

## INSTRUCTION BOOK ADDENDA

HQ-110A/VHF -- HQ-170A/VHF

2-Meter Converter, 6-Meter Pre-Amplifier

Introduction

The Hammarlund HQ-110A/VHF and HQ-170A/VHF Receivers are equipped to tune all amateur frequencies from 160 meters through 2 meters.

Reception of CW, AM and SSB signals are provided for.

Operation

To receive 6 meter signals (50 to 54 Mcs) the bandswitch is placed in the 50 to 54 Mc position, and the volume control knob is pushed in. A suitable antenna must be connected to the proper antenna terminal. (See fig. 2)

The sensitivity of the HQ-110A/VHF and the HQ-170A/VHF on the 6 meter band is improved over that of the HQ-110A or HQ-170A. This improvement is accomplished by the use of a low noise 6CW4 pre-amplifier stage.

When the bandswitch is in the 50 to 54 Mc position and the volume control knob is pulled out, frequency converter stages are turned on which change 144 to 148 Mc signals to 50 to 54 Mc signals.

When not receiving 2 meter signals, it is recommended that the volume control knob be pushed in. This reduces the power consumed in the receiver. Separate antennas are recommended for 6 and 2 meter operation. Where it is desired to use a combination 6/2 meter antenna, a switching unit should be used to disconnect the antenna terminal not in use.

On six and two meters the sideband switch is reversed due to the high frequency oscillator being used on the low side of the incoming signal. This results in the upper sideband being received in the lower sideband position and vice versa.

Theory of Operation

The converter consists of (4) type 6CW4 Nuvistor tubes in a combination 2 meter converter, 6 meter pre-amplifier circuit.

Signals at 144 to 148 Mc are introduced to the converter through a tapped antenna coil. A 6CW4 RF amplifier is coupled to a bandpass filter which consists of L202, C204, C206, L203 and L204.

A crystal controlled oscillator using a 31.333 Mc crystal  $\pm .002\%$  with output on 94 Mcs is coupled through a second tuned circuit, L208, C223 which attenuates any harmonics that may be present.

The output of the oscillator, 94 Mc, is mixed with the 144 to 148 Mc RF signal in V202. The difference frequency is 50 to 54 Mc. This signal is passed through L205, C210, L206, C212 which form a broadband filter approximately 5 Mc wide.

V203 amplifies the 52 Mc signals and is coupled to the receiver 6 meter antenna coil through C217.

The 6 meter antenna is isolated from the circuit by the relay. One set of contacts in the relay acts as an RF shield which prevents 6 meter leak through.

When receiving 50 to 54 Mc signals, relay K201 is not energized and power is not applied to V201, V202 and V204. The 50 to 54 Mc antenna is connected to a one turn link on L205.

The operation of the 6 meter pre-amplifier is exactly as described above for the 50 to 54 Mc signals.

The series trap consisting of L209, C225 is tuned to 188 Mc (second harmonic of the local oscillator). This trap has been included to prevent signals at 138 Mcs (aircraft) from being heard. The second harmonic of the oscillator, 188 Mc and a signal between 134 and 138 Mc will mix and produce a signal between 50 and 54 Mc. The trap virtually eliminates this spurious response.

The coil L211 is a tunable neutralizing coil. Adjustment of this coil is described in the alignment procedure.

The converter is carefully aligned at the factory, and it is recommended that any alignment follow the recommended procedure.

Use of a good antenna is important at these frequencies. The ARRL Handbook is a good source of material on VHF antenna systems.

Antenna connections for the VHF series of receivers are slightly different than shown in the basic instruction book. (See fig. 3)

No provision is made to feed the 6 meter jack from the long wire antenna as in the HQ-110A and HQ-170A.

In the event a combination 6/2 meter antenna is used, a switch box might be built to change the antenna connections. It is not recommended that the antenna terminations be paralleled.

## Field Alignment Procedure

### Equipment Required

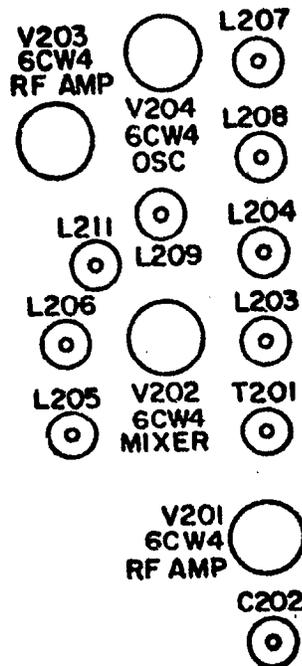
1. Signal generator.
2. Alignment tools.

Refer to Figure 1 for location of coils.

### Procedure (Cover must be in place during tune-up)

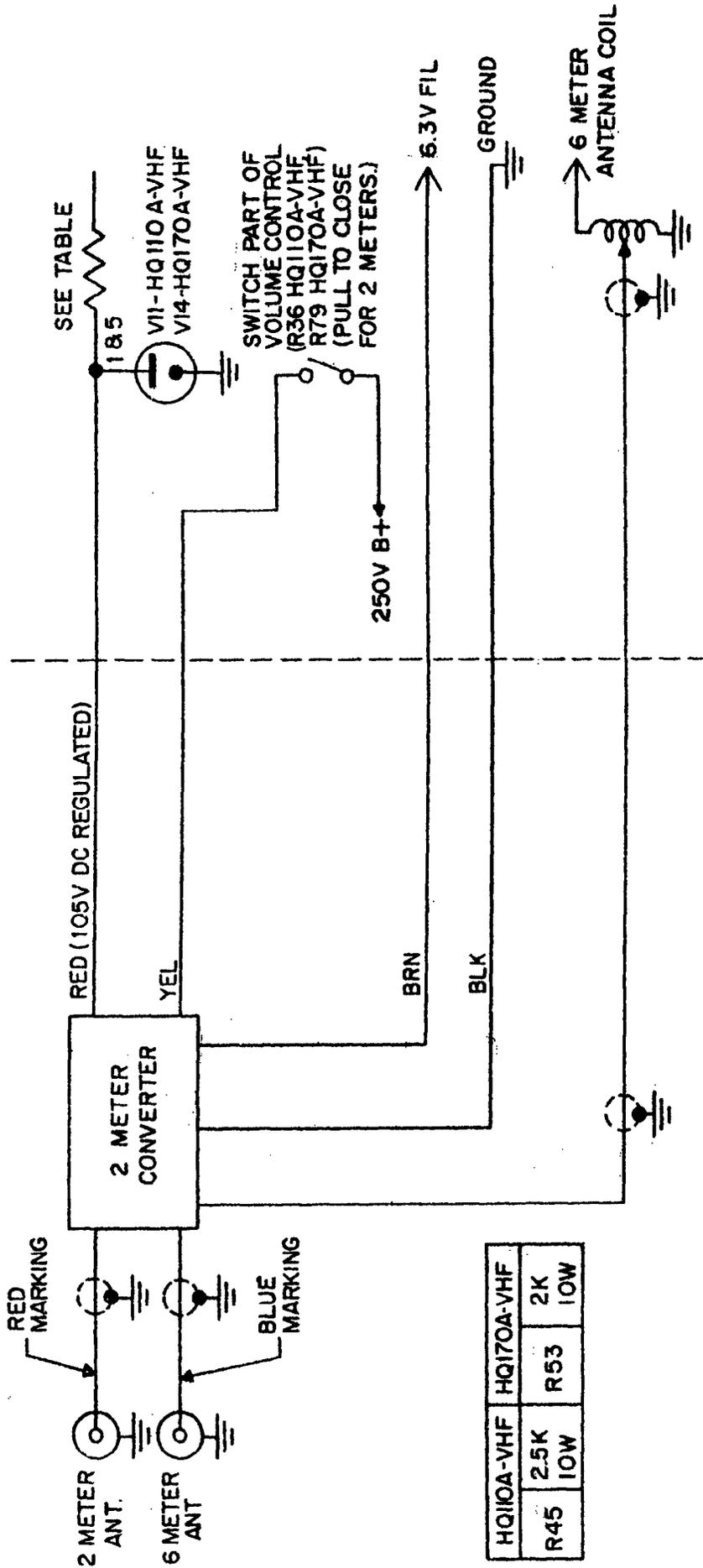
1. Turn all slugs counter-clockwise so that they are near bottom of coil. (nearest chassis)
2. Tune receiver to 50 Mc.  
  
Feed the signal generator to 6 meter antenna terminals and adjust so that signal is heard.
3. Adjust L205 and L206 for peak reading on meter. Turn each 2 turns at a time till they peak. Repeat several times.
4. Unsolder B+ lead to the converter. (Be sure to turn off set.)
5. Turn set on and tune L211 for a minimum reading on meter.
6. Resolder B+ lead and check tuning of L205 and L206.
7. Change generator to 144 Mcs and move generator output to 2 meter antenna connector. Pull out volume control knob for 2 meter operation. Tune receiver to 144 Mc.
8. Tune L207 & L208 while rocking signal generator around operating frequency until oscillation starts. Peak both coils.
9. Tune T201 and L204 for peak readings. Peak several times to be sure of proper tuning.
10. Peak C202 for maximum reading, then turn clockwise 1 full turn.
11. Tune generator and receiver to 147 Mc. Peak L203 for maximum. Trim L207 and L208 for maximum.
12. Tune receiver and generator to 145 Mc. Peak receiver.

13. Tune generator to approximately 137 mc. Increase generator output and find the signal. Tune L209 for a sharp dip in "S" meter reading. Carefully tune L208 (not more than 1/2 turn) for a dip. If none appears tune for peak. Trim L209 for maximum.

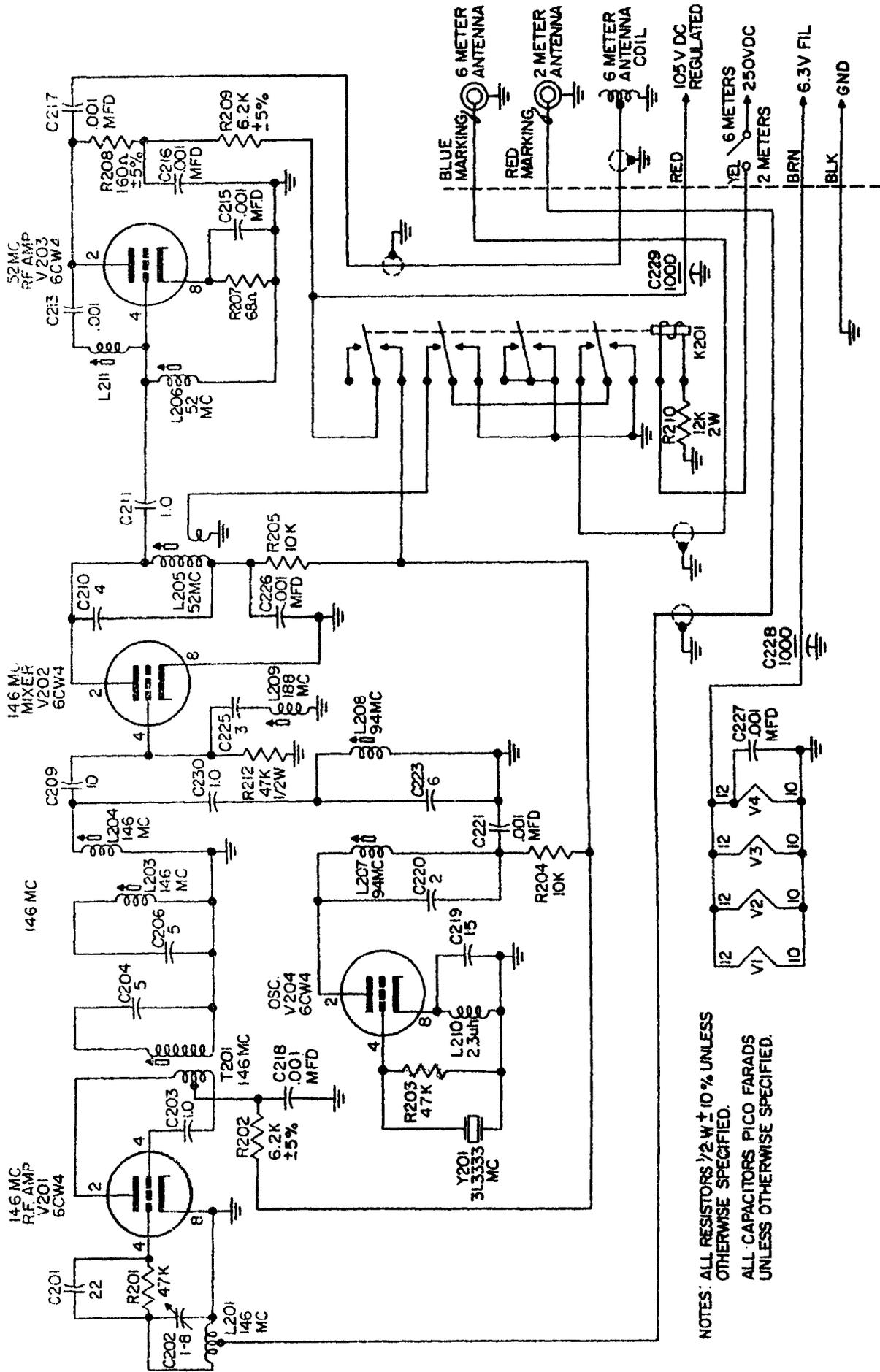


PT. NO. 2418-02-00029

FIGURE 1

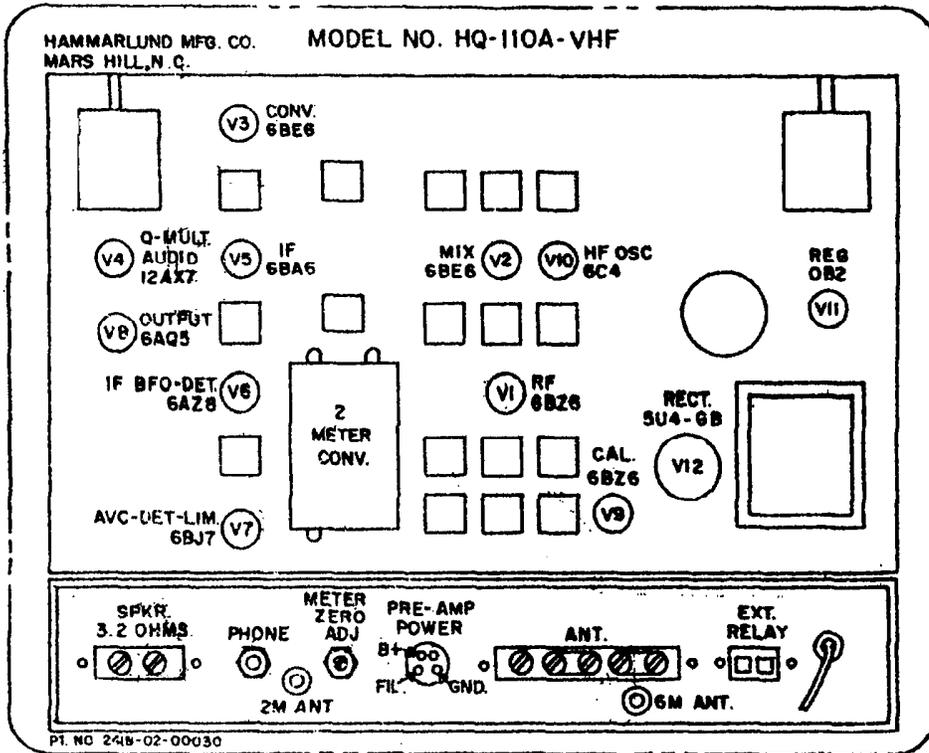


2 METER CONVERTER SYSTEM DIAGRAM  
HQ110A-VHF, HQ170A-VHF

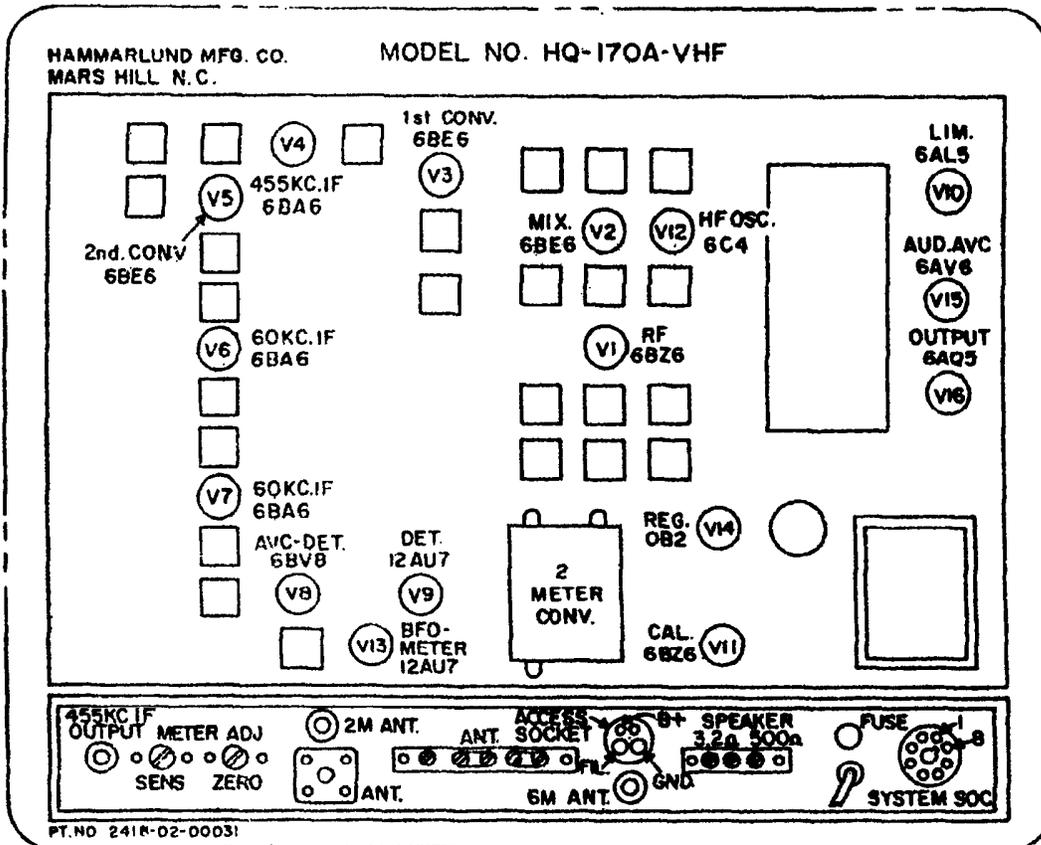


NOTES: ALL RESISTORS 1/2 W ± 10% UNLESS OTHERWISE SPECIFIED.  
 ALL CAPACITORS PICO FARADS UNLESS OTHERWISE SPECIFIED.

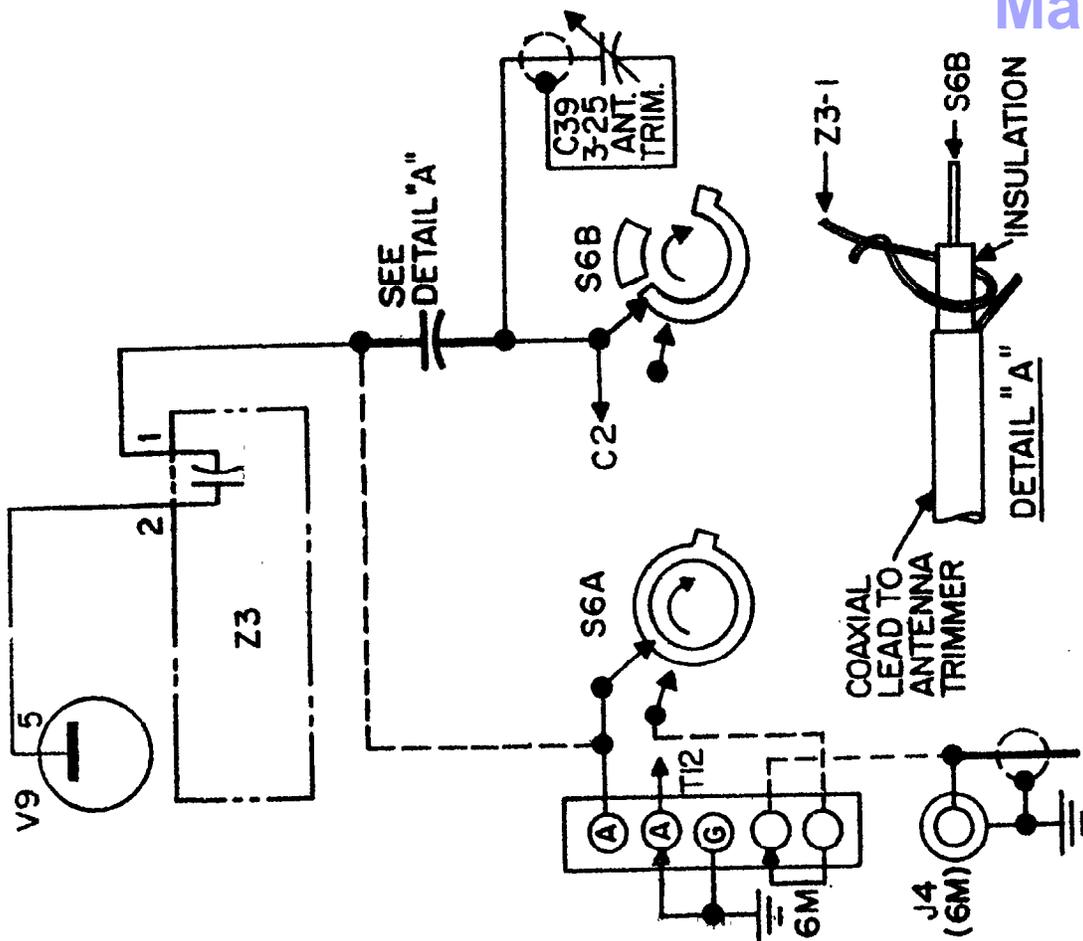
SCHEMATIC DIAGRAM  
 2 METER CONVERTER



TUBE LOCATION HQ110A - VHF



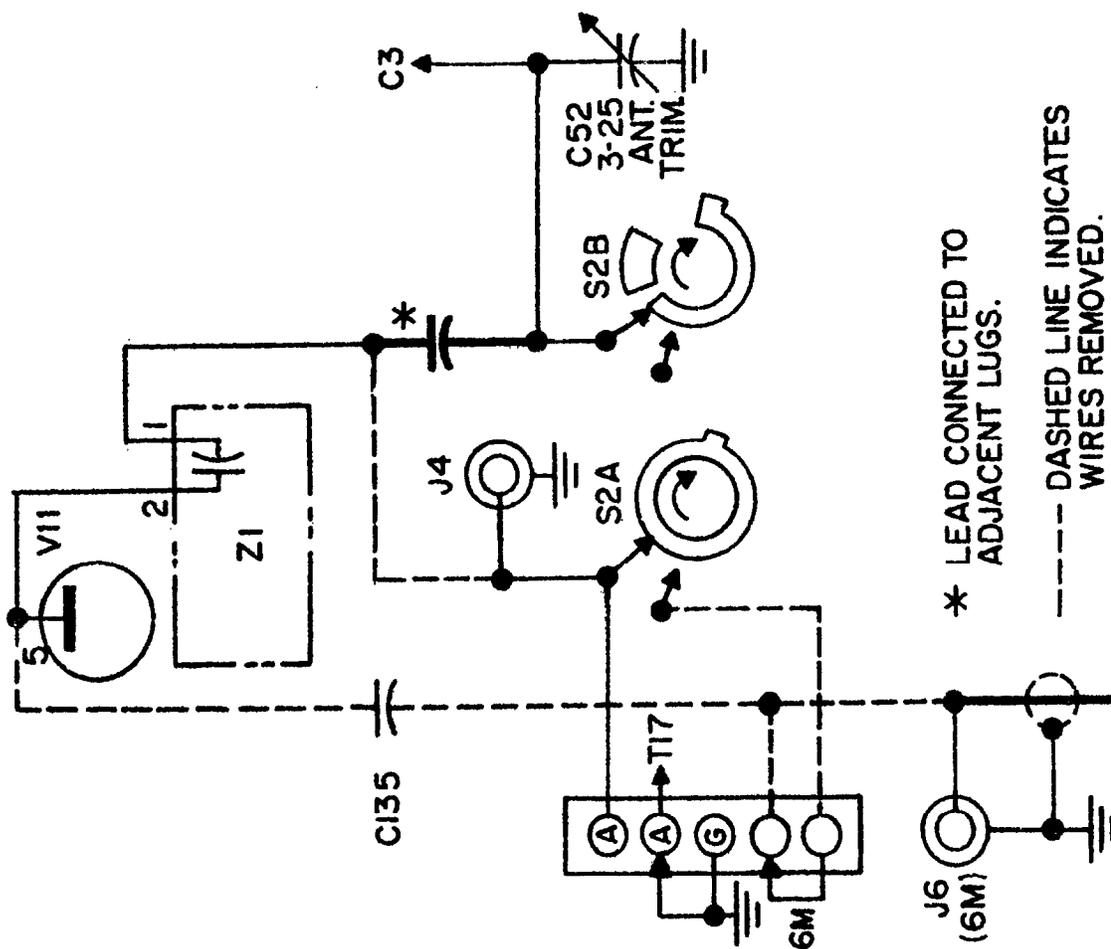
TUBE LOCATION HQ170A - VHF



--- DASHED LINE INDICATES WIRES REMOVED.  
 — HEAVY LINE INDICATES WIRES ADDED.

HQ110A-VHF

MODIFICATIONS OF ANTENNA AND CRYSTAL CALIBRATOR CIRCUITS



\* LEAD CONNECTED TO ADJACENT LUGS.

--- DASHED LINE INDICATES WIRES REMOVED.  
 — HEAVY LINE INDICATES WIRES ADDED.

HQ170A-VHF

MODIFICATIONS OF ANTENNA AND CRYSTAL CALIBRATOR CIRCUITS

Parts List

<u>Schematic Designation</u>	<u>Description</u>	<u>Hammarlund Part No.</u>
C201	Dur-Mica DM15 22 pf $\pm 5\%$ , 500V	M1519-01-00050
C202	Trimmer, 1-8 pf	K1527-01-00002
C203, 211, 222, 224, 225	Fixed molded, 1 pf $\pm 10\%$ , 500V	K1509-02-04001
C204, 206, 208	Dur-Mica DM15 5 pf $\pm 10\%$ , 500V	M1519-01-00003
C207	Dur-Mica DM15 3 pf $\pm .5$ pf, 500V	M1519-01-00011
C209	Dur-Mica DM15 10 pf $\pm 10\%$ , 500V	M1519-01-00006
C210, 223	Dur-Mica DM15 4 pf $\pm .5$ pf, 500V	M1519-02-00025
C213, 215, 216, 217, 218, 221, 226, 227	Disc Ceramic .001 MFD $\pm 10\%$ , 1000V	M1509-01-01013
C219	Dur-Mica DM15 15 pf $\pm .5$ pf, 300V	M1519-02-00022
C220	Dur-Mica DM15 2 pf $\pm .5$ pf, 500V	M1519-01-00024
C228, 229	Feed thru 1000 pf $\pm 5\%$ , 500V	K1524-02-01001
K201	Relay, 4PDT DC	K4515-01-00002
L201	Coil, Ant. 146 Mc	K1806-02-00102
L203	Coil, RF 146 Mc	K1806-02-00101
L204	Coil, RF 146 Mc	K1806-02-00100
L205, 206	Coil, RF 52 Mc	K1806-02-00103
L207, 208	Coil, Osc. 94 Mc	K1806-02-00104
L209	Coil, Trap 188 Mc	K1806-02-00105
L210	Coil, Neutralizing	K1805-01-00001
L211	Coil, RF 146 Mc	K1805-02-00122
R201, 203, 212	Resistor, Fixed 47K $\pm 10\%$ , $\frac{1}{2}$ W	K4703-01-00352
R202, 209	Resistor, Fixed 6.2K $\pm 5\%$ , $\frac{1}{2}$ W	K4703-02-00466
R204, 205	Resistor, Fixed 10K $\pm 10\%$ , $\frac{1}{2}$ W	K4703-01-00344
R207	Resistor, Fixed 68 OHMS $\pm 10\%$ , $\frac{1}{2}$ W	K4703-01-00318
R208	Resistor, Fixed 180 OHMS $\pm 10\%$ , $\frac{1}{2}$ W	K4703-01-00323
R210	Resistor, Fixed 12K $\pm 10\%$ , 2W	K4705-01-00945
T201	Transformer, RF 146 Mc	K1812-01-00018
Y201	Crystal, 31.333 Mc	M2305-01-00074
V201, 202, 203, 204	Tube, Electron 6CW4	K5704-02-00002

Parts added to or changed in the basic HQ-110A and HQ-170A.

Parts List

<u>Schematic Designation</u>	<u>Description</u>	<u>Hammarlund Part No.</u>
<u>HQ-110A-VHF</u>		
J5	Connector, Female 2M Antenna	K2106-01-00002
R30	Resistor, Variable, 1 Meg & SPST Push-Pull Switch	K4735-01-17001
R45	Resistor, Fixed 2.5K $\pm 10\%$ , 10W	K4714-02-01009
<u>HQ-170A-VHF</u>		
J7	Connector, Female 2M Antenna	K2106-01-00002
R47	Resistor, Variable, 1 Meg & SPST Push-Pull Switch	K4735-01-17001
R53	Resistor, Fixed 2K $\pm 10\%$ , 10W	K4714-01-01003