	450-kHz injection	450 kHz, 0.3 V rms (measured in circuit with a high impedance load into an rf voltmeter). Supplied to channel A if card (A8J5), channel B if card (A7J5), and/or dvbfo card (A4J2).
	P1	118.8-MHz injection	118.8 MHz, 0.5 V rms. Supplied to rf translator module (A9J6).
	P3	9.9-MHz injection	9.9 MHz, 0.3 V rms. Supplied to channel A if card (A8J3).
Synthesizer output A22	P2	109.35- to 79.35-MHz variable injection.	109.35 to 79.35 MHz, 0.5 V rms. Front-panel FREQUENCY KHZ of 00 000.00 ≅ 109.350 00 MHz, 29 999.99 ≅ 79.350 01 MHz. Supplied to rf translator module (A9J5).
Note 1. All signal levels are rms unless otherwise noted. 2. Nominal voltage levels only are given unless otherwise noted.			

3.3 Testing/Troubleshooting Procedures

The testing/troubleshooting procedures isolate a fault to a circuit card or chassis-mounted component. A test setup diagram is shown in figure 2. Testing/troubleshooting procedures are presented in tabular format. Table 4 presents a minimum performance test procedure that permits a quick check of the performance of the receiver using a minimum amount of test equipment. Table 5 presents a detailed performance test procedure that permits complete repair of the unit and returns the unit to satisfactory operation.

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be utilized to prevent equipment damage. Refer to paragraph 7.4, Electrostatic Discharge Sensitive Devices Precautions, before performing maintenance on this equipment.

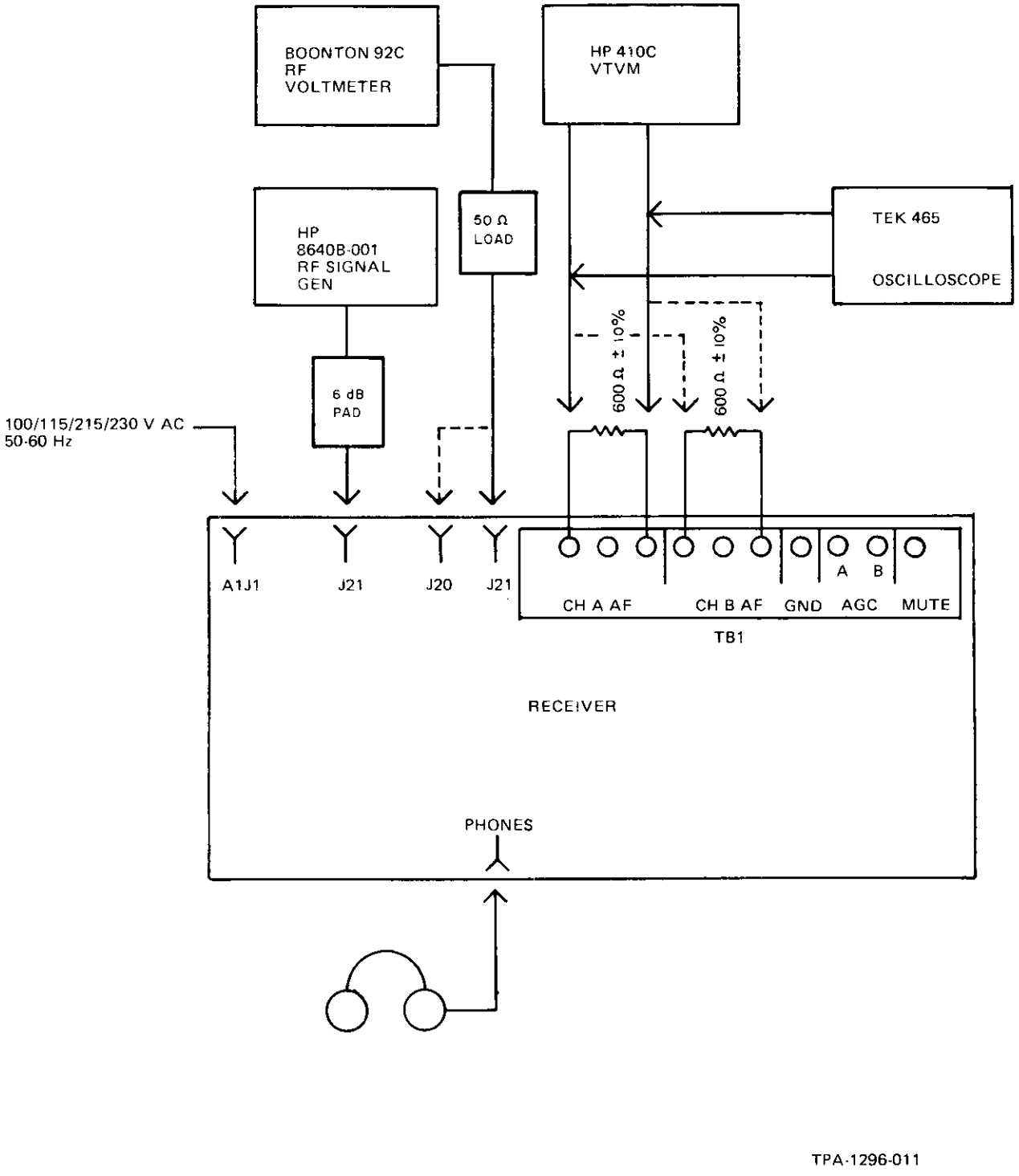
The test procedures in tables 4 and 5 are presented in a manner that allows complete testing or testing of specific characteristics only. After completion of setup (test 1), test procedures may be entered at any numbered test.

Note

Unless otherwise specified in testing, all rf signal inputs are open-circuit inputs (in series with 6-dB pad), rf signals are not modulated, rf outputs are loaded with 50 ohms, and audio outputs are loaded with 600 ohms.

Note

Meter level readings in testing apply with factory level settings. Readings may not be valid if field level adjustments have been made.



Test Setup
Figure 2

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top and bottom chassis covers of unit to be tested. b. Set unit LINE SELECTOR for power source available. (100/115/215/230 V ac). ***Note*** Ensure that proper fuse is installed for power source used. c. Connect unit to available power source. d. Refer to test setup, figure 2.	***Note*** In all tests, if power is removed the frequency must be changed slightly when power is restored to clear RCV FAULT indication.	
2. Initial checks (Cont)	***Note*** To make the initial checks, set unit on edge to gain access to A1TB1. ***Caution*** If repair has been made to the power supply or any power circuits, remove all plug-in cards/modules. a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to 16. DIAL to LOCK. BFO to FIX. AGC to FAST. RF GAIN to full cw. b. Measure dc voltages between the following points and ground (A1TB1-5): A1TB1-1 A1TB1-2 A1TB1-3 A1TB1-6 A1TB1-7 A1TB1-8 ***Note*** Perform step 2.c only if repair has been made to power supply or any power circuits.	 +24 ±1.0 V dc. +18 ±1.0 V dc. +15 ±1.0 V dc. +8 ±1.0 V dc. +5 ±0.5 V dc. -15 ±1.0 V dc.	 Check power supply A1 and check for shorts on output voltage lines.

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

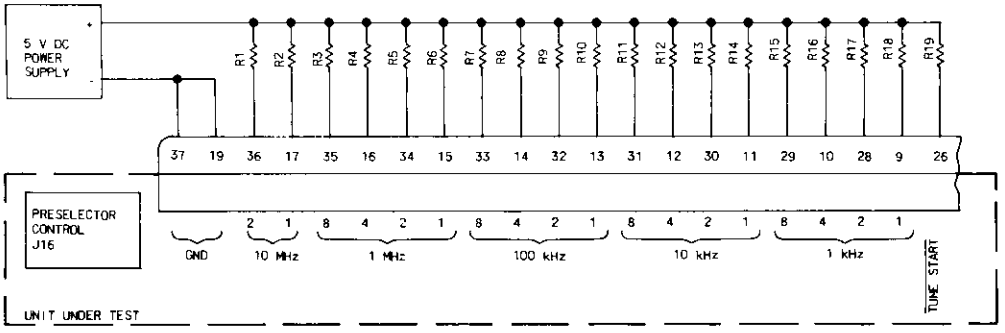
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	c. Measure dc voltages between the following points and ground: Receive audio A6: J4-18 Rf translator A9: J7-6 J7-23 J7-25 J7-27 Synthesizer voltage regulator A14: A23J1-8	 +18 ±1.0 V dc. -15 ±1.0 V dc. +15 ±1.0 V dc. +24 ±1.0 V dc. +5 ±0.5 V dc. +8 ±1.0 V dc.	Check wiring from A1TB1. Check for shorts on output lines, or check repaired power circuit.
3. Preselector control outputs (Cont)	a. Connect a 15-kΩ load between +5 V dc and each of the output pins of PRESELECTOR CONTROL J16 located on the rear panel. (See following figure.)  b. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to 16. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw. c. Adjust the TUNING knob for the following frequencies and note the logic output at J16:	***Note*** There is no internal pullup voltage on preselector control outputs, therefore test jig or equivalent must be connected.	Check control A10, TUNING control A2S13, and count/store assembly A2A4.

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)			

FREQUENCY SETTING (kHz)	BCD FREQUENCY (MHz)																	
	10		1				0.1				0.01				0.001			
	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
	J16-( )																	
	36	17	35	16	34	15	33	14	32	13	31	12	30	11	20	10	28	0
000.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 111.00	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1
12 222.00	0	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
13 333.00	0	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
14 444.00	0	1	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0
15 555.00	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
16 666.00	0	1	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0
27 777.00	1	0	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1
28 888.00	1	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
29 999.00	1	0	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1

Logic 1 = NLT +3.0 V dc; Logic 0 = NMT 0.5 V dc.

Note

It is not necessary to check all the above frequencies, but as a minimum check 000.00, 16 666.00, and 29 999.00.

	d. Connect an oscilloscope to J16-26.		
	e. Note oscilloscope display when switching CONT switch from LCL to REM.	Tune start pulse is generated when CONT switch is just switched to REM.	Check control A10 and CONT switch A2A2S8.
	f. Note oscilloscope display when switching CONT switch from REM to LCL.	Tune start pulse is generated when CONT switch is just switched to LCL.	Same as step 3.e.
	g. Note oscilloscope display when rotating TUNING knob.	Tune start pulse is generated for any frequency digit change.	Check control A10, TUNING control A2S13 and count/store assembly A2A4.
	h. Remove test setup of step 3.a.		
4. Control inputs (Cont)	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to 16. DIAL to LOCK. BFO to FIX. AGC to FAST. RF GAIN to full cw.		

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. (Cont)	**Caution** In the following procedures, when applying +5-V dc or 0-V dc (ground) to the indicated points, apply these levels through a 100-ohm (or more) series limiting resistor. The +5-V dc source should be obtained from the receiver power supply so that the integrated circuit supply voltages are not exceeded by the applied levels.		
	b. Apply +5 V dc to P16-8.	PRESEL FAULT indicator lights.	Check control A10 and LED status display A2A1.
	c. Remove +5 V dc from P16-8.	PRESEL FAULT indicator goes out.	Same as step 4.b.
	d. Apply +5 V dc to P16-27.	RCV OVERLOAD indicator lights.	Same as step 4.b.
	e. Remove +5 V dc from P16-27.	RCV OVERLOAD indicator goes out.	Same as step 4.b.
	f. Adjust AF GAIN (speaker volume) to hear a level of noise.		
	g. Apply a ground to TB1-10.	Noise from speaker should be muted (volume greatly reduced).	Check receiver audio A6.
	h. Remove ground from TB1-10.	Noise level returns.	Same as step 4.g.
5. TUNING knob (Cont)	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to 16. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw.		
	b. Check that TUNING knob rotates smoothly and continuously through 360° for as long as it is turned.	No binding, rubbing, or scraping.	Check TUNING control A2S13 and associated mounting hardware.
	c. Check that each frequency digit may be correctly set.	All frequencies between 000.00 and 29 999.99 kHz can be selected.	Check control A10 and frequency display A2A5.

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	d. Check that tuning rate is increased as rotation speed of TUNING knob is increased.	Tuning rate increases at a nonlinear rate.	Check control A10, TUNING control A2S13, and count/ store assy A2A4.
	e. Rotate TUNING knob in a clockwise direction.	Frequencies increase.	Same as step 5.d.
	f. Rotate TUNING knob in a counterclockwise direction.	Frequencies decrease	Same as step 5.d.
6. DIAL switch	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to 16. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw.		
	b. Rotate the TUNING knob slowly in each direction.	In a clockwise rotation of the TUNING knob the least significant digit counts up with carryovers to the next higher digit, etc. In a counterclockwise rotation of the TUNING knob, the least significant digit counts down and borrows from the next higher digit, etc.	Check control A10, DIAL switch A2A2S9, TUNING control A2S13, and count/store assembly A2A4.
	c. Set DIAL switch to CRS position.		
	d. Rotate the TUNING knob slowly in each direction.	In a clockwise rotation of the TUNING knob the 10-kHz digit counts up with carryovers to the next higher digit, etc. In a counterclockwise rotation of the TUNING knob, the 10-kHz digit counts down and borrows from the next higher digit, etc.	Same as step 6.b.

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. MODE switch	a. Front panel controls set as follows: PWR to ON. CONT to LCL. MODE to SSB/CW. BANDWIDTH to 16. DIAL to LOCK. BFO to FIX. AGC to FAST. RF GAIN to full cw. **Note** Step 7.d applicable only with ISB option installed. Step 7.e applicable only with FM option installed.		
	b. Note front panel mode indication.	SSB/CW indicator is lit.	Check MODE switch A2A2S4 and LED status display A2A1.
	c. Set MODE switch to AM.	AM indicator lights.	Same as step 7.b.
	d. Set MODE switch to ISB.	ISB indicator lights.	Same as step 7.b.
	e. Set MODE switch to FM.	FM indicator lights.	Same as step 7.b.
8. BANDWIDTH switch	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH TO 16. DIAL to LOCK. BFO to FIX. AGC to FAST. RF GAIN to full cw. **Note** Step 8.l applicable only if FM option is installed.		
	b. Note front panel BANDWIDTH indication.	16 indicator is lit.	Check MODE switch A2A2S4, BANDWIDTH switch A2A2S6, and LED status display A2A1.
	c. Set BANDWIDTH switch to A.	A indicator lights.	Same as step 8.b.
	d. Set BANDWIDTH switch to B.	B indicator lights.	Same as step 8.b.
	e. Set BANDWIDTH switch to USB.	U indicator lights.	Same as step 8.b.
	f. Set BANDWIDTH switch to LSB.	L indicator lights.	Same as step 8.b.
(Cont)	g. Set BANDWIDTH switch to C.	C indicator lights.	Same as step 8.b.

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8. (Cont)	h. Set BANDWIDTH switch to D.	D indicator lights.	Same as step 8.b.
	i. Set BANDWIDTH switch to E.	E indicator lights.	Same as step 8.b.
	j. Repeat steps 8.b through 8.i with MODE switch in AM position.	Same as steps 8.b through 8.i.	Same as step 8.b.
	k. Repeat steps 8.b through 8.i with MODE switch in ISB position.	All BANDWIDTH indicators go out and remain out.	Same as step 8.b.
	l. Repeat steps 8.b through 8.i with MODE switch in FM position.	Same as steps 8.b through 8.i.	Same as step 8.b.
9. Receive performance	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full ccw. SPKR to CH A. SQUELCH to off (full ccw).		
	b. Connect rf signal generator to RCV ANT J21 jack on rear panel.		
	c. Set rf signal generator to 501.00 kHz and receiver to 500.00 kHz.		
	d. Set rf signal generator level for 100 μV.		
	e. Note output of speaker.	Tone is heard.	Check A2A2S10 and receive audio A6.
	f. Set METER switch to CH A (+3 FS). Note meter indication.	NLT -2 dB mW.	Check A2A2S1 and receive audio A6.
	g. Set METER switch to RCV SIG. Note meter indication.	NLT 30 dB.	Check A2A2S1 and channel A if AB.
	h. Repeat step 9.d thru 9. g with the rf signal generator and receiver at the following frequencies: RF SIG GEN — RECEIVER 1 001.00 kHz — 1 000.00 kHz 15 001.00 kHz — 15 001.00 kHz	Same as steps 9.e, 9.f, and 9.g.	Same as steps 9.e, 9.f, and 9.g.
	Note Steps 9.i and 9.j are applicable only to receivers with an LSB filter installed.		
	i. Set BANDWIDTH switch to LSB.		
	j. Repeat steps 9.d thrug 9.g with the rf signal generator and receiver at the following frequencies. RF SIG GEN — RECEIVER 499.00 kHz — 500.00 kHz 999.00 kHz — 1 000.00 kHz 14 999.00 kHz — 15 000.00 kHz	Same as steps 9.e, 9.f, and 9.g.	Same as step 9.e, 9.f, and 9.g.
(Cont)			

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9. (Cont)	**Note** Steps 9.k thru 9.r are applicable only to receivers with ISB option installed.		
	k. Set MODE switch to ISB.		
	l. Set SPKR switch to CH B.		
	m. Set rf signal generator to 499.00 kHz and receiver to 500.00 kHz.		
	n. Set rf signal generator level for 100 μV.		
	o. Note output of speaker.	Tone is heard.	Check A2A2510 and receive audio A6.
	p. Set METER switch to CH B (+3 FS). Note meter indication.	NLT -2 dB mW.	Check A2A2S1 and receive audio A6.
	q. Set METER switch to RCV SIG. Note meter indication.	NLT 30 dB. channel A if A8.	Check A2A2S1 and channel A if A8.
	r. Repeat steps 9.n thru 9.q with the rf signal generator and receiver at the following frequencies: RF SIGN GEN — RECEIVER 999.00 kHz — 1 000.00 kHz 14 999.00 kHz — 15 000.00 kHz	Same as steps 9.o, 9.p, and 9.q.	Same as steps 9.o, 9.p, and 9.q.
10. AGC switch	a. Front panel controls set as follow: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full ccw. SPKR to CH A. SQUELCH to off (full ccw).		
	b. Connect rf signal generator to RCV ANT J21 jack on rear panel.		
	c. Set rf signal generator to 4 001.00 kHz and receiver to 4000.00 kHz.		
(Cont)	d. Set rf signal generator level for 100 μV.		

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
10. (Cont)	c. Set METER switch to RCV SIG. Note meter indication.	NLT 30 dB.	Check channel A if A8 and A2A2S12.
	f. Disconnect rf signal generator.	Meter reading decreases with no noticeable delay.	Same as step 10.e.
	g. Set AGC switch to SLOW.		
	h. Reconnect rf signal generator to RCV ANT J21 jack on rear panel. Note meter indication.	NLT 30 dB.	Same as step 10.e.
	i. Disconnect rf signal generator.	After approximately 1 second delay, meter reading decreases.	Same as step 10.e.
	j. Set AGC switch to OFF.		
	k. Reconnect rf signal generator to RCV ANT J21 jack on rear panel. Note meter indication.	Meter reading does not change when rf signal generator is connected.	Same as step 10.e.
11. RF GAIN control	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to OFF. RF GAIN to full cw. SPKR to CH A. SQUELCH to off (full ccw).		
	b. Connect rf signal generator to RCV ANT J21 jack on rear panel.		
	c. Set rf signal generator to 4001.00 kHz and receiver to 4000.00 kHz.		
	d. Set rf signal generator level for 100 μV.		
	e. Set METER switch to RCV SIG.		
	f. Slowly rotate RF GAIN to full ccw.	Meter reading increases and audio level decreases as RF GAIN is rotated ccw. At full ccw (minimum gain) no audio tone is present and meter indicates NLT 90 dB.	Check A2A2R9 and channel A if A8.

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
12. SQUELCH/ AF GAIN control	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to OFF. RF GAIN to full cw. SPKR to CH A. SQUELCH to off (full ccw).		
	b. Connect rf signal generator to RCV ANT J21 jack on rear panel.		
	c. Set rf signal generator to 4000.50 kHz and receiver to 4000.00 kHz.		
	d. Set rf signal generator level for 100 μV.		
	e. Disconnect rf signal generator.		
	f. Adjust SQUELCH control to the point just ccw of switch operation.	Background noise is heard.	Check A2A2S16 and receive audio A6.
	g. Slowly adjust SQUELCH cw until background noise disappears.		
	h. Reconnect rf signal generator to RCV ANT J21 jack on rear panel.	Squelch is broken and audio tone is heard from speaker.	Same as step 12.f.
	i. Adjust AF GAIN control to full cw and full ccw.	Maximum speaker volume at full cw. minimum speaker volume at full ccw.	Same as step 12.f.
	j. Disconnect rf signal generator.	After a slight delay, speaker should squelch, no audio tone, no background noise.	Same as step 12.f.
13. PHONES check (Cont)	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to ISB. BANDWIDTH to any. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw. SQUELCH to off (full ccw).		

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
13. (Cont)	b. Plug headphones into PHONES jack.		
	c. Set rf signal generator to 4001.00 kHz and receiver to 4000.00 kHz.		
	d. Set rf signal generator level for 100 μV.		
	e. Set PHONES switch to CH A.	Audio tone should be heard in headphones.	Check A2A2S3 and receive audio A6.
	f. Adjust PHONES level control to full ccw and full cw.	Minimum headphones volume at full ccw, maximum headphones volume at full cw.	Same as step 13.e.
	Note Steps 13.g thru 13.i applicable only if ISB option installed.		
	g. Set PHONES switch to CH B.	Background noise only in headphones.	Same as step 13.e.
	h. Set rf signal generator to 3999.00 kHz.	Audio tone should be heard in headphones.	Same as step 13.e.
	i. Set PHONES switch to CH A.	Background noise only in headphones.	Same as step 13.e.
14. SPKR check	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to ISB. BANDWIDTH to any. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw. SQUELCH to off (full ccw).		
	b. Set rf signal generator to 4001.00 kHz and receiver to 4000.00 kHz.		
	c. Set rf signal generator level for 100 μV.		
	d. Set SPKR switch to CH A.	Audio tone should be heard from speaker.	Check A2A2S10 and receive audio A6.
(Cont)	e. Set SPKR switch to BOTH.	Audio tone should be heard from speaker, slightly reduced in volume.	Same as step 14.d.

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
14. (Cont)	**Note** Steps 14.f thru 14.i applicable only if ISB option installed.		
	f. Set SPKR switch to CH B.	Background noise only in headphones.	Same as step 14.d.
	g. Set rf signal generator to 3999.00 kHz.	Audio tone should be heard from speaker.	Same as step 14.d.
	h. Set SPKR switch to BOTH.	Audio tone should be heard from speaker. slightly reduced in volume.	Same as step 14.d.
	i. Set SPKR switch to CH A.	Background noise only in headphones.	Same as step 14.d.
15. BFO switch (applicable only if vbfo option installed).	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to 16. DIAL to FINE. BFO to TUNE. AGC to FAST. RF GAIN to full cw. SPKR to CH A.		
	b. Check that each frequency digit of the VBFO OFFSET HZ can be set.	All frequencies between -9990 and +9990 Hz in 10-Hz increments can be selected.	Check vbfo A4, control A10, and BFO switch A2A2S11.
	c. Check that tuning rate is increased as rotation speed of TUNING knob is increased.	Tuning rate increases at a non-linear rate.	Same as step 15.b.
	d. Rotate TUNING knob in a clockwise direction.	VBFO OFFSET HZ frequencies increase.	Same as step 15.b.
(Cont)	e. Rotate TUNING knob in a counterclockwise direction.	VBFO OFFSET HZ frequencies decrease.	Same as step 15.b.

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
15. (Cont)	**Note** When rotating in either direction and +/- 9990 Hz is reached the count stops and will hold until the TUNING knob is rotated in the opposite direction.		
	f. With VBFO OFFSET HZ set at any frequency, set BFO switch to HOLD.		
	g. Rotate TUNING knob several times.	VBFO OFFSET HZ frequency does not change and FREQUENCY KHZ changes.	Check control A10 and BFO switch A2A2S11.
	h. Set BFO switch to TUNE and DIAL switch to LOCK.	VBFO OFFSET HZ frequency does not change and FREQUENCY KHZ does not change.	Same as step 15.g.
	i. Set BFO switch to FIX.	VBFO OFFSET HZ frequency goes blank.	Same as step 15.g.
	j. Connect rf signal generator to RCV ANT J21 jack on rear panel.		
	k. Set rf signal generator to 4000.00 kHz and receiver to 4000.00 kHz.	No audio tone from speaker.	
	l. Set BFO switch to TUNE.		
	m. Adjust BFO OFFSET HZ to +1000 Hz.	1000-Hz audio tone from speaker.	
	n. Adjust BFO OFFSET HZ to -1000 Hz.	1000-Hz audio tone from speaker.	
	o. Adjust BFO OFFSET HZ to ±0.00 Hz.	No audio tone from speaker.	
16. CONT switch (applicable only if remote control option installed) (Cont)	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to 16. DIAL to LOCK. BFO to FIX. AGC to FAST. RF GAIN to full cw.	No faults are lit. SSB/CW and BANDWIDTH-16 indicator are lit.	Check control A10 and mounting switchboard A2A2.

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
16. (Cont)	b. Connect a compatible receiver control to the unit under test.		
	c. Set receiver control PWR to on and make changes to the following receiver control front-panel controls: MODE switch. BANDWIDTH switch. DIAL switch. BFO switch. AGC switch. RF GAIN control. TUNING control.	Changing of receiver control front panels has no effect on the unit under test displays/indications.	Check parallel input A11, parallel output A12, and serial interface A13.
	d. Set the receiver control front-panel controls as follows: PWR to on. CONT to NORM. MODE to AM. BANDWIDTH to A. DIAL to FINE. BFO to FIX. AGC to OFF. RF GAIN to MIN.		
	e. Set the unit under test CONT switch to REM.	Faults do not light. AM and BANDWIDTH-A indicators light.	Same as step 12.a.
	f. Make changes to the following unit under test controls MODE switch. BANDWIDTH switch. DIAL switch. BFO switch. AGC switch. RF GAIN control.	Changing of unit under test controls has no effect on the unit under test displays/indicators.	Same as step 12.a.
	g. Make changes to the controls listed in step 12.c.	Unit under test is controlled by receiver control.	Same as step 12.c.
	h. Set receiver control DIAL switch to FINE and BFO switch to FIX.		
(Cont)	i. Rotate receiver control TUNING knob cw and note receiver FREQUENCY KHZ display.	Display changes at the least significant digit with carryovers to the next significant digit, etc. The receiver display and receiver control display must agree.	Same as step 12.c.

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
16. (Cont)	j. Rotate receiver control TUNING knob ccw and note receiver FREQUENCY KHZ display.	Display changes at the least significant digit with borrowing from the next significant digit, etc.	Same as step 12.c.
17. Indicators	a. Front panel controls set as follows: PWR to off. CONT to LCL. MODE to SSB/CW. BANDWIDTH to 16. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw.		
	b. Set PWR switch on.	RCV FAULT indicator lights.	Check control A10.
	c. Slightly adjust TUNING knob.	RCV FAULT indicator goes out.	Same as step 17.b.
	d. Apply +5 V dc to P16-8.	PRESEL FAULT indicator lights.	Check control A10, rfi card, and LED status display A2A1.
	e. Remove +5 V dc from P16-8.	PRESEL FAULT indicator goes out.	Same as step 17.d.
	f. Apply +5 V dc to P16-27.	RCV OVERLOAD indicator lights.	Same as step 17.d.
	g. Remove +5 V dc from P16-27.	RCV OVERLOAD indicator goes out.	Same as step 17.d.
	h. To check mode indicators perform test 7.	Same as test 7.	Same as test 7.
	i. To check BANDWIDTH indicator perform test 8.	Same as test 8.	Same as test 8.
	j. To test FREQUENCY KHZ display perform test.	Same as test 5.	Same as test 5.
	k. To test VBFO OFFSET HZ display perform test 11.	Same as test 15.	Same as test 15.
18. Receive overload operation (Cont)	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw.		

Table 4. 851S-1 Receiver, Minimum Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
18. (Cont)	b. Using TUNING knob, adjust unit to any frequency between 1.6 and 30.0 MHz. c. Connect an rf signal generator to RCV ANT jack J21 on the rear panel. d. Set rf signal generator to 4.0 MHz. Increase rf signal generator output until RCV OVERLOAD indicator lights. Note rf signal generator output level. e. Remove rf signal generator.	 NLT 2.5 V rms (open circuit). Note RCV OVER-LOAD indicator goes out.	 Check rf translator A9. Same as step 18.d.
19. Shutdown	a. Set PWR switch off. b. Disconnect unit from power source. c. Disconnect all test equipment. d. Set unit LINE SELECTOR for power source in installation to be used (100/115/215/230 V ac). ***Note*** Ensure that proper fuse is installed for power source used. e. Install top and bottom chassis covers on unit tested.		

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top and bottom chassis covers of unit to be tested. b. Set unit LINE SELECTOR for power source available. (100/115/215/230 V ac). **Note** Ensure that proper fuse is installed for power source used. c. Connect unit to available power source. d. Refer to test setup, figure 2.	**Note** In all tests, if power is removed the frequency must be changed slightly when power is restored to clear RCV FAULT indication.	
2. Initial checks (Cont)	**Note** To make the initial checks, set unit on edge to gain access to A1TB1. **Caution** If repair has been made to the power supply or any power circuits, remove all plug-in cards/modules. a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to 16. DIAL to LOCK. BFO to FIX. AGC to FAST. RF GAIN to full cw. b. Measure dc voltages between the following points and ground (A1TB1-5): A1TB1-1 A1TB1-2 A1TB1-3 A1TB1-6 A1TB1-7 A1TB1-8 **Note** Perform step 2.c only if repair has been made to power supply or any power circuits. c. Measure dc voltages between the following points and ground.	 +24 ±1.0 V dc. +18 ±1.0 V dc. +15 ±1.0 V dc. +8 ±1.0 V dc. +5 ±0.5 V dc. -15 ±1.0 V dc.	 Check power supply A1 and check for shorts on output voltage lines. Check wiring from A1TB1, check for shorts on output lines, or check repaired power circuit.

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	Receive audio A6:		
	J4-18	+18 ±1.0 V dc.	
	RF translator A9:		
	J7-6	-15 ±1.0 V dc.	
	J7-23	+15 ±1.0 V dc.	
	J7-25	+24 ±1.0 V dc.	
	J7-27	+5 ±0.5 V dc.	
	Synthesizer voltage regulator A14:		
	A23J1-8	+8 ±1.0 V dc.	
3. Sensitivity	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to OFF. RF GAIN to full cw.		
	b. Connect an rf signal generator to RCV ANT J21 jack on rear panel.		
	c. Connect an audio voltmeter and 600-Ω load across TB1-1 TB1-3.		
	d. Set receiver for 110 kHz.		
	e. Adjust rf signal generator frequency to receiver frequency +1000 Hz and level for 10-dB increase from noise level with no signal input.	Note input signal level for information only (frequency outside specified limits of receiver).	Check rf translator A9 and channel A if A8.
	f. Repeat steps 3.d and 3.e at each of the following frequencies.	(Open circuit microvolts.)	Same as step 3.e.
(Cont)			

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

<table>
<tr><th>TEST</th><th>PROCEDURE</th><th>NORMAL INDICATION</th><th>IF INDICATION IS ABNORMAL</th></tr>
<tr><td>3. (Cont)</td><td>
<table>
<tr><th>FREQUENCY (kHz)</th><th>MAXIMUM INPUT FOR 10-dB INCREASE</th></tr>
<tr><td>250.00</td><td>1.7 μV</td></tr>
<tr><td>530.00</td><td>1.7 μV</td></tr>
<tr><td>540.00</td><td>1.7 μV</td></tr>
<tr><td>1 550.00</td><td>1.7 μV</td></tr>
<tr><td>1 600.00</td><td>0.7 μV</td></tr>
<tr><td>4 000.00</td><td>0.7 μV</td></tr>
<tr><td>8 000.00</td><td>0.7 μV</td></tr>
<tr><td>16 000.00</td><td>0.7 μV</td></tr>
<tr><td>22 000.00</td><td>0.7 μV</td></tr>
<tr><td>29 990.00</td><td>0.7 μV</td></tr>
</table>
g. Set MODE switch to AM and BANDWIDTH switch to 16.

h. Set receiver for 4000.00 kHz.

i. Adjust rf signal generator frequency to 4000.00 kHz, modulated 30% with 1000 Hz.

j. Adjust rf signal generator level for 10-dB increase from noise level with no signal input.</td><td>5.6 μV maximum.</td><td>Same as step 3.e.</td></tr>
<tr><td>4. Gain

(Cont)</td><td>a. Front panel controls set as follows:

PWR to on.
CONT to LCL.
MODE to SSB/CW.
BANDWIDTH to USB.
DIAL to FINE.
BFO to FIX.
AGC to FAST.
RF GAIN to full cw.

b. Connect an rf signal generator to RCV ANT J21 jack on rear panel.

c. Connect an audio voltmeter and 600-Ω load across TB1-1 and TB1-3.

d. Connect an rf voltmeter (with a 50-Ω load) to CH A IF OUT J19 jack on rear panel.

e. Set receiver for 250.00 kHz.

f. Adjust rf signal generator frequency to receiver frequency +1000 Hz and level for 3 μV.</td><td>Audio voltmeter indicates NLT -3 dB mW, rf voltmeter indicates 27 ±10 mW.</td><td>Check channel A if A8, receive audio A6, and rf translator A9.</td></tr>
</table>

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

<table>
<tr><th>TEST</th><th>PROCEDURE</th><th>NORMAL INDICATION</th><th>IF INDICATION IS ABNORMAL</th></tr>
<tr><td>4. (Cont)</td><td>g. Repeat steps 4.e and 4.f at each of the following frequencies:
<table>
<tr><th>FREQUENCY (kHz)</th><th>AUDIO OUTPUT</th><th>IF OUTPUT</th></tr>
<tr><td>530.00</td><td>NLT -3 dB mW</td><td>27 ±10 mV</td></tr>
<tr><td>1 550.00</td><td>NLT -3 dB mW</td><td>27 ±10 mV</td></tr>
<tr><td>1 600.00</td><td>NLT -3 dB mW</td><td>27 ±10 mV</td></tr>
<tr><td>4 000.00</td><td>NLT -3 dB mW</td><td>27 ±10 mV</td></tr>
<tr><td>8 000.00</td><td>NLT -3 dB mW</td><td>27 ±10 mV</td></tr>
<tr><td>16 000.00</td><td>NLT -3 dB mW</td><td>27 ±10 mV</td></tr>
<tr><td>22 000.00</td><td>NLT -3 dB mW</td><td>27 ±10 mV</td></tr>
<tr><td>29 900.00</td><td>NLT -3 dB mW</td><td>27 ±10 mV</td></tr>
</table></td><td></td><td>Same as step 4.f.</td></tr>
<tr><td>5. In-band intermodulation

(Cont)</td><td>a. Front panel controls set as follows:

PWR to on.
CONT to LCL.
MODE to SSB/CW.
BANDWIDTH to USB.
DIAL to FINE.
BFO to FIX.
AGC to FAST.
RF GAIN to full cw.

b. Connect two rf signal generators to unit under test as shown figure 3.

c. Set one rf signal generator to 16.001 100 MHz.

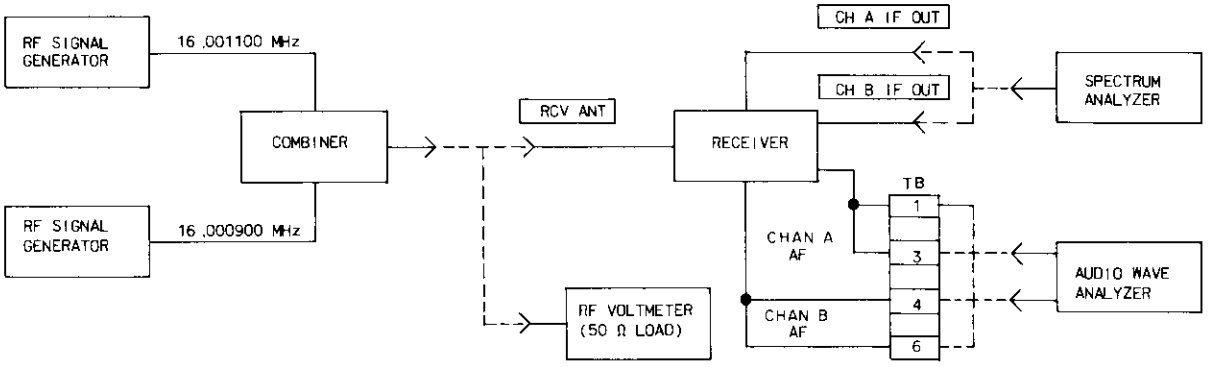
d. Set second rf signal generator to 16.000 900 MHz.

e. Using an rf vtvm (with 50-Ω load) connected at output of combine, independently adjust each rf signal for 50 mV rms.

f. Connect the 2-tone signal to RCV ANT J21 jack on rear panel.

g. Set receiver for 16 000.00 kHz.

h. Connect audio wave analyzer (with 600-Ω load) to TB1-1 and TB1-3 (channel A af).</td><td></td><td></td></tr>
</table>



TPA-1363-013

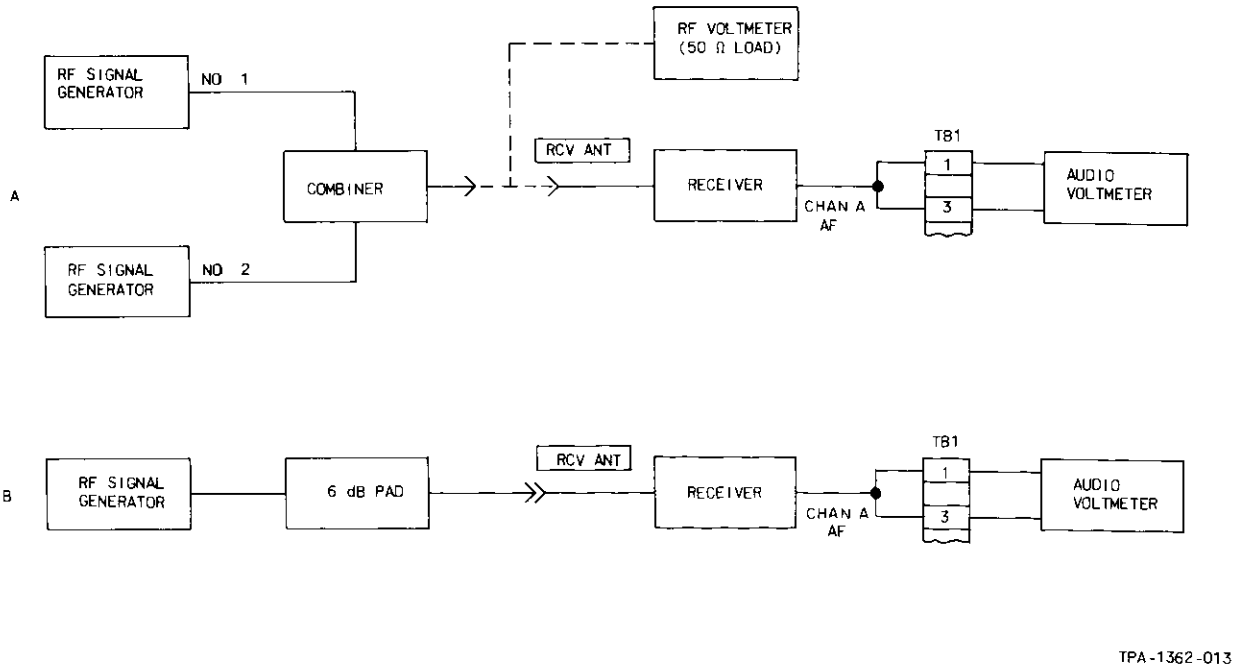
In-Band Intermodulation Test Setup
Figure 3

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	i. Measure and record 900 Hz and 1100 Hz on the audio wave analyzer.	Reference.	
	j. Measure the second and third order intermodulation products on the audio wave analyzer.		Perform receiver alignment procedures, check bypass and feedthru capacitors, or return to factory for repair.
	200 Hz (lower 2nd) 700 Hz (lower 3rd) 1300 Hz (upper 3rd) 2000 Hz (upper 2nd)	NLT 47 dB down from reference of test 5.i.	
	k. Connect a spectrum analyzer at IF OUT-J19 CH A.		
	l. With spectrum analyzer set for manual sweep, 200 Hz/division, and 10-Hz bandwidth measure and record 450.900 kHz and 451.100 kHz.	Reference.	
(Cont)	m. Measure the second and third order intermodulation products on the spectrum analyzer.	NLT 47 dB down from reference of test 5.l.	Same as step 5.j.

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	450.200 kHz (lower 2nd) 450.700 kHz (lower 3rd) 451.300 kHz (upper 3rd) 452.000 kHz (upper 2nd)		
	Note Steps 5.n thru 5.t are applicable only if ISB option installed.		
	n. Set receiver for 16 002.00 kHz.		
	o. Connect audio wave analyzer (with 600-Ω load) to TB1-4 and TB1-6 (channel B af).		
	p. Measure and record 900 Hz and 1100 Hz on the audio wave analyzer.	Reference.	
	q. Measure the second and third order intermodulation products on the audio wave analyzer. 200 Hz (upper 2nd) 700 Hz (upper 3rd) 1300 Hz (lower 3rd) 2000 Hz (lower 2nd)	NLT 47 dB down from reference of test 5.p.	Same as step 5.j.
	r. Connect spectrum analyzer at IF OUT-J20 CH B.		
	s. With spectrum analyzer, measure and record 449.100 kHz and 448.900 kHz.	Reference.	
	t. Measure the second and third order intermodulation products on the spectrum analyzer. 449.800 kHz (upper 2nd) 449.300 kHz (upper 3rd) 448.700 kHz (lower 3rd) 448.000 kHz (lower 2nd)	NLT 47 dB down from reference of test 5.s.	Same as step 5.j.
6. Out-of-band intermodulation	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to OFF. RF GAIN to full cw.		
(Cont)	b. Connect two rf signal generators to unit under test as shown in figure 4A.		



Out-of-Band Intermodulation Test Setup
Figure 4

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6. (Cont)	c. Set one rf signal generator to 2.155 000 MHz. d. Set second rf signal generator to 4.256 000 MHz. e. Using an rf vtvm (with 50-Ω load) connected at output of combiner, independently adjust each rf signal for 50 mV rms. f. Connect the 2-tone signal to RCV ANT J21 jack on rear panel. g. Set receiver for 2000.00 kHz. h. Connect an audio voltmeter (with 600-Ω load) to TB1-1 and TB1-3 (channel A af).		
(Cont)	i. Note audio output level.	Reference.	

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

<table>
<tr><th>TEST</th><th>PROCEDURE</th><th>NORMAL INDICATION</th><th>IF INDICATION IS ABNORMAL</th></tr>
<tr><td>6. (Cont)</td><td>j. Disconnect 2-tone setup and reconnect one rf signal generator to unit under test as shown in figure 4B.

k. Set the rf signal generator to the receiver frequency +1000 Hz.

l. Adjust rf signal generator output to produce same level on audio voltmeter as was referenced in step 6.i.

m. Repeat steps 6.b thru 6.l at the following settings:</td><td>NMT 4.0 µV rms.</td><td>Perform receiver alignment procedures. Check bypass and feedthru capacitors, or return to factory for repair.</td></tr>
<tr><td colspan="4"><table>
<tr><th>RCVR FREQ</th><th>RF SIG GEN #1</th><th>RF SIG GEN #2</th><th>STEP 6.l INDICATION</th></tr>
<tr><td>2 000.00 kHz</td><td>2 155.00 kHz</td><td>2 209.00 kHz</td><td>NMT 1.3 µV rms</td></tr>
<tr><td>27 000.00 kHz</td><td>27 055.00 kHz</td><td>27 109.00 kHz</td><td>NMT 1.3 µV rms</td></tr>
</table></td></tr>
<tr><td>7. Squelch operation</td><td>a. Front panel controls set as follows:

PWR to on.
CONT to LCL.
MODE to SSB/CW.
BANDWIDTH to USB.
DIAL to FINE.
BFO to FIX.
AGC to FAST.
RF GAIN to full cw.

b. Adjust the TUNING knob for any frequency between 1600 and 29 990 kHz (rf signal generator disconnected).

c. Set SQUELCH control full ccw. Adjust SQUELCH control cw just out-of-detent (minimum squelch with squelch enabled).

d. Note speaker output.

e. Rotate SQUELCH control cw about 45 degrees from off position.

f. Connect an rf signal generator to the RCV ANT J21 jack on rear panel.</td><td>Speaker should not squelch on normal receiver noise.

Speaker output should squelch on noise only.</td><td>Check A2R10B and receive audio A6.

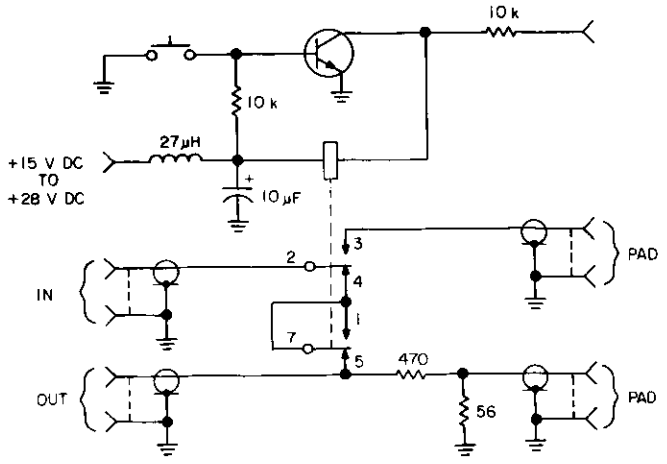
Check A2R10B, A2R10C, and receive audio A6.</td></tr>
<tr><td>(Cont)</td><td></td><td></td><td></td></tr>
</table>

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. (Cont)	g. Set rf signal generator to the frequency of the receiver.		
	h. Adjust the rf signal generator for a 10-μV rf input and a 300-Hz audio output.	Speaker should break squelch and audio tone should be heard in speaker.	Same as step 7.e.
	i. Disconnect rf signal generator.	After 1- to 3-second delay, speaker output should squelch on noise only.	Same as step 7.e.
8. Audio distortion	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw.		
	b. Connect an rf signal generator to RCV ANT J21 jack on rear panel.		
	c. Set receiver to any frequency between 1600.00 kHz and 29 999.99 kHz.		
	d. Set rf signal generator to receiver frequency +1000 Hz and adjust for an rf input of 10 mV.		
	e. Connect an audio distortion analyzer and 600-Ω load across TB1-1 and TB1-3.		
	f. Measure audio distortion.	NMT 1%.	Check receive audio A6.
	g. Set MODE switch to AM and BANDWIDTH switch to 16.		
	h. Set rf signal generator to receiver frequency and adjust for 50%, 1000-Hz modulation.		
	i. Measure audio distortion.	NMT 3%.	Same as step 8.f.
	j. Set MODE switch to SSB/CW and BANDWIDTH switch to USB.		
	k. Connect an audio distortion analyzer and 600-Ω load across headphone audio output.		
(Cont)	l. Measure audio distortion.	NMT 3%	Same as step 8.f.

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8. (Cont)	m. Connect an 8-Ω, 4-W resistor between TB3-2 and TB3-3. Disconnect strap between TB3-1 and TB3-2. n. Connect an audio distortion analyzer across the 8-Ω resistor and adjust AF GAIN control for 4 V rms across the resistor. o. Measure audio distortion. p. Remove the 8-Ω resistor for TB3-2 and TB3-3. Reconnect strap between TB3-1 and TB3-2.	NMT 5%.	Same as step 8.f.
9. AGC characteristics (Cont)	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw. b. Connect an rf signal generator through an AGC switching device (figure 5) to RCV ANT J21 jack on rear panel.		



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AGC Switching Device
Figure 5

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9. (Cont)	c. Set receiver to 4000.00 kHz.		
	d. Connect audio voltmeter and 600-Ω load across TB1-1 and TB1-3.		
	e. Set rf signal generator to receiver frequency +1000 Hz and 3 μV at RCV ANT J21 jack on rear panel.		
	f. Note audio output level.	Reference.	
	g. Increase rf signal input in 10-dB steps to 1 V rms at RCV ANT J21 jack on rear panel.	Gradual audio increase up to 5 dB above reference at 1-V rms input	Check AGC switch A2A2S12, channel A if A8, and rf translator A9.
	h. Connect an oscilloscope to A8Q18-collector (channel A if extended).		
	i. Set rf signal generator to 200 μV at RCV ANT J21 jack on rear panel.		
	j. Observe oscilloscope level.	Reference.	
	k. Reduce rf signal level at RCV ANT J21 jack on rear panel from 200 μV to 10 μV, using AGC switching device.		
	l. Reference decay time (time for if signal to return to reference level ±6 dB).	0.07 to 0.17 seconds (AGC FAST decay).	Same as step 9.g.
	m. Set rf signal generator to 200 μV at RCV ANT J21 jack on rear panel.		
	n. Set AGC switch to SLOW.		
	o. Observe oscilloscope level.	Reference.	
	p. Reduce rf signal level at RCV ANT J21 jack on rear panel from 200 μV to 10 μV, using AGC switching device.		
	q. Reference decay time (time for audio output to return to reference level ±6 dB).	0.7 to 1.7 seconds (AGC SLOW decay).	Same as step 9.g.
	r. Set AGC switch to OFF.		
	s. Set METER switch to RCV SIG position.		
(Cont)	t. Increase rf signal generator output to 1.0 V rms at RCV ANT J21 jack on rear panel.		

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9. (Cont)	u. Note meter deflection.	Meter does not deflect.	Check AGC switch A2A2S12 and channel A if A8.
10. Cross sideband rejection	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to OFF. RF GAIN to full cw. b. Connect an rf signal generator to RCV ANT J21 jack on rear panel. c. Set receiver to any frequency between 1600.00 kHz and 29 999.99 kHz. d. Set rf signal generator to receiver frequency +1000 Hz and adjust for an rf input of 1 μV. e. Connect an audio voltmeter and 600-Ω load across TB1-1 and TB1-3. f. Set rf signal generator to receiver frequency -1000 Hz. g. Increase rf signal generator output to produce reference level of step 10.e.	Reference audio level. NLT 60-dB increase in rf signal generator output. ***Note*** If rf signal generator output is increased more than 60 dB and level of step 10.e is not reached, indication is normal and reference level need not be produced.	Check if filters, perform receiver alignment procedures, or return to factory for repair.
11. AGC voltage input/output (Cont)	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw.		

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

<table>
<tr><th>TEST</th><th>PROCEDURE</th><th>NORMAL INDICATION</th><th>IF INDICATION IS ABNORMAL</th></tr>
<tr><td>11. (Cont)</td><td>b. Connect an rf signal generator to RCV ANT J21 jack on rear panel.

c. Set receiver to 4000 kHz.

d. Connect a dvm and 10-kΩ load between channel A - AGC output (TB1-8) and ground (TB1-7).

e. Set rf signal generator to receiver frequency +1000 Hz.

f. Adjust rf signal generator level to produce 1.0-V dc reading on dvm.

g. Change the rf signal generator level in 20-dB steps and note the associated AGC outputs.

<table><tr><th>RF INPUT SIGNAL (from reference level)</th><th>AGC OUTPUT</th></tr><tr><td>-20 dB</td><td>0.07 ±0.15 V dc</td></tr><tr><td>+20 dB</td><td>2.00 ±0.15 V dc</td></tr><tr><td>+40 dB</td><td>3.00 ±0.15 V dc</td></tr><tr><td>+60 dB</td><td>4.00 ±0.15 V dc</td></tr><tr><td>+80 dB</td><td>5.00 ±0.15 V dc</td></tr></table></td><td>Reference input (10 μV ±3 dB).</td><td>Check channel A if A8.</td></tr>
<tr><td>12. Image and if rejection

(Cont)</td><td>a. Front panel controls set as follows:

PWR to on.
CONT to LCL.
MODE to SSB/CW.
BANDWIDTH to USB.
DIAL to FINE.
BFO to FIX.
AGC to OFF.
RF GAIN to full cw.

b. Connect an rf signal generator to RCV ANT J21 jack on rear panel.

c. Set receiver to 4000 kHz.

d. Connect audio voltmeter and 600-Ω load across TB1-1 and TB1-3.

e. Set rf signal generator to receiver frequency +1000 Hz and adjust for 0 dB mW on audio voltmeter.</td><td>Reference rf signal generator input.</td><td></td></tr>
</table>

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

<table>
<tr><th>TEST</th><th>PROCEDURE</th><th>NORMAL INDICATION</th><th>IF INDICATION IS ABNORMAL</th></tr>
<tr><td>12. (Cont)</td><td>f. Set the rf signal generator frequency to each of the following frequencies and note the increase in dB from the reference required to obtain 0 dB mW on the audio voltmeter.

<table><tr><th>RF INPUT FREQUENCY</th><th>RF INPUT INCREASE</th></tr><tr><td>9.449 MHz</td><td>NLT 100 dB</td></tr><tr><td>0.451 MHz</td><td>NLT 100 dB</td></tr><tr><td>3.099 MHz</td><td>NLT 100 dB</td></tr><tr><td>22.899 MHz</td><td>NLT 100 dB</td></tr></table></td><td></td><td>Check channel A if A8, rf translator A9, or return to factory for repair.</td></tr>
<tr><td>13. Internal spurious signals

(Cont)</td><td>a. Front panel controls set as follows:

PWR to on.
CONT to LCL.
MODE to SSB/CW.
BANDWIDTH to USB.
DIAL to FINE.
BFO to FIX.
AGC to FIX.
RF GAIN to full cw.

b. Connect a 50-Ω load to RCV ANT J21 jack and ground.

c. Connect audio voltmeter and 600-Ω load across TB1-1 and TB1-3.

d. Set receiver to each of the following frequencies and reference audio voltmeter reading at each frequency.</td><td>Note

Increase AF GAIN control so that the internal spurious tones are audible. Peak audio voltmeter on tone. If a spurious signal cannot be located at any given frequency, it has been suppressed beyond detection and is a normal indication.</td><td></td></tr>
</table>

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

<table>
<tr><th>TEST</th><th>PROCEDURE</th><th>NORMAL INDICATION</th><th>IF INDICATION IS ABNORMAL</th></tr>
<tr><td>13. (Cont)

* Only with vbfo installed.</td><td>
<table>
<tr><th>RECEIVER REFERENCE SETTING</th><th>AUDIO OUTPUT</th></tr>
<tr><td>449 kHz</td><td>Reference</td></tr>
<tr><td>2 409 kHz</td><td>Reference</td></tr>
<tr><td>29 409 kHz</td><td>Reference</td></tr>
<tr><td>9 674 kHz</td><td>Reference</td></tr>
<tr><td>10 174 kHz</td><td>Reference</td></tr>
<tr><td>9 899 kHz</td><td>Reference</td></tr>
<tr><td>19 799 kHz</td><td>Reference</td></tr>
<tr><td>*13 499 kHz</td><td>Reference</td></tr>
</table>
e. Remove 50-Ω load from RCV ANT J21 jack.

f. Connect an rf signal generator to RCV ANT J21 jack on rear panel.

g. Set receiver 10 kHz off each frequency listed in step 12.d.
<table>
<tr><th>RECEIVER SETTING</th></tr>
<tr><td>459 kHz</td></tr>
<tr><td>2 419 kHz</td></tr>
<tr><td>29 419 kHz</td></tr>
<tr><td>9 684 kHz</td></tr>
<tr><td>10 184 kHz</td></tr>
<tr><td>9 909 kHz</td></tr>
<tr><td>19 809 kHz</td></tr>
<tr><td>*13 509 kHz</td></tr>
</table>
h. Set rf signal generator 1000 Hz above each receiver frequency and note rf input at each frequency required to obtain reference audio output.
<table>
<tr><th>RF SIGNAL GENERATOR FREQUENCY</th><th>REQUIRED INPUT</th></tr>
<tr><td>460 kHz</td><td>NMT 0.5 μV</td></tr>
<tr><td>2 420 kHz</td><td>NMT 0.3 μV</td></tr>
<tr><td>29 420 kHz</td><td>NMT 0.3 μV</td></tr>
<tr><td>9 685 kHz</td><td>NMT 0.3 μV</td></tr>
<tr><td>10 185 kHz</td><td>NMT 0.3 μV</td></tr>
<tr><td>9 910 kHz</td><td>NMT 0.4 μV</td></tr>
<tr><td>19 810 kHz</td><td>NMT 0.3 μV</td></tr>
<tr><td>*13 510 kHz</td><td>NMT 0.3 μV</td></tr>
</table>
</td><td></td><td>Check channel A if A8, rf translator A9, or return to factory for repair.</td></tr>
</table>

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
14. Bandwidth (Cont)	***Note*** When performing bandwidth tests, filter complement of unit under test must be known. a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to OFF. RF GAIN to full cw. b. Connect an rf signal generator to RCV ANT J21 jack on rear panel. c. Set receiver to 4000.00 kHz. d. Connect audio voltmeter and 600-Ω load across TB1-1 and TB1-3. e. Set signal generator to 4000.00 kHz at 1 μV rms. f. Increase (or decrease) signal generator frequency to find peak response on audio voltmeter. ***Note*** If audio response is distorted due to overdrive of if circuits, reduce rf signal level until distortion is not present. g. Increase signal generator frequency to the point where the audio voltmeter level is 3 dB below reference level of step 14.f. h. Decrease signal generator frequency to the point where the audio voltmeter level is 3 dB below reference level of step 14.f. i. Repeats steps 14.f thru 14.h at each applicable BANDWIDTH switch position (those having filters installed).	Reference level. Note peak frequency (refer to chart that follows step 14.i). Frequency NLT UPPER 3-dB point shown in chart for applicable filter. Frequency NMT LOWER 3-dB point shown in chart for applicable filter. Refer to chart for peak, upper, and lower frequencies.	For FL1, check channel A if A8. Same as step 14.f. Same as step 14.f. For FL2, check channel B if A7 or filter A8A2. For FL3 through FL7, check filter A8A2. For FL8, check channel A if A8 or rf translator A9.

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
14. (Cont)			

FILTER	COLLINS PART NUMBER	3 dB POINTS (kHz)	
		UPPER	LOWER
USB (FL1)	526-9955-010	4003.00	4000.25
	526-9980-010	4003.30	4000.25
	526-9985-010	4003.40	4000.30
	526-9976-010	4006.00	4000.20
LSB (FL2)	526-9956-010	3999.75	3997.00
	526-9981-010	3999.75	3996.70
	526-9986-010	3999.70	3996.60
	526-9977-010	3999.80	3994.00
A (FL3)	526-9963-060	4003.00	3997.00
B (FL4)	526-9963-040	4001.50	3998.50
C (FL5)	526-9963-030	4000.50	3999.50
	526-9974-030	4001.50	4000.50
D (FL6)	526-9963-020	4000.25	3999.75
	526-9974-020	4001.25	4000.75
E (FL7)	526-9963-010	4000.10	3999.90
	526-9974-010	4001.10	4000.90
	293-1333-010	4000.05	3999.95
16 (FL8)	*	4006.00	3994.00
	**	4008.00	3992.00

* 16-kHz pad, 6-dB points with narrowband rf translator.
** 16-kHz pad, 6-dB points with broadband rf translator.

15. Frequency accuracy	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw. b. Connect a highly accurate 10-MHz standard to RCV ANT J21 jack on rear panel. c. Set receiver to 9999.00 kHz.		
(Cont)			

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
15. (Cont)	d. Connect a 600-Ω load across TB1-1 and TB1-3 and connect a counter between TB1-1 and TB1-3.		
	e. Note audio output frequency.	1000 ±5 Hz.	Check frequency synthesizer A14 through A23.
16. External spurious signals	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to OFF. RF GAIN to full cw.		
	b. Connect an rf signal generator to RCV ANT J21 jack on rear panel.		
	c. Set receiver to 4000.00 kHz.		
	d. Connect an audio voltmeter RCV AF 600 Ω - CH A on rear panel.		
	e. Set rf signal generator to 4001.00 kHz at 1 μV rms.		
	f. Adjust rf signal generator frequency for peak response on audio voltmeter.	Reference voltmeter reading.	
	g. Set rf signal generator to 4101.00 kHz at 1 μV rms.		
	h. Increase the rf signal generator level to return the audio to the above reference. Rf signal generator frequency may be varied slightly to locate spurious response.		
	i. Note increase in rf signal generator level.	NLT 80 dB.	Check bypass and feedthru capacitors or return to factory for repair.
	j. Repeat steps 16.g thru 16.i at each of the following frequencies:		

SIGNAL GENERATOR FREQ	RF VOLTMETER
3901.00 kHz	NLT 80 dB DOWN
4051.00 kHz	NLT 80 dB DOWN
3951.00 kHz	NLT 80 dB DOWN

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
17. AC-8012 oven standard test	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw. b. Connect a highly accurate 10-MHz standard to RCV ANT J21 jack on rear panel. c. Set receiver to 9999.00 kHz. d. Connect a 600-Ω load across TB1-1 and TB1-3 and connect a counter between TB1-1 and TB1-3 (ground). e. Note audio output frequency.	1000 ±0.3 Hz (after 1-hour warmup).	Check oven standard or frequency synthesizer A14 through A22.
18. AC-8013 External standard test (Cont)	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw. b. Connect a highly accurate 1-MHz standard to RCV ANT J21 jack on rear panel. c. Set receiver to 1001.00 kHz. d. Connect a 600-Ω load across TB1-1 and TB1-3 and connect a counter between TB1-1 and TB1-3. e. Connect an rf signal generator to the EXT STD J23 jack. f. Strap synthesizer reference for external and external phase-lock for 100 kHz. g. Set rf signal generator for 100 kHz at 90 mV rms. h. Vary rf signal generator ±1 Hz from 100 kHz and observe audio output.	Reference audio output frequency. Step 18.g reference ±100 Hz.	Check frequency synthesizer A14 through A22.

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
18. (Cont)	i. Repeat steps 18.g and 18.h with level at 1.0 V rms.	Same as steps 18.g and 18.h.	Same as step 18.h.
	j. Strap external phase-lock for 1 MHz.		
	k. Set rf signal generator for 1 MHz at 90 mV rms.	Reference audio output frequency.	
	l. Vary rf signal generator ±10 Hz from 1 MHz and observe audio output.	Step 18.k reference ±100 Hz.	Same as step 18.h.
	m. Repeat steps 18.k and 18.l with level at 1.0 V rms.	Same as steps 18.k and 18.l.	Same as step 18.h.
	n. Strap external phase-lock for 5 MHz.		
	o. Set rf signal generator for 5 MHz at 90 mV rms.	Reference audio output frequency.	
	p. Vary rf signal generator ±50 Hz from 5 MHz and observe audio output.	Step 18.k reference ±100 Hz.	Same as step 18.h.
	q. Repeat steps 18.o and 18.p with level at 1.0 V rms.	Same as steps 18.o and 18.p.	Same as step 18.h.
19. AC-8090 Remote control test	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to 16. DIAL to LOCK. BFO to FIX. AGC to FAST. RF GAIN to full cw.	No faults are lit. SSB/CW and BANDWIDTH-16 indicators are lit.	Check control A10 and mounting switchboard A2A2.
	b. Connect a compatible receiver control to the unit under test.		
(Cont)	c. Set receiver control PWR to on and make changes to the following receiver control front panel controls: MODE switch. BANDWIDTH switch. DIAL switch. BFO switch. AGC switch. RF GAIN control. TUNING control.	Changing of receiver control front panel controls has no effect on the unit under test displays/ indications.	Check parallel input A11, parallel output A12, and serial interface A13.

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
19. (Cont)	d. Set the receiver control front panel controls as follows: PWR to on. CONT to NORM. MODE to AM. BANDWIDTH to A. DIAL to FINE. BFO to FIX. AGC to OFF. RF GAIN to MIN.		
	e. Set the unit under test CONT switch to REM.	Faults do not light. AM and BAND-WIDTH-A indicators light.	Same as step 19.a.
	f. Make changes to the following unit under test controls: MODE switch. BANDWIDTH switch. DIAL switch. BFO switch. AGC switch. RF GAIN control.	Changing of unit under test controls has no effect on the unit under test displays/indicators.	Same as step 19.a.
	g. Set receiver control DIAL switch to FINE and BFO switch to FIX.		
	h. Rotate receiver control TUNING knob cw and note receiver FREQUENCY KHZ display.	Display changes at the least significant digit with carry-overs to the next significant digit, etc. The receiver display must agree.	Check serial interface A13 and parallel output A12.
	i. Rotate receiver control TUNING knob ccw and note receiver FREQUENCY KHZ display.	Display changes at the least significant digit with borrowing from the next significant digit, etc.	Same as step 19.g.
	j. Connect an rf signal generator to the RCV ANT J21 jack on the rear panel.		
	k. Set receiver control to 4000.00 kHz.		
	l. Connect audio voltmeter and 600-Ω load across TB1-1 and TB1-3.		
(Cont)	m. With control unit AGC at OFF and RF GAIN to MAX, set rf signal generator to 4001.00 kHz. Adjust rf signal generator level for a reference level on audio voltmeter.	Reference audio voltmeter reading. ***Note*** Reference level must be set below saturation level of audio circuits.	

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
19. (Cont)	n. Step receiver control RF GAIN control 1 stop counterclockwise.		
	o. Increase rf signal generator level as needed to obtain reference level of step 19.m.	6 ±2-dB change per step.	Same as step 19.i.
20. AC-85100 ISB test	***Note*** This test checks ISB operation (channel B) with the exception of bandwidths. Bandwidths should be checked per test 14.		
	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to ISB. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to OFF. RF GAIN to full cw.		
	b. Connect an rf signal generator to RCV ANT J21 jack on rear panel.		
(Sensitivity)	c. Connect an audio voltmeter and 600-Ω load across TB1-4 TB1-6.		
	d. Set receiver for 4000.00 kHz.		
	e. Adjust rf signal generator frequency to receiver frequency -1000 Hz and level for 10-dB increase from noise level with no signal input.	0.7 μV maximum.	Check rf translator A9 channel A if A8 and channel B if A7.
(Audio distortion)	f. Set receiver to any frequency between 1600.00 kHz and 29 999.99 kHz.		
	g. Set AGC switch to FAST.		
	h. Set rf signal generator to receiver frequency -1000 Hz and adjust for an rf input of 10 mV.		
	i. Connect an audio distortion analyzer and 600-Ω load across TB1-4 and TB1-6.		
	j. Measure audio distortion.	NMT 1%.	Check channel B if A7 or receive audio A6.
(AGC characteristics) (Cont)	k. Connect the rf signal generator through an AGC switching device (figure 5) to RCV ANT J21 jack on rear panel.		

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
20. (Cont) (AGC characteristics) (Cont)	l. Set receiver to 4000.00 kHz.		
	m. Connect audio voltmeter and 600-Ω load across TB1-4 and TB1-6.		
	n. Set rf signal generator to receiver frequency -1000 Hz and 3 μV at RCV ANT J21 jack on rear panel.		
	o. Note audio output level.	Reference.	
	p. Increase rf signal input in 10-dB steps to 1 V rms at RCV ANT J21 jack on rear panel.	Gradual audio increase up to 5 dB above reference at 1-V rms input.	Same as step 20.l.
	q. Connect an oscilloscope to A7Q19-collector (channel B if extended).		
	r. Set rf signal generator to 200 μV at RCV ANT J21 jack on rear panel.		
	s. Observe oscilloscope level.	Reference.	
	t. Reduce rf signal level at RCV ANT J21 jack on rear panel from 200 μV to 10 μV using AGC switching device.		
	u. Reference decay time (time for if signal to return to reference level ±6 dB).	0.07 to 0.17 seconds (AGC FAST decay).	Same as step 20.l.
	v. Set rf signal generator to 200 μV at RCV ANT J21 jack on rear panel.		
	w. Set AGC switch to SLOW.		
	x. Observe oscilloscope level.	Reference.	
	y. Reduce rf signal level at RCV ANT J21 jack on rear panel from 200 μV to 10 μV using AGC switching device.		
	z. Reference decay time (time for if signal to return to reference level ±6 dB).	0.7 to 1.7 seconds (AGC SLOW decay).	Same as step 20.l.
	aa. Set AGC switch to OFF.		
	ab. Set METER switch to RCV SIG position.		
	ac. Increase rf signal generator output to 1.0 V rms at RCV ANT J21 jack on rear panel.		
	ad. Note meter deflection.	Meter does not deflect.	Check AGC switch A2A2S12 and channel A if A8.
(Cross side-band rejection) (Cont)	ae. Set receiver to any frequency between 1600.00 kHz and 29 999.99 kHz.		

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

<table>
<tr><th>TEST</th><th>PROCEDURE</th><th>NORMAL INDICATION</th><th>IF INDICATION IS ABNORMAL</th></tr>
<tr><td>(Cross side-band rejection) (Cont)</td><td>af. Set rf signal generator to receiver frequency -1000 Hz and adjust for an rf input of 1 μV at RCV ANT J21 jack on rear panel.</td><td></td><td></td></tr>
<tr><td></td><td>ag. Connect an audio voltmeter and 600-Ω load across TB1-4 and TB1-6.</td><td>Reference audio level.</td><td></td></tr>
<tr><td></td><td>ah. Set rf signal generator to receiver frequency +1000 Hz.</td><td></td><td></td></tr>
<tr><td></td><td>ai. Increase rf signal generator output to produce reference level of step 20.ag.</td><td>NLT 60-dB increase in rf signal generator output.</td><td>Check if filters, perform receiver alignment procedures, or return to factory for repair.</td></tr>
<tr><td>(AGC voltage input/output)</td><td>aj. Set receiver to 4000 kHz.</td><td></td><td></td></tr>
<tr><td></td><td>ak. Connect a dvm and 10-kΩ load between channel B - AGC output (TB1-9) and ground (TB1-7).</td><td></td><td></td></tr>
<tr><td></td><td>al. Set rf signal generator to receiver frequency -1000 Hz.</td><td></td><td></td></tr>
<tr><td></td><td>am. Adjust rf signal generator level to produce 1.0-V dc reading on dvm.</td><td>Reference input (10 μV ±3 dB) at RCV ANT J21 jack on rear panel.</td><td></td></tr>
<tr><td></td><td>an. Change the rf signal generator level in 20-dB steps and note the associated AGC outputs.
<table><tr><th>RF INPUT SIGNAL (from reference level)</th><th>AGC OUTPUT</th></tr><tr><td>-20 dB</td><td>0.07 ±0.15 V dc</td></tr><tr><td>+20 dB</td><td>2.00 ±0.15 V dc</td></tr><tr><td>+40 dB</td><td>3.00 ±0.15 V dc</td></tr><tr><td>+60 dB</td><td>4.00 ±0.15 V dc</td></tr><tr><td>+80 dB</td><td>5.00 ±0.15 V dc</td></tr></table></td><td></td><td>Check channel B if A7.</td></tr>
<tr><td>21. AC-85101 dvbfo test

(Cont)</td><td>a. Front panel controls set as follows:

PWR to on.
CONT to LCL.
MODE to SSB/CW.
BANDWIDTH to 16.
DIAL to FINE.
BFO to FIX.
AGC to OFF.
RF GAIN to full cw.</td><td></td><td></td></tr>
</table>

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
21. (Cont)	b. Note VBFO OFFSET HZ display.	Blanked.	Check VBFO A4 and frequency display A2A5.
	c. Set BFO switch to HOLD. Note VBFO OFFSET HZ display.	Displays 00. **Note** Because of keep-alive feature, previously stored VBFO OFFSET HZ may be stored in memory.	Same as step 21.b.
	d. Rotate TUNING knob. Note VBFO OFFSET HZ and FREQUENCY KHZ displays. Stop TUNING knob rotations.	VBFO OFFSET HZ display does not change. FREQUENCY KHZ display changes with TUNING knob rotation.	Check count/store assembly A2A4, frequency display A2A5, control A10, and VBFO A4.
	e. Set BFO switch to TUNE. Note VBFO OFFSET HZ display.		
	f. Rotate TUNING knob. Note VBFO OFFSET HZ and FREQUENCY KHZ displays. (Rotate TUNING knob in both directions.) Stop TUNING knob rotation.	VBFO OFFSET HZ display changes with TUNING knob rotation. In a positive direction for cw rotation and a negative direction for ccw rotation. FREQUENCY KHZ display does not change.	Same as step 21.d.
	g. Set BFO switch to HOLD.		
	h. Adjust TUNING knob for a FREQUENCY kHz of 1000.00.		
	i. Set BFO switch to TUNE.		
	j. Connect an rf signal generator to RCV ANT J21 jack on rear panel.		
	k. Set rf signal generator to 1.000 00 MHz.		
	l. Connect a 600-Ω load across TB1-1 and TB1-3 and connect a frequency counter between TB1-1 and TB1-3.		
(Cont)	m. Rotate the TUNING knob through the full range of the vbfo (-9990 to +9990) while listening to the audio output.	Audio frequency changes smoothly (frequency and loudness).	Check VBFO A4.

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
21. (Cont)	n. Set the VBFO OFFSET HZ at each of the following frequencies and note the counter reading. -6660 -3330 -1000 1990 5550 9000	 6660 ±5 Hz 3330 ±5 Hz 1000 ±5 Hz 1990 ±5 Hz 5550 ±5 Hz 9000 ±5 Hz	Same as step 21.m.
22. AC-85102 decade expansion test	a. Front panel controls set as follows: PWR to on. CONT to LCL. MODE to SSB/CW. BANDWIDTH to USB. DIAL to FINE. BFO to FIX. AGC to FAST. RF GAIN to full cw. b. Rotate TUNING knob slowly and note FREQUENCY KHZ display. c. Perform test 15.	 FREQUENCY KHZ display indicates tuned frequency in increments of 10 Hz.	 Check control A10.
23. AC-85105 optional filters test	***Note*** Test AC-85105 Optional Filters Kit per test 14. The following is a list of filters included in each kit.		

FILTER	COLLINS PART NUMBER	KIT 622-4611( )							
		-001	-002	-003	-004	-005	-006	-007	-008
LSB (FL2)	526-9956-010		X	X			X	X	
A (FL3)	526-9963-060	X		X	X				X
	526-9963-040							X	
B (FL4)	526-9963-040	X		X	X				
	526-9963-030							X	
C (FL5)	526-9963-030	X		X	X		X		
	526-9963-020							X	
	526-9999-010								X
D (FL6)	526-9963-020	X		X	X				
	526-9963-090							X	
	526-9963-010								X
E (FL7)	526-9963-020	X		X			X	X	
	293-1333-010				X				
	526-9999-010					X			

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

<table>
<tr><th>TEST</th><th>PROCEDURE</th><th>NORMAL INDICATION</th><th>IF INDICATION IS ABNORMAL</th></tr>
<tr><td>24. AC-85106 rf translator test

(Cont)</td><td>
Note

This test used for rf translator 637-3757-001 instead of tests 3 and 4. All other testing of the rf translator 637-3757-001 is the same as for 637-1767-001.

Tests for rf translator 637-1767-002 are the same as tests for 637-1767-001, except the 637-1767-002 is the broad-band rf translator noted in test 14.

a. Front panel controls set as follows:

PWR to on.
CONT to LCL.
MODE to SSB/CW.
BANDWIDTH to USB.
DIAL to FINE.
BFO to FIX.
AGC to OFF.
RF GAIN to full cw.

b. Connect an rf signal generator to RCV ANT J21 jack on rear panel.

c. Connect an audio voltmeter and 600-Ω load across TB1-1 TB1-3.

d. Set receiver for 100 kHz.

e. Adjust rf signal generator frequency to receiver frequency +1000 Hz and level for 10-dB increase from noise level with no signal input.

f. Repeat steps 24.d and 24.e at each of the following frequencies:
<table>
<tr><th>FREQUENCY (kHz)</th><th>MAXIMUM INPUT FOR 10-dB INCREASE</th></tr>
<tr><td>250.00</td><td>1.7 μV</td></tr>
<tr><td>530.00</td><td>1.7 μV</td></tr>
<tr><td>540.00</td><td>1.7 μV</td></tr>
<tr><td>1 550.00</td><td>1.7 μV</td></tr>
<tr><td>1 600.00</td><td>1.7 μV</td></tr>
<tr><td>4 000.00</td><td>0.7 μV</td></tr>
<tr><td>8 000.00</td><td>0.7 μV</td></tr>
<tr><td>16 000.00</td><td>0.7 μV</td></tr>
<tr><td>22 000.00</td><td>0.7 μV</td></tr>
<tr><td>29 990.00</td><td>0.7 μV</td></tr>
</table>
</td><td>Note input signal level for information only (frequency outside specified limits of receiver).</td><td>Check rf translator A9 and channel A if A8.

Same as step 24.e.</td></tr>
</table>

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
24. (Cont)	g. Set MODE switch to AM and BANDWIDTH switch to 16.		
	h. Set receiver for 4000.00 kHz.		
	i. Adjust rf signal generator frequency to 4000.00 kHz modulated 30% with 1000 Hz.		
	j. Adjust rf signal generator level for 10-dB increase from noise level with no signal input.	5.6 μV maximum	Same as step 24.e.
	k. Set AGC switch to FAST.		
	l. Connect an rf voltmeter (with 50-Ω load) to CH A IF OUT J19 jack on rear panel.		
(Gain)	m. Set receiver for 250.00 kHz.		
	n. Adjust rf signal generator frequency to 250 kHz and level for 3 μV.	Audio voltmeter indicates NLT -3 dB mW, rf voltmeter indicates 27 ±10 mV.	Check channel A if A8, receive audio A6, and rf translator A9.
	o. Repeat steps 24.m and 24.n at each of the following frequencies:		Same as step 24.n.

FREQUENCY (kHz)	AUDIO OUTPUT	IF OUTPUT
1 600.00	NLT -3 dB mW	27 ±10 mV
3 000.00	NLT -3 dB mW	27 ±10 mV
5 000.00	NLT -3 dB mW	27 ±10 mV
7 000.00	NLT -3 dB mW	27 ±10 mV
10 000.00	NLT -3 dB mW	27 ±10 mV
14 000.00	NLT -3 dB mW	27 ±10 mV
20 000.00	NLT -3 dB mW	27 ±10 mV
27 000.00	NLT -3 dB mW	27 ±10 mV

25. AC-85108 channel A if test (Cont)	***Note*** Test AC-85108 Channel A if kit per test 14. The following is a list of the filters included in each kit.		

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

<table>
<tr><th>TEST</th><th>PROCEDURE</th><th>NORMAL INDICATION</th><th>IF INDICATION IS ABNORMAL</th></tr>
<tr><td>25. (Cont)</td><td colspan="3">
<table>
<tr><th rowspan="2">FILTER</th><th rowspan="2">COLLINS PART NUMBER</th><th colspan="2">KIT 622-4614-( )</th></tr>
<tr><th>-001</th><th>-002</th></tr>
<tr><td rowspan="5">USB(FL1)</td><td>526-9955-010</td><td></td><td></td></tr>
<tr><td>526-9980-010</td><td></td><td></td></tr>
<tr><td>526-9980-010</td><td></td><td></td></tr>
<tr><td>526-9985-010</td><td>X</td><td></td></tr>
<tr><td>526-9976-010</td><td></td><td>X</td></tr>
<tr><td>16(FL8)</td><td>*</td><td>X</td><td>X</td></tr>
<tr><td colspan="4">* 16(FL8) filter characteristics are a result of rf translator being used.</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>26. Presets</td><td colspan="3">a. Front panel controls set as follows:

PWR to on.
CONT to PSET.
PRESET to OPER.
MODE to any.
BANDWIDTH to any.
DIAL to LOCK.
BFO to FIX.
AGC to FAST.
RF GAIN to full cw.

b. Set up unit with the following frequencies, modes, and bandwidths preset to the assigned channels.
<table>
<tr><th>CHAN</th><th>FREQUENCY KHZ</th><th>MODE</th><th>BANDWIDTH</th></tr>
<tr><td>0</td><td>20000.000</td><td>AM</td><td>16</td></tr>
<tr><td>1</td><td>01111.110</td><td>SSB/CW</td><td>A</td></tr>
<tr><td>2</td><td>02222.220</td><td>AM</td><td>B</td></tr>
<tr><td>3</td><td>03333.330</td><td>SSB/CW</td><td>USB</td></tr>
<tr><td>4</td><td>04444.440</td><td>AM</td><td>LSB</td></tr>
<tr><td>5</td><td>05555.550</td><td>SSB/CW</td><td>C</td></tr>
<tr><td>6</td><td>06666.660</td><td>AM</td><td>D</td></tr>
<tr><td>7</td><td>07777.770</td><td>SSB/CW</td><td>E</td></tr>
<tr><td>8</td><td>08888.880</td><td>ISB</td><td></td></tr>
<tr><td>9</td><td>09999.990</td><td>AM</td><td>A</td></tr>
<tr><td>10</td><td>10000.000</td><td>SSB/CW</td><td>B</td></tr>
<tr><td>11</td><td>11000.000</td><td>AM</td><td>C</td></tr>
<tr><td>12</td><td>12000.000</td><td>SSB/CW</td><td>D</td></tr>
<tr><td>13</td><td>13000.000</td><td>AM</td><td>E</td></tr>
<tr><td>14</td><td>14000.000</td><td>ISB</td><td></td></tr>
<tr><td>15</td><td>15000.000</td><td>SSB/CW</td><td>LSB</td></tr>
</table>
</td></tr>
</table>

Table 5. 851S-1 Receiver, Detailed Performance Test Procedure (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
26. (Cont)	c. With each of the channels preset as shown, check each channel in sequence to see that the preset information is retained.	Agrees with chart.	Check preset A12.
	d. Set power off for several minutes.		
	e. Set power on and recheck each channel in sequence to see that the preset information was retained.	Agrees with chart.	Same as step 26.c.
27. AC-85104 Automatic frequency control test	a. Front panel controls set as follows: PWR to ON CONT to LCL MODE to CW BANDWIDTH to 16 DIAL to FINE BFO to FIX AGC to OFF RF GAIN to full cw AFC to ON		
	b. Connect an rf signal generator to RF IN jack J22 on rear panel.		
	c. Set receiver for 4000.00 kHz.		
	d. Set rf signal generator to 4.000 00 MHz at 0.22 μV.		
	e. Note AFC LOCK indicator.	AFC LOCK indicator lights.	Check AFC A3 and LED status display A2A1.
	f. Disconnect rf signal generator from RF IN jack J22.		
	g. Set rf signal generator to 4.000 05 MHz at 0.11 μV.		
	h. Reconnect rf signal generator to RF IN jack J22 on rear panel.		
	i. Note AFC LOCK indicator.	Same as step 27.e.	Check AFC A3.
	j. Disconnect rf signal generator from RF IN jack J22.		
	k. Set rf signal generator to 3.999 95 MHz at 0.11 μV.		
	l. Reconnect rf signal generator to RF IN jack J22 on rear panel.		
	m. Note AFC LOCK indicator.	Same as step 27.e.	Check AFC A3.

4. ALIGNMENT/ADJUSTMENT

Procedures in this section are instructions for properly aligning the receiver. It is assumed that no malfunctions exist in the receiver when these procedures are performed. If a malfunction is suspected, refer to detailed performance test procedures for troubleshooting information. All other adjustments are made in card maintenance and repair.

4.1 Line Audio Adjustments (Receive Audio Card)

Note

Receive line audio inputs may be adjusted to any desired gain level within the amplifier range (-20- to +10-dB mW output for a 3-μV rf input). These adjustments are accessible through the top dust cover.

4.1.1 CH A RCV LINE ADJ A6R28

A6R28 controls channel A receive line audio output.

a. Set front panel METER switch to RCV-CH A AF (+13FS) position.
b. Set front panel MODE switch to ISB. Set front panel AGC switch to FAST.
c. Set front panel RF GAIN control fully clockwise.
d. Connect rf signal generator output to RCV ANT input. Adjust rf signal generator output frequency to approximately 1 kHz above setting of receiver frequency. Apply a 3-μV input to RCV ANT jack.
e. Adjust A6R28 (CH A RCV LINE ADJ) for a level as required for the application in which the receiver is being used.

4.1.2 CH B RCV LINE ADJ A6R65

Note

Applicable only if AC-85100 ISB Kit is installed.

A6R65 controls channel B receive line audio output.

a. Set front panel METER switch to RCV-CH B AF (+13FS) position.
b. Set front panel MODE switch to ISB. Set front panel AGC switch to FAST.
c. Set front panel RF GAIN control fully clockwise.
d. Connect rf signal generator output to RCV ANT input. Adjust rf signal generator output frequency to approximately 1 kHz below setting of receiver frequency. Apply a 3-μV input to RCV ANT jack.
e. Adjust A6R65 (CH B RCV LINE ADJ) for a level as required for the application in which the receiver is being used.

4.2 Meter Adjustments

Meter adjustments are required only if the meter circuit is repaired and/or the associated card is replaced. If the associated card is replaced, make only those adjustments applicable to that card.

4.2.1 Receive Audio Meter Adjustments (Receive Audio Card)

Note

The variable resistors for these adjustments are accessible only by extending receive audio card A6.

If unit does not have AC-85100 ISB Kit installed, in step b set MODE switch to SSB/CW and BANDWIDTH switch to USB. If AC-85100 ISB Kit is not installed, terminate adjustment at step e.

a. Perform line audio adjustments per paragraphs 4.1.1 and 4.1.2.
b. Terminate channel A and channel B receive line outputs (TB1-1 and -3, and TB1-4 and -6) with 600 ohms. Turn on PWR switch. Set mode switch to ISB mode.
c. Connect rf signal generator output to RCV ANT input. Adjust rf signal generator output to frequency approximately 1 kHz above setting of receiver.
d. Connect audio voltmeter across TB1-1 and TB1-3. Adjust rf signal generator output until audio voltmeter indicates +10 dB mW.

Note

If audio voltmeter contains internal 600-ohm load, remove 600-ohm load between terminals being measured. Failure to do so will result in erroneous readings.

e. With METER switch set at CH A AF (+13FS) position, adjust A6R43 for +10-dB mW reading on front panel meter.
f. Adjust rf signal generator to frequency approximately 1 kHz below setting of receiver.
g. Connect audio voltmeter across TB1-4 and TB1-6. Adjust rf signal generator output until audio voltmeter indicates +10 dB mW.

h. With METER switch set at CH B AF (+13FS) position, adjust A6R80 for +10-dB mW reading on front panel meter.

4.2.2 Receiver Signal Meter Adjustment (Channel A IF Card)

Note

The variable resistor for this adjustment is accessible only by extending channel A if card A8. This adjustment is made with an rf input signal 80 dB greater than a 1-μV rf input signal.

a. Turn on PWR switch. Set MODE switch to SSB/CW mode and BANDWIDTH switch to USB. Set RF GAIN control fully clockwise. Set frequency controls for 4000.00 kHz.
b. Connect rf signal generator output to RCV ANT input. Set rf signal generator to 10-mV output.
c. With METER switch set at RCV SIG position, adjust A8R132 for an 80-dB reading on front panel meter.

5. DISASSEMBLY/ASSEMBLY

Warning

Do not attempt disassembly or assembly of the unit with primary power applied.

Caution

Do not remove or install card modules with primary power applied to the equipment. Doing so could damage components on the modules.

Electrostatic sensitive devices (COS/MOS) used in this unit require special handling. Refer to paragraph 7.4 for instructions.

5.1 Disassembly

After removing the top and bottom cover plates of the 851S-1, the circuit cards all plug directly into connectors mounted on the chassis. The power supply, located at the rear of the unit, is secured to the chassis by screws. Subassemblies located behind the front panel are made accessible by removing the front panel. Subassemblies other than the plug-in circuit cards are interconnected by connectors mounted on ribbon-type cables.

Note

Retain hardware removed during disassembly for use in reassembly. Refer to unit parts list as an aid in disassembly and assembly.

5.1.1 Meter Lamp Replacement

a. Grasp spring-loaded white terminal block and pull block away from back of meter until lamps are clear. Rotate block 90 degrees and gently release.
b. Remove and replace meter lamps.
c. Grasp spring-loaded white terminal block and carefully rotate the block back to its original position.

5.1.2 LED Status Display A2A1 Removal

a. Remove unit top cover.
b. Remove front panel from unit by removing four hexhead screws and attaching hardware.
c. Remove four Phillips-head screws that secure LED status display to hexposts/front panel.
d. Disconnect plug P5 from LED status display jack A2J3.
e. Carefully pull LED status display from front panel mounted position (pull straight back).

5.1.3 Count/Store Assembly A2A4 Removal

a. Remove unit top cover.
b. Remove front panel from unit by removing four hexhead screws and attaching hardware.
c. Remove four Phillips-head screws that secure count/store assembly to hexposts/switch mounting board A2A2.
d. Disconnect plug P13 from count/store assembly jack A2A4J3.
e. Carefully pull count/store assembly from its mounted position on the switch mounting board.

5.1.4 Mounting Board A2A2 Removal

a. Remove unit top cover.
b. Remove front panel from unit by removing four hexhead screws and attaching hardware.
c. Remove count/store assembly A2A4.

Caution

Upper overlay panel (plexiglass) is brittle; exercise care during removal of upper overlay panel.

d. Remove upper overlay panel from front panel as follows:
   1. Remove four Phillips-head screws and lockwashers that secure back of front panel to upper edge bar.
   2. Remove four Phillips-head screws and lockwashers that secure back of front panel to panel support (middle bar on front panel).
   3. Lift upper edge bar from front panel.
   4. Carefully remove upper overlay panel.
e. Remove lower overlay panel from front panel as follows:
   1. Remove all knobs from front-panel switches and controls.
   2. Remove four Phillips-head screws and lockwashers that secure back of front panel to lower edge bar.
   3. Lift lower edge bar from front panel.
   4. Remove lower overlay panel.
f. Remove attaching hardware from all switches, controls, and connectors on the front panel.
g. Disconnect plugs P3 and P4 from mounting board jacks A2J2 and A2J1 respectively.
h. Remove mounting board by removing three Phillips-head screws and attaching hardware (screwheads on front of front panel). Be careful not to damage wiring of wire-mounted controls and connectors.

5.1.5 Frequency Display A2A5 Removal

a. Remove unit top cover.
b. Loosen frequency display by removing four Phillips-head screws and attaching hardware.
c. Disconnect plug P8 from jack A2J5 on frequency display.
d. Carefully pull frequency display from front-panel mounted position.

5.1.6 Speaker Removal

a. Remove unit top cover.
b. Remove front panel from unit by removing four hexhead screws and attaching hardware.

Caution

Upper overlay panel (plexiglass) is brittle; exercise care during removal of upper overlay panel.

c. Remove upper overlay panel from front panel as follows:
   1. Remove four Phillips-head screws and lockwashers that secure back of front panel to upper edge bar.
   2. Remove four Phillips-head screws and lockwashers that secure back of front panel to panel support (middle bar on front panel).
   3. Lift upper edge bar from front panel.
   4. Carefully remove upper overlay panel.
d. Remove speaker overlay panel from front panel as follows:
   1. Remove all knobs from front-panel switches and controls.
   2. Remove four Phillips-head screws and lockwashers that secure back of front panel to lower edge bar.
   3. Lift lower edge bar from front panel.
   4. Remove speaker overlay panel.
e. Disconnect jack J47 from speaker plug A2P2.
f. Remove speaker by removing four Phillips-head screws and attaching hardware (screwheads on front of front panel).

5.2 Assembly

Except for the subassemblies that require mounting to the rear of the front panel before the panel is attached to the chassis, assembly of the unit is not in any certain order. The plug-in circuit cards are keyed so each card can be inserted in only the correct connector.

5.2.1 Speaker Installation

a. Mount speaker to front panel using four Phillips-head screws and attaching hardware (screwheads on front of front panel).
b. Mount panel support (middle bar on front panel) to front panel by using four Phillips-head screws and lockwashers.
c. Install speaker overlay panel and lower overlay panel into slot of middle bar on front panel.
d. Carefully install lower edge bar and secure to front panel by using four Phillips-head screws and lockwashers.

Caution

Upper overlay panel (plexiglass) is brittle; exercise care when installing upper overlay panel.

e. Carefully install upper overlay panel into slot of middle bar on front panel.
f. Carefully install upper edge bar and secure to front panel by using four Phillips-head screws and lockwashers.
g. Install all knobs on front-panel switches and controls.
h. Plug jack J47 into speaker plug A2P2.

i. Install front panel to unit using four hexhead screws and attaching hardware.
j. Install unit top cover.

5.2.2 Frequency Display A2A5 Installation

a. Carefully slide frequency display in place in front panel.
b. Connect plug P8 to jack A2J5 on frequency display.
c. Secure frequency display using four Phillips-head screws and attaching hardware.
d. Install unit top cover.

5.2.3 Mounting Board A2A2 Installation

a. Carefully install mounting board to front panel using three Phillips-head screws and attaching hardware (screwheads on front of front panel). Be careful not to damage wiring of wire-mounted controls and connectors.
b. Install the necessary attaching hardware on all front-panel switches, controls, and connectors.
c. Mount panel support (middle bar on front panel) to front panel by using four Phillips-head screws and lockwashers.
d. Install lower overlay panel and speaker overlay panel into slot of middle bar on front panel.
e. Carefully install lower edge bar and secure to front panel by using four Phillips-head screws and lockwashers.

Caution

Upper overlay panel (plexiglass) is brittle; exercise care when installing upper overlay panel.

f. Carefully install upper overlay panel into slot of middle bar on front panel.
g. Carefully install upper edge bar and secure to front panel by using four Phillips-head screws and lockwashers.
h. Install all knobs on front-panel switches and controls.
i. Plug P3 and P4 into mounting board jacks A2J2 and A2J1 respectively.
j. Install front panel to unit using four hexhead screws and attaching hardware.
k. Install unit top cover.

5.2.4 Count/Store Assembly A2A4 Installation

a. Carefully position count/store assembly in its mounted position on the switch mounting board.
b. Secure in place using four Phillips-head screws.
c. Connect plug P13 to count/store assembly jack A2A4J3.
d. Install front panel to unit using four hexhead screws and attaching hardware.
e. Install unit top cover.

5.2.5 LED Status Display A2A1 Installation

Caution

LED status display must be correctly positioned and pushed straight into front panel slot.

a. Carefully push LED status display into front-panel mounted position.
b. Secure LED status display to hex-screw posts/front panel using four Phillips-head screws.
c. Plug P5 into LED status display jack A2J3.
d. Install front panel to unit using four hexhead screws and attaching hardware.
e. Install unit top cover.

6. REPAIR

Repair of the 851S-1 consists of replacing subassemblies and chassis-mounted components. For replacement of subassemblies, refer to paragraph 5. Use standard shop practices to replace chassis-mounted components.

7. CIRCUIT CARD REPAIR

7.1 General

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be utilized to prevent equipment damage. Refer to paragraph 7.4, Electrostatic Discharge Sensitive Devices Precautions, before performing maintenance on this equipment.

The following paragraphs provide information for repair and replacement of components mounted on subassemblies or circuit cards. Testing and troubleshooting procedures for circuit cards and subassemblies are included in the individual instruction sheets in the instruction book. The following is a list of tools and materials necessary for repair of circuit cards.

a. Flux, Kester 1544 or equivalent
b. Solder, 0.5 mm (0.020 inch) diameter, 63/37 rosin flux core or equivalent
c. Solvent, Freon TMC
d. Soldering iron, 40-watt, 1.588-mm (1/16-inch) tip
e. Solder sucker, plunger type
f. Needle-nose pliers
g. Small brush
h. Pipe cleaners
i. Diagonal cutters

7.2 Replacement of Resistors, Diodes, and Capacitors

7.2.1 Removal

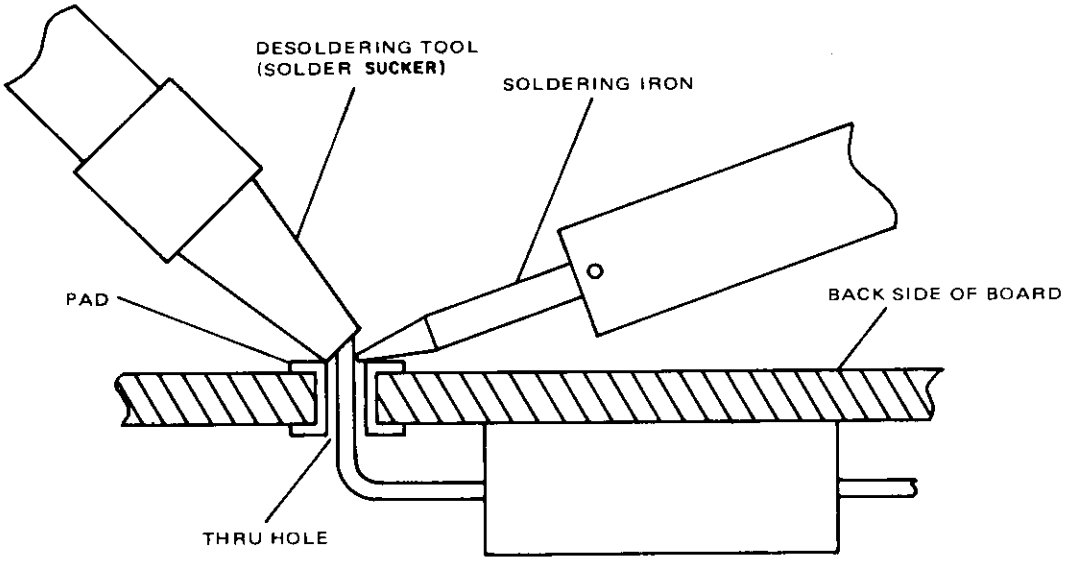
Note

Before removing diodes or polarized capacitors, note polarity marking and orientation on the circuit card.

Caution

Do not apply heat at a thru hole for more than 8 seconds.

a. On back side of board (side opposite components), place soldering iron on pad of component to be removed until solder begins to melt (refer to figure 6).
b. Use a solder sucker, and remove solder from hole. More solder may be required to conduct heat into hole and provide better suction for removal.
c. Use needle-nose pliers to remove lead from hole. It may be necessary to reheat lead, as a certain amount of solder will remain in thru hole.
d. When component has been removed, reheat thru holes and, using a solder sucker, remove excess solder. Reheat procedure as necessary until holes are clean as indicated by lack of solder on walls, top, or bottom.



2-Lead Component Removal Diagram
Figure 6

7.2.2 Installation

a. Using a small brush or tip of a pipe cleaner dipped in solvent, carefully clean both sides of surface area, thru holes, and pads.
b. Observe polarity markings and properly orient component. Shape leads of the replacement component so that leads fit freely into correct thru holes.
c. Gently maneuver component, inserting leads into proper thru holes, until component is inserted to proper depth or until body of component makes contact with surface of circuit board.

Note

Do not crimp or bend leads to hold component in position for soldering. Protruding portion of lead should remain straight to prevent damage to circuit board if subsequent replacement is required.

d. Using small diagonal cutters, cut leads so that protruding length (approx 1.5 mm (1/16 inch)) matches that of other components.
e. Using flux and solder sparingly, solder each lead on side opposite component. Ensure that component does not shift position during soldering procedure.
f. Carefully inspect all new solder joints for evidence of poor connection, cold solder, or short circuit. Solder should completely fill thru hole without excess. Refer to figure 7.
g. Using a small brush or the tip of a pipe cleaner dipped in solvent, thoroughly clean all new soldered joints. Ensure that all flux and rosin are removed. Solder joints should appear clean, smooth, and bright.

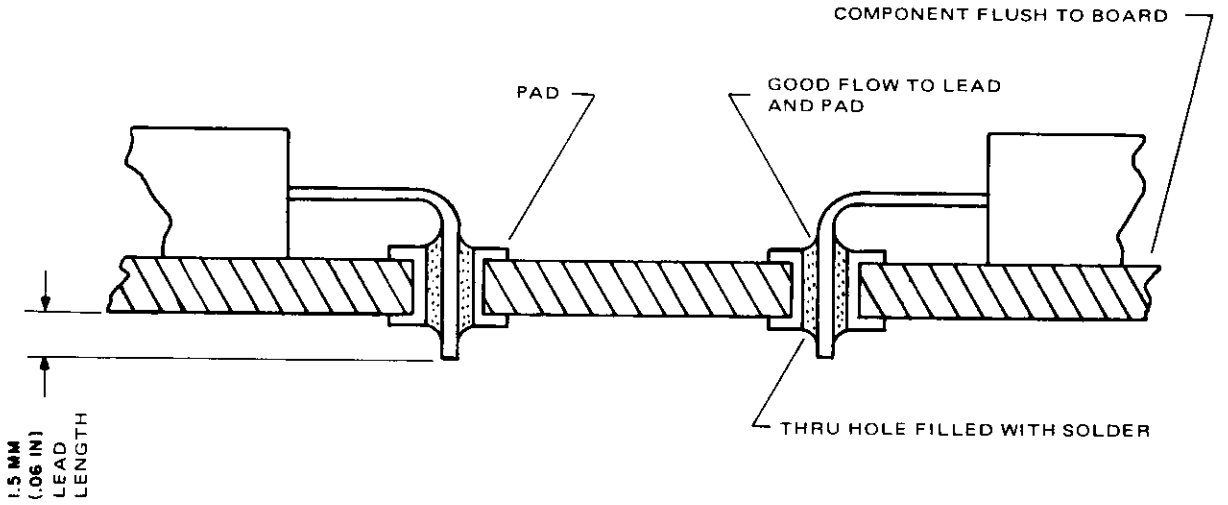
7.3 Replacement of Multilead Components (Transistors, Transformers, Dual-in-Line Packages, Relays, Etc)

7.3.1 Removal

a. Locate component to be removed. Note position, lead conformation, and physical alignment of component. Observe position of orientation tab (if any). Determine pads and thru holes used for mounting.
b. Lay circuit board flat on a clean surface with component side facing down.

Caution

Do not apply heat at a pad or thru hole for longer than 8 seconds.



2-Lead Component Installation Diagram
Figure 7

c. Place soldering iron tip to one pad and lead until solder begins to melt. Use a solder sucker to remove excess solder. More solder may be required to conduct heat into hole and to provide better suction for solder removal. Refer to figure 8.
d. Allow circuit board to cool before applying heat to thru hole in same area. Repeat procedure for each lead.
e. When all leads have been unsoldered, remove component from board.
f. When component has been removed, reheat each hole. When solder is melted, use a solder sucker to remove excess solder. Allow circuit board to cool before reapplying heat in same area. Repeat procedure as required until each thru hole is clean, as indicated by absence of solder on walls, top, and bottom.

7.3.2 Installation

a. Using a small brush or tip of a pipe cleaner dipped in solvent, carefully clean both sides of circuit board in mounting area. Clean mounting holes and pads.
b. Carefully bend leads of new component to same configuration as old one so that leads fit freely into correct thru holes. Do not cut leads at this time.
c. Gently maneuver component, inserting leads into proper thru holes. Continue with rocking movement until component is inserted to proper depth.

Note

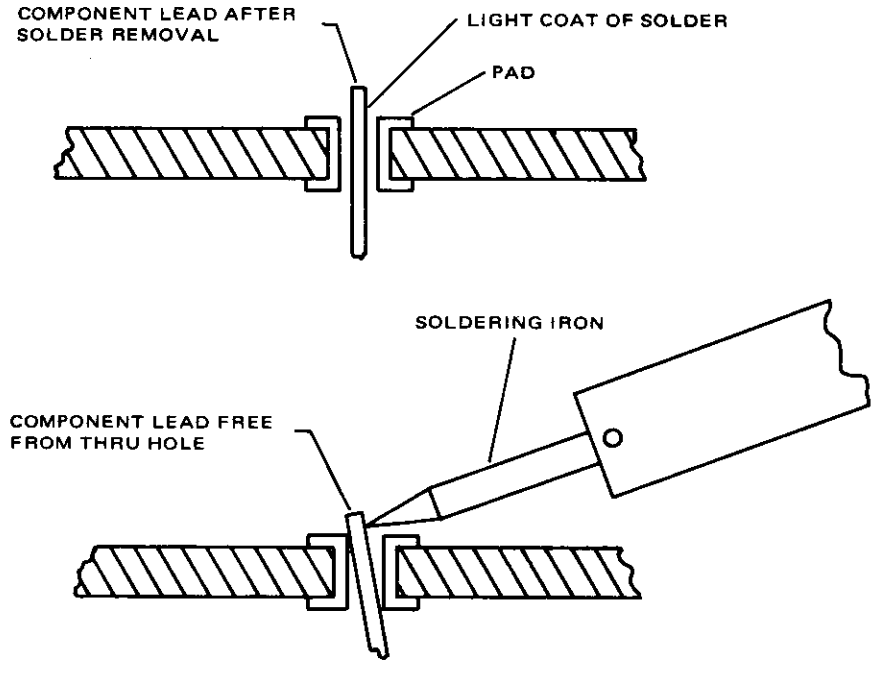
Do not crimp or bend leads to hold component in position for soldering. The protruding portion of lead should remain straight to prevent damage to circuit board if subsequent replacement is required.

d. Using small diagonal cutters, cut leads so that protruding length (approx 1.5 mm (1/16 inch)) matches that of other components.

Caution

Do not apply heat at a thru hole for longer than 8 seconds.

e. Using flux and solder sparingly, solder each lead at side opposite component. Ensure that component does not shift position during soldering procedure.
f. Allow circuit board to cool before applying heat to other thru holes.



Multilead Component Removal Diagram
Figure 8

g. Carefully inspect all new solder joints for evidence of poor connections, cold or excess solder, or short circuits. Solder should completely fill hole without excess (refer to figure 9.)
h. Using a small brush or tip of pipe cleaner dipped in solvent, thoroughly clean all new soldered joints. Ensure that all flux is removed. Solder joints should appear clean, smooth, and bright.

7.4 Electrostatic Discharge Sensitive Devices Precautions

A static charge is produced by friction between, and separation of, dissimilar materials. Potentials of one to twenty kilovolts are commonly generated on the human body or insulated surfaces. Voltages of this magnitude can produce both immediate and latent failure in electrostatic discharge sensitive (ESDS) devices. Highly sensitive (0 to 400 volts) ESDS devices include metal-oxide-semiconductor (MOS) without input protection (C-MOS, D-MOS, N-MOS, P-MOS, V-MOS, etc) and surface acoustic wave (SAW). Most other solid-state electronic devices are ESDS and fall in the moderately sensitive (400 to 2500 volts) or marginally sensitive (2500 to 15 000 volts) range.

Note

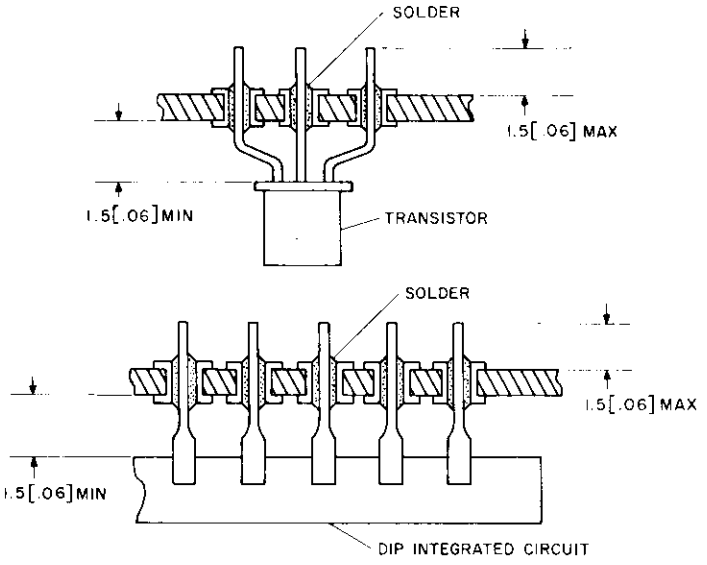
Dry weather (relative humidity less than 30 percent) multiplies the accumulation of static charges on a surface. In a low-humidity environment, the handling procedures specified are of greater importance and should be adhered to without exception.

7.4.1 Handling of ESDS Devices

Caution

Nylon or synthetic gloves should not be used when handling ESDS devices. Excessive static can build up on this type of material. Handle ESDS devices by their case whenever possible. Avoid touching the leads on contacts even though grounded.

The transport of ESDS devices at the component level requires that all device leads be effectively shorted together. This can be accomplished by one of the following methods.



NOTE:
1. UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETRES [INCHES].

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Multilead Component Installation Diagram
Figure 9

a. Insert device in high-density conductive foam.
b. Insert device in aluminum foil lined individual packages.
c. Insert device in a dual-in-line carrier tube made of aluminum of specially coated plastic. (Must be labeled as static charge dissipative.)

The label shown below shall be shown on all individual part containers.

Caution

This component can be damaged by static electricity. Special handling methods and materials must be utilized.

Antistatic protection is required for ESDS devices from the time they are received until they are terminated in a protective subassembly. If ESDS devices are in subassemblies that do not provide adequate ESDS device protection, they are still vulnerable to static damage.

The transport of circuit board or module subassemblies containing ESDS devices requires that contact with exposed subassemblies be prevented. Conductive plastic bags, not clear polyvinyl, are well suited to this purpose. Plastic bags should be adequate in size to enclose the subassembly being transported. After the subassembly containing ESDS devices is installed in the top level unit, normal ESDS devices handling is adequate.

7.4.2 Storage of ESDS Devices

The methods of handling described in paragraph 7.4.1 are appropriate for storage.

Caution

Lead corrosion may result if the device or assembly is stored in a high temperature/high humidity environment.

7.4.3 Testing of Subassemblies Containing ESDS Devices

Observe the following precautions when testing any subassembly containing ESDS devices.

a. Remove power from test fixtures or equipment before inserting/removing any ESDS device or subassembly containing an ESDS device.
b. All test equipment must be well grounded.
c. Apply dc-source power to ESDS device or subassembly containing an ESDS device before applying any signal voltages.
d. Remove signal voltages from ESDS device or subassembly containing an ESDS device before removing dc-source power.
e. Dielectric strength or insulation resistance checks are not recommended for any ESDS device or subassembly containing an ESDS device.

7.4.4 Replacement of ESDS Devices

Protective carriers for ESDS devices should be placed on grounded conductive work station surfaces. This permits the dissipation of any static charge prior to removal, transfer, or insertion of any ESDS device into a subassembly.

It is recommended that an ionized air blower be used in the work area where personnel are handling ESDS devices and that personnel work in the path of the ionized air. The blower should be operated for 3 minutes before handling an ESDS device so that residual static charges may be removed. In lieu of an ionized air blower, a grounded wrist strap in contact with bare skin can be used.

Warning

If a grounded wrist strap is used, make sure no voltages exist in the area of the work station.

Observe the following precautions when replacing an ESDS device.

a. Soldering iron tips, special tools, and hand tools should be well grounded.
b. Only uninsulated metal hand tools should be used. All hand tools shall be placed on the conductive work station surface when not in use.
c. The leads of the ESDS devices should be in contact with a conductive material, except when being installed, to avoid buildup of static charge.
d. ESDS devices should not be installed (inserted) in, or removed from, circuits with the power on because transient voltages may cause damage.
e. All unused input leads of the ESDS device must be connected to ground or the ESDS device supply, whichever is applicable for the logic circuit involved.