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SERVICE MANUAL

DIAMOND 60

SOLID STATE CITIZENS BAND

SSB/AM TRANSCEIVERS

T A B L E O F C O N T E N T S

1. SSB TRANSMITTER ALIGNMENT
2. AM TRANSMITTER ALIGNMENT
3. AM RECEIVER
4. SSB RECEIVER
5. SYNTHESIZER
6. SIGNAL FLOW

1. SSB TRANSMITTER ALIGNMENT

1.1 SSB Exciter Alignment

- A. Disconnect TP 4 and connect oscilloscope TP4-TP5.
- B. Rotate the channel selector switch to channel 11.
- C. Set to mode selector switch on either upper or lower sidebands.
- D. Connect an audio generator to the input terminals of the microphone connector. Inject the frequency of 1kHz.
- E. Adjust the audio generator output level to 3 millivolts.
- F. Press the mike button and adjust transformers T1, T2, T3, T4 and T5 for maximum output.
- G. Set T6 to the maximum position and rotate to 3 turns clockwise position.

TABLE I

<u>Location</u>	<u>AF or RF Voltage</u>	<u>DC Voltage</u>
Mike jack	3mV r.m.s. (1kHz)	
TP13	350mV r.m.s. (1kHz)	
TP1	0.6V P-P	
Q3, 4 Base		1.5V
Q3, 4 Emitter		0.9V
Q3, 4 Collector		6.7V
Q5 Base		0.65V
Q5 Collector		4.2V

1.2 Transistors Bias Adjustment of Linear Amplifier

- A. Connect a 50 ohm Wattmeter to antenna jack.
- B. Set the mode selector switch on either upper or lower sideband.

- C. Connect a milliamp meter between L4 and +B (TP10).
- D. Short the microphone input. Press the mike button and adjust R102 for 5 milliamp current indication.

1.3 Linear Amplifier Alignment

- A. Set the mode selector switch on either upper or lower sideband and rotate to the TTC on center.
- B. Short TP11-TP12 and connect audio generator to the microphone input circuit. Inject the frequency of 1kHz.
- C. Adjust the audio generator output level to 10 millivolts.
- D. Press the mike button and adjust the transformer and coils T14, L2 and L5 for maximum power output. Power output should be more than 9 watts.
- E. Disconnect TP11-TP12 and adjust R112 for 8 watts power output.

TABLE II

<u>Location</u>	<u>RF Voltage</u>	<u>DC Voltage</u>
Q16 Base		1.8V
Q16 Emitter		1.2V
Q16 Collector	10V P-P	10V
Q17 Base	1.2V P-P	
Q17 Collector	12.5V P-P	
Q20 Base	3.5V P-P	
Q20 Collector	30V P-P	
Ant. Jack	60V P-P	

1.4 Carrier Balance Alignment

- A. Select either upper or lower sideband with the mode switch and short the microphone input circuit to ground.
- B. Press the microphone button and adjust the R20 and C15 for minimum indication on the oscilloscope. Output voltage should be less than 0.6 volts P-P.

2. AM TRANSMITTER ALIGNMENT

SSB Alignment should be performed before AM alignment

2.1 AM Transmitter Alignment

A. Press the mike button and adjust R98 for 3.7 watts power output.

TABLE III

<u>Location</u>	<u>RF Voltage</u>	<u>DC Voltage</u>
Q16 Base		2.3V
Q16 Emitter		1.9V
Q16 Collector	8.5V P-P	9V
Q17 Base	1.5V P-P	
Q17 Collector	16V P-P	
Q20 Base	25V P-P	
Q20 Collector	30V P-P	10.5V
Ant. Jack	40V P-P	

2.2 Modulation performance check

- A. Connect an oscilloscope across the 50 ohm dummy load.
- B. Connect an audio generator to the microphone input circuit. Inject the frequency of 1kHz.
- C. Adjust the audio generator output level 2 millivolts modulation should be approximately 100%.

TABLE IV

<u>Location</u>	<u>AF Voltage</u>
Mike jack	2mV
Q31 Base	2.5mV
Q32 Base	150mV
Q32 Collector	3V
Q34, 35 Collector	8V
TP10	5V

2.3 Antenna Protector Circuit Alignment

- A. Connect a 250 ohm dummy load through the series power meter.
- B. Press the mike button and adjust R81 for output power drop to zero.

3. AM RECEIVER

3.1 AM Receiver performance check

- A. Connect the RF signal generator to the antenna jack. Set the generator output at 0.5 microvolts, 1kHz 30% modulation.
- B. Connect the 8 ohm load with an audio voltmeter to external speaker jack.
- C. Rotate the volume control, RF GAIN control to the maximum clockwise position and the squelch control to the maximum counter-clockwise position.
- D. Set the channel selector switch to channel 11 and the signal generator to 27.085 MHz.
- E. Audio output power should be more than 1 watt.
- F. Adjust the volume control for 1 (or 0.775) volt indication on the audio voltmeter. Remove the modulating signal from the Signal generator. Indication on the audio voltmeter should drop 10 db or more.

3.2 AM Receiver Alignment

The following table is provided to aid the alignment of the AM receiver section.

TABLE V

<u>Alignment</u>	<u>Generator Frequency & Output Level</u>	<u>Generator Connection</u>	<u>Adjustment</u>	<u>Voltmeter Connection</u>	<u>Adjust For</u>
2nd IF Stage	455 KHz (10 uV)	TP7-TP6	T12, T13	EXT SP Jack	MAX.
1st IF Stage	7.8 MHz (3 uV)	Base of Q10	T10, T11	EXT SP Jack	MAX
RF Stage	27 MHz (0.5 uV)	Ant. jack	T7, T8, T9	EXT SP Jack	MAX

3.3 AM Receiver Transistor Voltage

TABLE VI

	<u>Q7</u>	<u>Q8</u>	<u>Q9</u>	<u>Q10</u>	<u>Q11</u>	<u>Q12</u>
Emitter (Source)	0	0.65	0.65	1.5	0.1	0
Collector (Drain)	0	0.6	7.5	7.0	3.5	1.8
Base (Gate)	0.65	0.6	0.45	2.0	0.4	0.65
	(with RF Gain CCW)					

All voltages are measured with a 100K ohm voltmeter at no output of signal generator.

3.4 AM AGC Performance Check

- A. Connect the signal generator to the unit. Select Channel 11 and adjust the signal generator for 0.5 microvolts output signal modulated to 30%.
- B. Increase the signal generator output to 100 millivolts.
- C. Adjust the volume control for 1 (or 0.775) volt indication on the audio voltmeter.
- D. Reduce the signal generator to 10 microvolts. The audio voltmeter should not drop more than 6 db.

3.5 AM S Meter Alignment

- A. Connect the unit as described in Step 3.4 and adjust the signal generator for 100 microvolts.
- B. Adjust R72 for S9 indication.

3.6 Squelch Performance Check

- A. Connect the unit as described in Step 3.1.
- B. Rotate the squelch control until the signal has been just muted.
- C. Advance the signal generator output level until the squelch is broken. It should take less than 0.5 microvolts increase on the signal generator output to break the squelch.

- D. Rotate the squelch control to the maximum clockwise position. Advance the signal generator output. Adjust R186 to break the squelch between the output of 30 and 300 microvolts.

3.7 Squelch Troubleshooting

Table VII is to be used as an aid in locating and correcting the troubles in the squelch circuitry.

TABLE VII		
<u>Stage</u>	<u>Unsquelch</u>	<u>Full Squelch</u>
Q38	E 0	0
	C 0.7	0.06
	B 0.35	0.65
Q39	E 0	0
	C 0.03	6.5
	B 0.7	0.06

SSB RECEIVER

4.1 SSB Receiver Performance Check

- A. Connect a signal generator to the antenna jack. Set the signal generator output level to 0.25 microvolts with no modulation.
- B. Connect an 8 ohm load with an audio voltmeter to external speaker jack.
- C. Set the mode selector switch to upper sideband. Rotate the volume control, RF Gain Control to its maximum clockwise position and the squelch control to its maximum counterclockwise position.
- D. Rotate channel selector switch to channel 11.
- E. Adjust the signal generator output frequency to the audio tone of approximately 1 KHz. Audio output power should be more than 1 watt.
- F. Adjust the volume control for 1 (or 0.775) volt indication on the audio voltmeter.

- G. Reduce the signal generator output. The indication on the audio voltmeter should drop 10 db or more.

TABLE VIII

<u>LOCATION</u> (terminal of ICI)	<u>DC VOLTAGE</u>
1	2
2	2
3	8
4	0
5	8
6	2
7	2

4.2 SSB S Meter Alignment

- A. Connect the unit as described in Step 4.1 and adjust the signal generator for 100 microvolt.
- B. Adjust R159 for S9 indication.

5. SYNTHESIZER

5.1 Synthesizer Performance Check

- A. Connect a 50 ohm wattmeter to the antenna jack.
- B. Connect a frequency counter to the antenna jack.
- C. Connect an audio generator set at 1 kHz to the microphone input.
- D. Rotate the channel selector to channel 1 and the mode switch to USB.
- E. Press the mike button and increase the audio generator output until sufficient RF output is obtained to trigger the counter.

- F. Check the CLAR control for maximum and minimum output frequency. This should be 26.966 MHz \pm approximately 800Hz.
- G. Check the remaining channels in the upper sideband mode. Keep in mind that the output frequency will appear 1 kHz higher than the actual assigned channel number since you are using a 1 kHz tone.
- H. When checking output frequency when the mode switch is at LSB, the measured output frequency should be 1 kHz \pm approximately 800Hz, less than the assigned channel frequency.

5.2 Synthesizer Alignment

- A. Short between TP-301 and ground (TP305) and connect the frequency counter between TP303 and TP305.
- B. Set the channel selector switch on channel 1 and mode selector switch to USB or LSB.
- C. Adjust C320 for a frequency reading of 6,000 MHz.
- D. Frequency adjustment for the remaining channels are listed in Table IX.

TABLE IX

<u>Channel</u>	<u>Mode Switch</u>	<u>Adjustment</u>	<u>Frequency (MHz)</u>
1	USB or LSB	C320	6,000
2	USB or LSB	C318	6,010
3	USB or LSB	C316	6,020
4	USB or LSB	C314	6,040

- E. Disconnect TP301-TP305 and short between TP302 and TP305.
- F. Set the channel selector switch on channel 1 and mode switch to USB or LSB.
- G. Adjust C312 for frequency reading of 15.965 MHz.
- H. Frequency adjustment for the remaining channels are listed in Table X.

TABLE X

<u>Channel</u>	<u>Mode Switch</u>	<u>Adjustment</u>	<u>Frequency (MHz)</u>
1	USB or LSB	C312	15.965
5	USB or LSB	C310	16.015
9	USB or LSB	C308	16.065
13	USB or LSB	C306	16.115
17	USB or LSB	C304	16.165
21	USB or LSB	C302	16.215

- I. Remove the frequency counter from TP303 and TP305.
- J. Connect the frequency counter between TP304 and TP305.
- K. Set the mode selector switch on USB and delta tune control to its maximum clockwise position.
- L. Adjust L301 for a frequency reading of 12.8023 MHz.
- M. Set the mode selector switch on LSB and delta tune control to its maximum counterclockwise position.
- N. Adjust R327 for a frequency reading of 12.7977 MHz.
- O. Set the mode selector switch on USB and delta tune control to its maximum counterclockwise position.
- P. Adjust R325 for a frequency reading of 12.8007 MHz.
- Q. Set the mode selector switch on LSB and delta tune control to its maximum clockwise position.
- R. Adjust R323 for a frequency reading of 12.7993 MHz.
- S. Remove the frequency counter from TP303-TP304.
- T. Short between TP306 and TP305 and connect an oscilloscope to TP304-TP305.
- U. Tune the peak of T301 and T302 for maximum indication on the oscilloscope.
- V. Remove the oscilloscope from TP304-TP305 and disconnect TP306-TP305.
- W. Connect an oscilloscope to output of T305.

5.3 Synthesizer Troubleshooting

- A. Locating a problem in the synthesizer circuitry of the unit, use the measurement in Table XI.

TABLE XI

<u>Location</u>	<u>RF Voltage (V P-P)</u>
Q301 Base	2.4
Q302 Base	6.4
Q305 Emitter	2
T305 (output)	0.2

- B. If there was no synthesizer output on some channels, refer to Table XII to locate the defective crystal.