

Checked
11/24/80 LS

HIGH SEAS AND OVERSEAS RADIO B3 PRIVACY DEVICE MAINTENANCE

1. GENERAL

1.01 The B-3 Privacy unit, when used in a radiotelephone circuit, is normally connected permanently in the control terminal and is energized continuously. Jacks are provided in the control terminal so that a spare privacy unit may be patched into the circuit when the regular unit is to be taken out of service for maintenance tests.

For Average A-C Line Voltage from	Connect to Trans- former Term. Block Punchings
96 - 104	4 and 5
104 - 111	4 and 6
111 - 119	4 and 7
119 - 126	4 and 8

2. DESCRIPTION OF TESTS AND ADJUSTMENTS

(A) A-C Line and Heater Voltages

2.01 Power shall be connected to the circuit for at least two minutes before the heater voltage tests are made. At time of the initial installation (unless the average line voltage is already known), measurements of the a-c line voltage shall be made over a period of at least 24 hours. At the end of the test period, the average a-c line voltage shall be determined, neglecting short time surges in the voltage, and appropriate connections made to the transformer terminal block which is mounted beneath the protective cover associated with the power supply unit on the panel.

Caution: The voltages under the protective cover on the rear of the panel are dangerous. This cover may be removed with the aid of a screwdriver, but the power lead must first be disconnected and not reconnected until the cover has been replaced.

2.02 Apparatus

A-c Voltmeter, Weston Model 341, 0-50-150V (or equivalent)
Screwdriver, 4-inch

2.03 Procedure

- (1) Disconnect a-c power lead and, with voltmeter plugged into the body at the end of the lead, measure the a-c line voltage.
- (2) With lead still disconnected, remove protective cover and observe to what terminals on the power transformer the incoming leads are connected.

Requirements:

Connections to the transformer P terminal block shall be made in accordance with the following table:

- (3) Reconnect the input leads as required, replace cover and reconnect the a-c power lead.

- (4) After power has been applied for at least two minutes, measure the a-c heater voltage of each vacuum tube with the voltmeter connected to the indicated socket terminals.

Requirements:

Tube	Measure between Socket Terminals	A-C Voltage
T	1 and 6	8.7 - 11.3
R	1 and 6	8.7 - 11.3
OSC	1 and 5	8.7 - 11.3
RECT	1 and 4	4.7 - 5.3

(B) Grid Bias Voltage

2.04 The grid bias voltage for the transmitting and the receiving amplifier tubes T and R is obtained through cathode resistance drop so that it is a measure of the plate currents in the tubes. Since the settings of the T GAIN and R GAIN potentiometers affect not only the gain but the grid bias on the associated tube, specific values cannot be given for all operating conditions. Extreme grid bias voltage values are given for maximum and minimum gain settings of the potentiometers.

2.05 Apparatus

D-c Voltmeter, Weston Volt-Ohmmeter Model 564, KS-7245, 1000 ohms per volt (or equivalent)
Screwdriver, 4-inch

2.06 Procedure

- (1) Note the normal settings of the T GAIN and R GAIN potentiometers and turn them first to their full clockwise and then to their full counter-clockwise positions.
- (2) Measure voltage drop across the "E" and "K" resistances which are designated 11B500 and located on the rear of the panel at the right of the T GAIN and R GAIN potentiometers respectively.

Requirements:

<u>For Maximum Gain Setting of Potentiometer (Full Clockwise Pos.)</u>	<u>For Minimum Gain Setting of Potentiometer (Full Counter- Clockwise Pos.)</u>
1.6 - 4.5 v	3.7 - 7.1 v

- (3) Restore potentiometers to normal settings.

(C) Plate Voltage2.07 Apparatus

D-c Voltmeter, Weston Volt-Ohmmeter Model 564, KS-7345, 1000 ohms per volt (or equivalent)

2.08 Procedure

- (1) Measure between socket terminals 3 and 4 of the OSC tube.

Requirement: The plate voltage shall be in the range of 115-150 volts.

(D) Vacuum Tubes2.09 Apparatus

Hickok Model 530B Tube Tester (or equivalent)

2.10 Procedure

- (1) Remove each vacuum tube from its socket and test it in the tube tester in accordance with BSP 100-640-101.

Note: The tube tester settings and test requirements for the three types of tubes as given in BSP 100-640-101 should be used rather than those indicated on the tester roll chart.

- (2) Replace any tube that does not meet the requirements.

(E) Oscillator Frequency

2.11 When the panel is manufactured, the oscillator frequency is adjusted to within 0.6 cps of its nominal value. It should not be necessary to change this adjustment (unless the strapping of the OSC condenser becomes broken) until the aging of the circuit elements causes the frequency to depart from its nominal value by more than 5 cps.

Note: If no precision oscillator is available for the frequency test, the test shall not be made since the frequency change attributable to aging is less than the probable error in the ordinary oscillator.

2.12 Apparatus

Oscillator, 6010B (or equivalent)
Telephone Receiver, 528 equipped with 2W2A Cord

or

Volume Indicator, 753-B (or equivalent)
Resistance, 300-ohm
Patch Cord, 3F14B

2.13 Procedure

- (1) Temporarily connect a 300-ohm resistance between terminals 12 and 14 on the T terminal strip so as to apply a portion of the precision oscillator output directly to terminals 13 and 14 on the T terminal strip.

- (2) Adjust precision oscillator for 1 MW of 1500-cps tone, if H condenser is an AL6, or 1625-cps tone, if H condenser is an AN11.

- (3) Connect precision oscillator output to TR jacks, if terminals 11 and 12 on the T terminal strip are connected to terminals 9 and 10 or to 3 and 4; otherwise use TA IN jacks.

- (4) Connect telephone receiver or volume indicator to TA OUT jacks, if terminals 13 and 14 on the T terminal strip are connected to terminals 15 and 16; otherwise use TR jacks.

- (5) Listen at the receiver or observe the volume indicator meter needle as the portion of the precision oscillator output that has passed through the modulator beats against the unmodulated portion; and adjust OSC condenser by strapping for "zero beat".

Note: Do not apply a soldering iron to the condenser terminals until the proper strapping has been completely determined.

- (6) Remove 300-ohm resistance.

(F) Oscillator Output Voltage2.14 Apparatus

40B Transmission Measuring System
or
6A Transmission Measuring Set
Patch Cord, 2W24A

2.15 Procedure

- (1) Connect input of measuring set to terminal 8 of transformer T IN and center terminal "3" of potentiometer T BAL.

- (2) Calibrate measuring set for 3000 cps, if H condenser is an AL6, or 3250 cps, if H condenser is an AN11, and measure level.

Requirement: The oscillator output level shall be at least +11 dbm (2.8 v).

- (3) Make same measurement for the connection to terminal 8 of transformer R IN and center terminal "3" of potentiometer R BAL.

(G) Gain-Frequency Characteristics

2.16 The privacy gain measurements are divided into three parts: Amplifier alone, Modulator alone, Amplifier plus Modulator. Only those tests that correspond with the arrangements actually used in the circuit need be made. However, for trouble location tests, it may be desirable to test the individual parts. The tests are based on the privacy wired for operation in a 600-ohm impedance circuit.

2.17 Apparatus

40B Transmission Measuring System
19C or 13A Oscillator
or

6A Transmission Measuring Set
13A Oscillator

- 2 - Patch Cords, 3P14B
- 2 - Patch Cords, 2W24A
- Screwdriver, 4-inch

2.18 Procedure (Amplifier)

- (1) Patch from SEND jacks of measuring set to TA IN or RA IN jacks of transmitting or receiving amplifier; and from TA OUT or RA OUT jacks to REC jacks of measuring set.
- (2) Observe to which terminal of amplifier input transformer TA IN or RA IN the flexible lead from the grid cap of the associated amplifier vacuum tube is connected. Refer to table below and use corresponding tone input power.
- (3) Note the normal settings of the T GAIN and R GAIN potentiometers and turn them first to their full clockwise and then to their full counterclockwise positions.
- (4) Measure output of each amplifier at 200, 1000 and 3000 cps for both maximum and minimum gain conditions. Check to see that amplifier gain is within the correct ranges for the input transformer terminal in use.

Requirements:

a. Grid Cap Connected to Input Trans. Terminal	Send- ing Tone Power	Gain at 1000 cps with GAIN potentiometer Set for	
		Max. Gain	Min. Gain
	dbm	db	db
1	-30	33 -37	26.7-32.1
2	-30	28.5-33.5	22.2-28.6
3	-30	24.5-29.5	18.2-24.6
4	-20	20.5-25.5	14.2-20.6
5	-20	16.5-21.5	10.2-16.6
6	-20	12.5-17.5	6.2-12.6

- b. The gain at 200 cps shall not differ from the measured value of 1000-cps maximum gain by more than +0.4 to -1.6 db and from the measured value of minimum gain by more than 0 to -2 db.

- c. The gain at 3000 cps shall not differ from the measured value of 1000-cps maximum gain by more than 0 to -1 db and from the measured value of minimum gain by more than +0.3 to -1.5 db.

- (5) Restore the GAIN potentiometers to their normal operating settings.

2.19 Procedure (Modulator)

- (1) Temporarily disconnect straps from terminals 11, 12, 13 and 14 on the T and R terminal strips.
- (2) Connect the SEND jacks of the measuring set to terminals 11 and 12 on the T or R terminal strip (for transmitting or receiving modulator); and connect terminals 13 and 14 on the T or R terminal strip to the REC jacks of the measuring set.

Note: If a 6A TMS is used, it will be necessary, for each test frequency used, to adjust its SEND and CAL positions with its oscillator set for the output frequency to be measured and then to adjust its SEND position for the input frequency to be used. Its key is then operated directly from the SEND to the MEAS position when the loss measurement is to be made.

- (3) Send 1 MW of tone at the frequencies shown below, measure the output (calibrating the measuring set at the frequencies of column 2 or 3) and calculate the loss in the modulator.

Requirements:

Input Freq. cps	Output Frequency If H Condenser is an		Loss at 1500 cps db	Loss Relative to Measured Value of 1500-cps Loss db
	AL6 cps	AN11 cps		
1500	1500	1750	8.3-11.3	-
250	2750	3000	-	+1 to -3
2750	250	-	-	+0.2 to -3.8
3000	-	250	-	+1 to -3

- (4) Reconnect straps to terminals 11, 12, 13 and 14 on T and R terminal strips.

2.20 Procedure (Amplifier and Modulator)

- (1) If the amplifier follows the modulator, patch from the SEND jacks of the measuring set to the TR or REC jacks (for the transmitting or receiving side of the privacy) and from the TA OUT or RA OUT jacks to the REC jacks of the measuring set.
- (2) If the amplifier precedes the modulator, patch from the SEND jacks of the measuring set to the TA IN or RA IN jacks and from the TR or REC jacks to the REC jacks of the measuring set. (See Note under step (2) of Paragraph 2.19)

- (3) Observe the designated number of the terminal of amplifier input transformer TA IN or RA IN to which the flexible lead from the grid cap of the amplifier vacuum tube T or R is connected.

- (4) Note the normal setting of the associated GAIN potentiometer and turn it to full clockwise position for maximum gain.

- (5) Send tone at -25 dhm and at the frequencies shown below, measure the output (calibrating the measuring set at the frequencies of column 2 or 3) and calculate the gain of the amplifier and modulator.

Requirements:

Input Freq. cps	Output Frequency If H Condenser is an		Overall Maximum Gain		Gain Relative to Measured Value of 1500-Cycle Gain db
	AL6 cps	AN11 cps	With Rep. Coil T or R db	Without Rep. Coil T or R db	
1500	1500	1750	22.7-27.7 less 4(N-1)*	23.1-28.1 less 4(N-1)*	
250	2750	3000	-	-	+0.1 to -3.5
500	2500	2750	-	-	+0.7 to -0.7
1000	2000	2250	-	-	+0.9 to -0.5
2000	1000	1250	-	-	+0.9 to -1.1
2500	500	750	-	-	+0.9 to -2.3
2750	250	-	-	-	-0.5 to -3.7
3000	-	250	-	-	-0.5 to -3.7

* N is the numerical designation of the terminal on the amplifier input transformer to which the flexible lead is connected. For example, if the flexible lead connects to terminal 4 the overall gain range is 12 db less than that shown.

- (6) Restore the GAIN potentiometers to their normal operating settings.

(H) Carrier Leak2.21 Apparatus

Telephone Receiver, 528 equipped with 2W2A Cord
2 - Patch Cords, 2P13A
Screwdriver, 4-inch

2.22 Procedure

- (1) Note their normal settings and turn the T GAIN and R GAIN potentiometers to their full clockwise position for maximum gain.
- (2) Note their normal connections and connect flexible leads from caps of T and R vacuum tubes to terminal 1 of TA IN and RA IN input transformers.

(3) If amplifiers come before modulators, patch from TR jacks to TA IN jacks and from REC jacks to RA IN jacks.

(4) Connect telephone receiver to TA OUT jacks and, while listening to oscillator tone (3000 or 3250 cps), adjust the T BAL potentiometer until the tone is minimum.

Requirement: The minimum tone shall be barely audible and there shall be a sharp balance.

(5) If this requirement cannot be met by the adjustment of the potentiometer alone, it will be necessary to adjust the capacity of condenser K and perhaps to change its connection to the T OUT repeating coil from terminal 3 to terminal 8 or vice versa.

(6) Connect telephone receiver to RA OUT jacks and, using the R BAL potentiometer (and condenser L, if necessary), repeat the test of step (4).

(7) Restore GAIN potentiometers to their normal settings and the flexible leads of the T and R vacuum tubes to their normal terminals on the TA IN and RA IN input transformers.

(I) Noise

2.23 Apparatus

- 2B Noise Measuring Set (or equivalent)
- 2 Plugs, 600-ohm 217-D
- 2 Resistances, 600-ohm
- 2 Patch Cords, 2P13A
- Screwdriver, 4-inch

2.24 Procedure

(1) Note their normal settings and turn the T GAIN and R GAIN potentiometers to their full clockwise position for maximum gain.

(2) Note their normal connections and connect flexible leads from caps of T and R vacuum tubes to terminal 1 of TA IN and RA IN input transformers.

(3) If amplifiers come after modulators, terminate TR and REC jacks in 600 ohms.

(4) If amplifiers come before modulators, patch from TR jacks to TA IN jacks and from REC jacks to RA IN jacks. Temporarily connect 600-ohm resistances across terminals 17 and 18 on the T and R terminal strips.

(5) Insert measuring set plug in its LINE jack, connect the set in turn to the TA OUT and RA OUT jacks and measure noise.

Requirement: The noise shall be less than 46 db above reference noise (message weighting).

(6) If requirement is not met, check the plate supply filter (retard coils A and B and condensers E, F and G).

(7) Remove 600-ohm terminations, restore GAIN potentiometers to their normal settings and the flexible leads of the T and R vacuum tubes to their normal terminals on the TA IN and RA IN input transformers.