SECTION 5.

SERVICING INFORMATION

CAUTION: This radio uses surface mount construction. It is recommended that servicing may be limited to replacement of complete modules and non-surface mount components. Component level servicing should not be attempted unless the engineer or technician is very familiar with surface mount repair techniques and has all of the necessary specialized tools and equipment.

5.1 TEST EQUIPMENT AND TOOLS

ITEM DESCRIPTION

1. DMM (Digital Multi-meter)
2. Audio Generator 10 Hz To 10,000 Hz
3. Regulated DC Power Supply with Volt and Amp meters, adjustable up to 15 V @ 15 Minimum
4. AC Voltmeter Analog Type preferred
5. Test Set With Signal Generator, Frequency Counter, Watt-Meter/Load, Deviation Meter, CTCSS/DCS. If test set is not available, separate equipment may be used for these functions,
6. Complete Set Of Small Hand Tools.
7. Temperature Controlled Soldering Iron.
8. Desoldering Braid Or Vacuum Type Desoldering Iron.

5.2 TUNING AND ADJUSTMENTS

5.2.1 GENERAL

All adjustments have been properly set at the factory and should not require readjustment in the field. If a module has been replaced, refer to the section which covers the adjustment or tuning of that module.

Tuning tools should fit exactly. Use insulated, nonmetallic tools for all RF adjustments.

Always use an antenna or 50 Ohm dummy load for transmitter tests.

Do not key transmitter when connected to signal generator.

Connect the radio to a regulated DC power. Adjust for 13.8 volts at the power supply terminals.

Adjustments are to be made with the top and bottom covers removed. *Refer to section 5.3 DISASSEMBLY PROCEDURES.*

5.2.2 VCO ADJUSTMENTS

Note: Adjustment should not be required unless parts or the entire module have been replaced.
If replacement and readjustment of the VCO, after repair is made, program wide band low and high power test channels near the low end, center and high end of the band (six channels in all) with CTCSS of 100 Hz on all channels. Example, for VHF Band, 146-174 MHz, program channels at 146.1 high and low power, 160.1 high and low power, and 173.9 high and low power.. Remove these channels after testing

is completed and program customer frequencies. Use the low power channels for all VCO tests to minimize overheating of the radio.

The VCO must be adjusted so that the phase detector voltage remains between 1V and 5 V over the entire range of frequencies used.

1. To access the VCO, remove the top cover, 2 black screws, and the VCO shield, 5 brass screws.

2. Select the center channel which was programmed for tuning adjustments. Connect DMM to TP2 located on the left edge of the main board.

3. Adjust L301 located on the lower left, for 3 V in the RX mode.

4. Adjust L305 located on the lower right, for 3 V in the TX mode.

5. Check both RX ant TX VCO at highest and lowest frequency to make certain that voltage remains between 1 V and *5* V. Make minor readjustments as required.

6. For frequency spread of less than 10 mHz, re-install VCO shield and top cover. For spread over 10 MHz, leave covers off for later adjustment of FVR3O1 Modulation Balance control.

5.2.2 RECEIVER TUNING ADJUSTMENTS

Note: If no repairs have been made to the radio, the sensitivity may be easily checked by testing the squelch sensitivity. Set the squelch to threshold and apply an on-frequency signal of .25 uV. If the Squelch opens, the sensitivity is OK. Typical squelch sensitivity is usually <.2uV,

1. Connect one lead of the Analog AC voltmeter to the high side of the speaker at the rear connector, pin 3 or 4 (jumper wire). Connect the other lead to the radio chassis.
Remove bottom cover, 2 black screws.

2. Connect signal generator to antenna connector, select center channel frequency.

3. Check that RX VCO voltage at TP2 is near 3 V (+/- .5 V). Recheck VCO adjustment if necessary.

4. Select the center channel and adjust L1, L2 and L5, L6 or BPF1 (depends on band) and T3 for best sensitivity. Check sensitivity at the highest and lowest frequency and make minor adjustments if needed. Note that there may be a slight difference is sensitivity on these channels but it should not be outside of the sensitivity specifications.

5. After tuning is completed, sensitivity should be less than 0.4 uV for 20 dB quieting and less than .3 uV for 12 dB SINAD. Squelch sensitivity should be less than .25 uV at threshold.

5.2.3 FREQUENCY ADJUSTMENT

1. Connect frequency counter to the transmitter using proper attenuation.

2. Key the transmitter on a low power channel and adjust the trimmer on the reference oscillator OSC1 for correct frequency within 1 PPM. OSC1 is located on the front left side of the radio. This adjustment controls both the TX and RX frequencies.

5.2.4 TRANSMITTER POWER AMPLIFIER ADJUSTMENT

Note: The mobile transmitter is designed for 20% duty cycle. Key the transmitter only long enough to make the adjustments. The transmitter contains internal protection against overheating which may reduce the power output if it is keyed for a long time. This may cause improper setting of the power output and possible damage to the radio..

1. Connect wattmeter and load to antenna connector.

2. Select high power center channel and adjust the PWR HIGH (FVR8) for 25 Watts (40 Watts on high power models) or other desired power below maximum rated power.

3. Adjust FVC1 (FVC3) for maximum power and repeat step 2.

4. Check power at highest and lowest frequency and readjust FVC1 to balance the power. Power may be slightly lower at band extremes but should not exceed -1 dB.

5. Select low power center channel and adjust PWR LOW (FVR7) for ½ power or other low power setting.

6. The Reverse Protect feature protects the power amplifier from damage due to reflected power if the antenna becomes open or shorted. Select any high power channel. Key transmitter and adjust REVERSE PROTECT (FVR9) until power supply current just begins to drop. Slowly adjust in the other direction until current returns to normal. Repeat if necessary to make sure you have the correct adjustment.

5.2.5 TRANSMITTER DEVIATION ADJUSTMENT

1. Select the low power, low frequency channel.

2. Connect dummy load or antenna to the transmitter.

3. Connect deviation meter using proper attenuation.

4. Connect microphone to the connector on the control unit.

5. While speaking loudly and very close to the microphone, key the transmitter and adjust FVR2 for 4.8 kHz deviation.

6. Adjust FVR5 for 700 Hz deviation of the CTCSS tone (note that any background noise in the area will be picked up by the microphone and cause an error in adjustment. Recheck step 5 if necessary.

7. If DTMF tones will be used, adjust FVR201 located on logic unit for 3 kHz deviation while holding the 5 key on the keypad.

8. Select the highest frequency channel and recheck deviation. Adjust Modulation Balance control FVR301 in the VCO to balance the modulation on the highest and lowest frequency, if required.

9. Reassemble all covers.

5.3 DISASSEMBLY PROCEDURES

Note the positioning of the cables for reassembly later. Perform only the steps necessary for service required. *Refer to EXPLODED VIEW for tag numbers (nn).*

5.3.1 TOP COVER REMOVAL

I. Remove two black screws (36) from top cover (35).

2. Remove top cover (35).