

**ANTENNA LOW PASS FILTER:**

Using the #10 TORX bit Remove the cover over the transmitter low pass filter, this is the small solid cover which is near the antenna connector. This is done to enable you to gain access to the following LOW PASS FILTER components.

See Figures 8, 9 and 10

Presetting of the transmitter low pass filter inductors L20, L22 and L23.

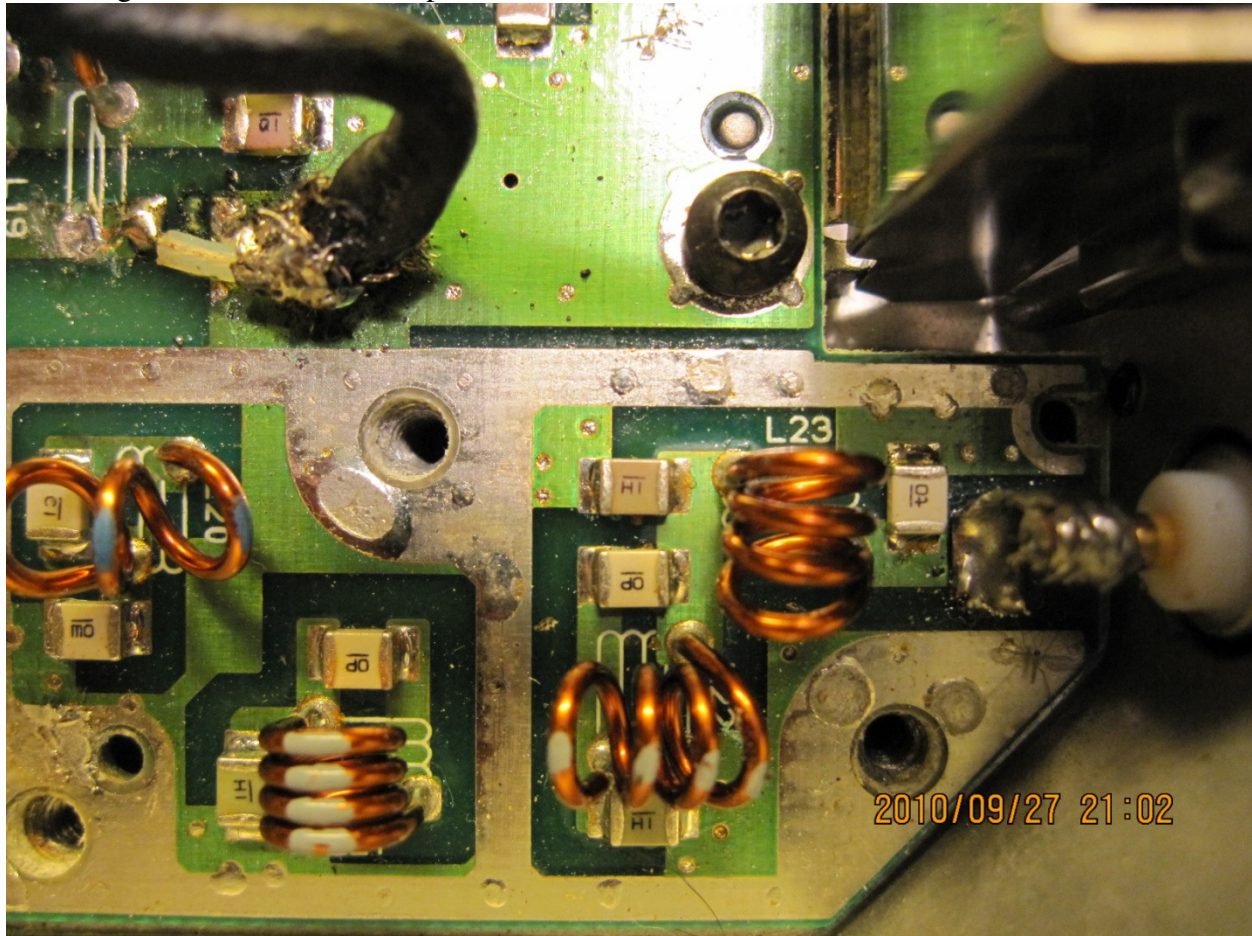


Figure 8. Antenna Low pass filter L20, L22 and L23 spread open. L21 2<sup>nd</sup> from left is not spread.

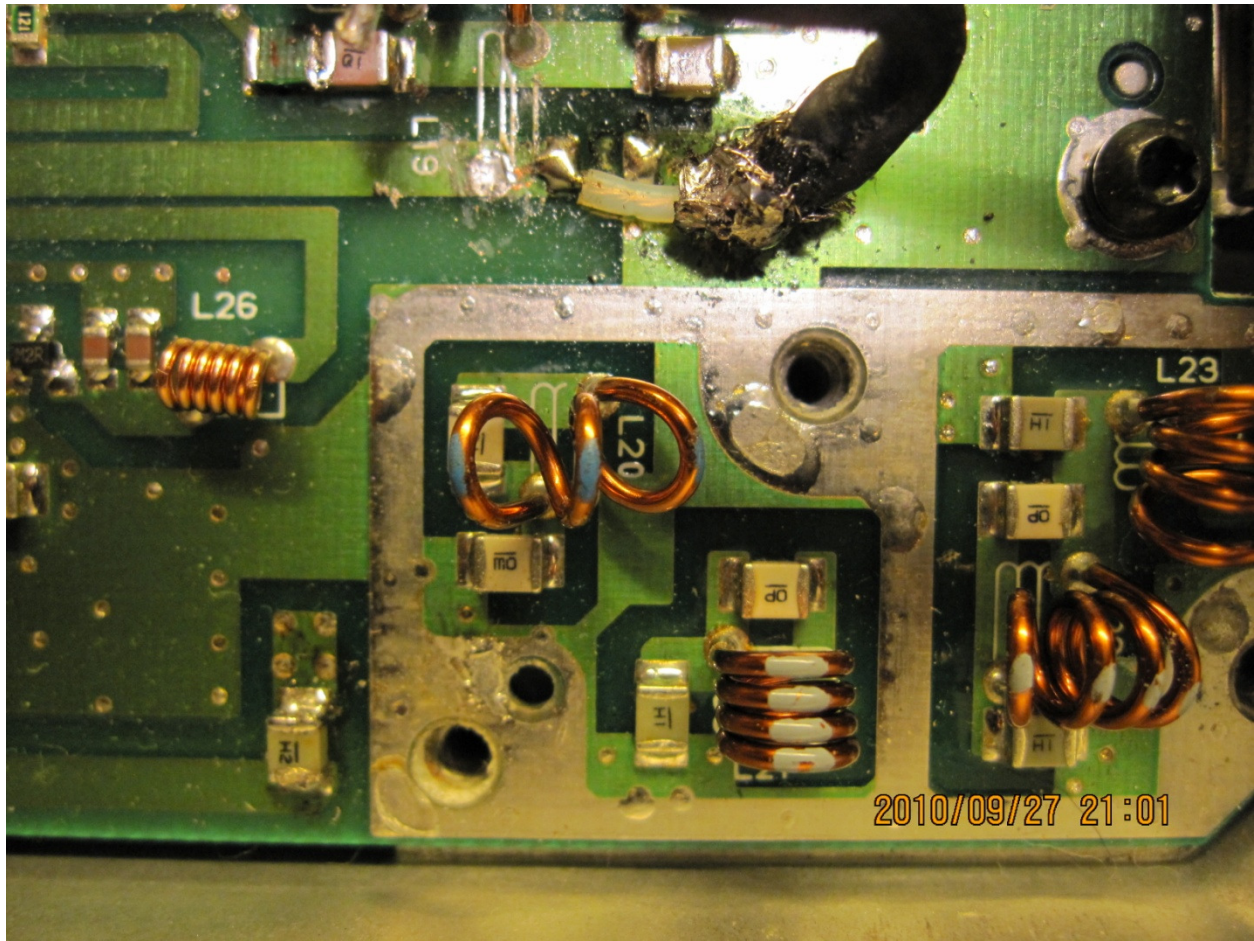


Figure 9. L20 close up turns spacing, this inductor is spread the most. The two turns on each end are approximately at a 45 degree angle from the circuit board.



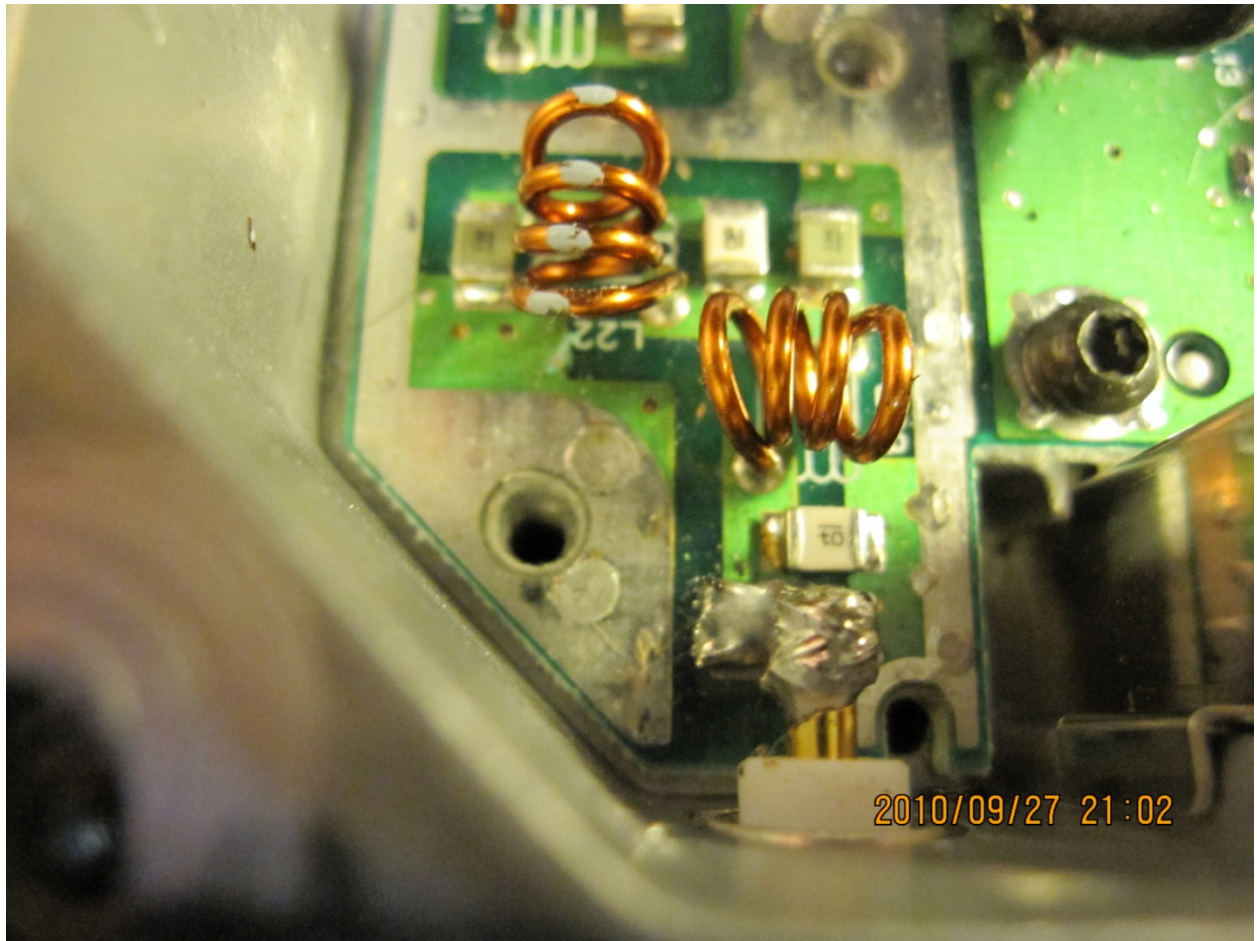


Figure 10. L22 and L23, turns spread approximately  $1 \frac{1}{2}$  wire turns spacing between windings.

**TRANSMITTER POWER AMPLIFIER:** See figures 11, 12, 13 and 14.

To properly mod the transmitter it was decided to bypass the output amplifier stage so that all versions of the VHF Orion could use the same mod procedure.

See LBI39002. Disconnect Jumper W1 to remove voltage from the output power amplifier stages, the output transistors can be left as is since they are now disconnected from the active circuitry.

**REMOVE** the original VHF power module, driver HC1, and replace it with a Toshiba SAV-15 or similar power module from RF Parts. The SAV-15 is a direct drop in replacement. Figure 11.

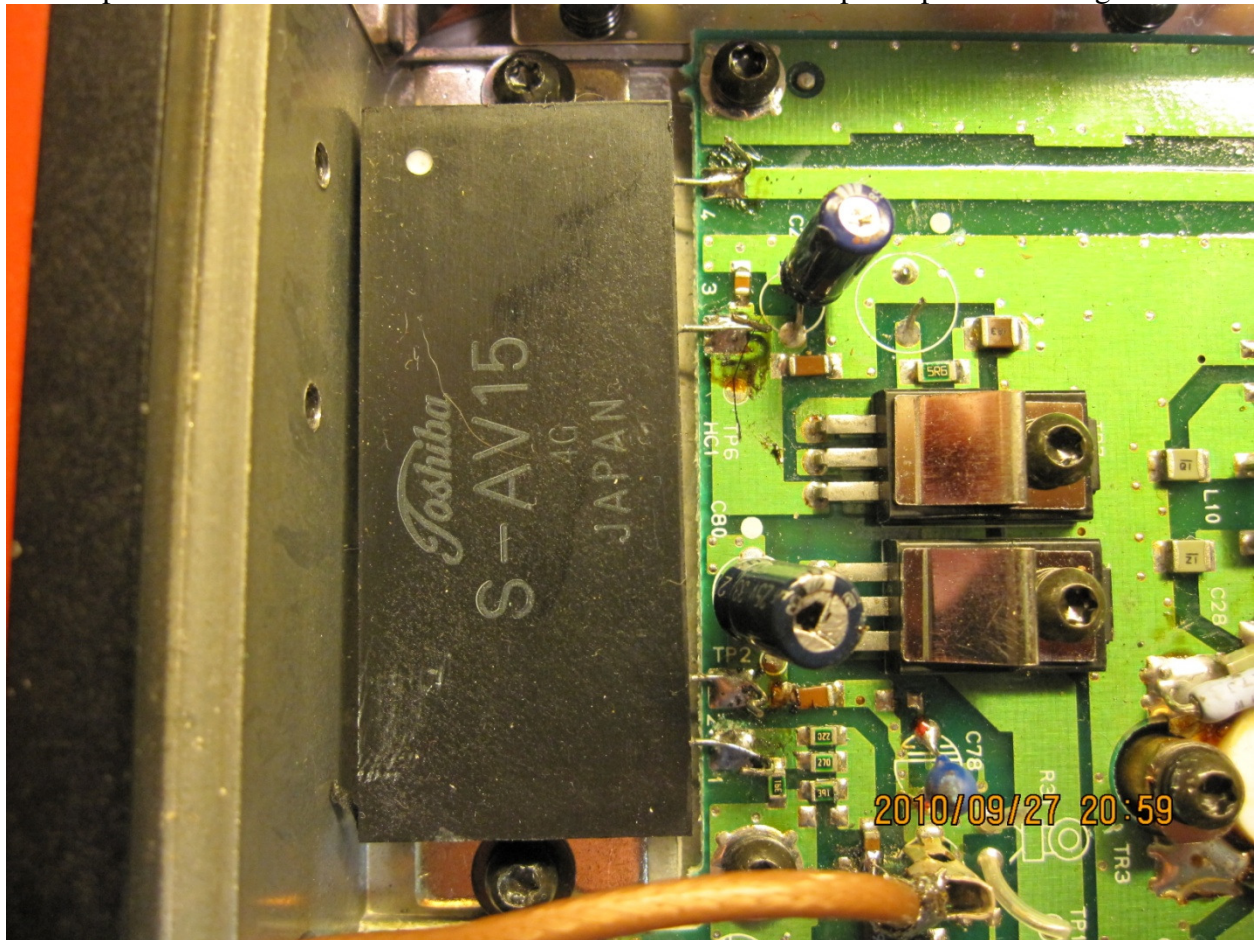


Figure 11, SAV-15 220 power module.



On the output trace of the new 220 power module, HC1-220 rev, remove C15 and lift one side of L32 to isolate L32 from the circuit. This will be to bypass the down stream output power amplifier stages. Figure 12.

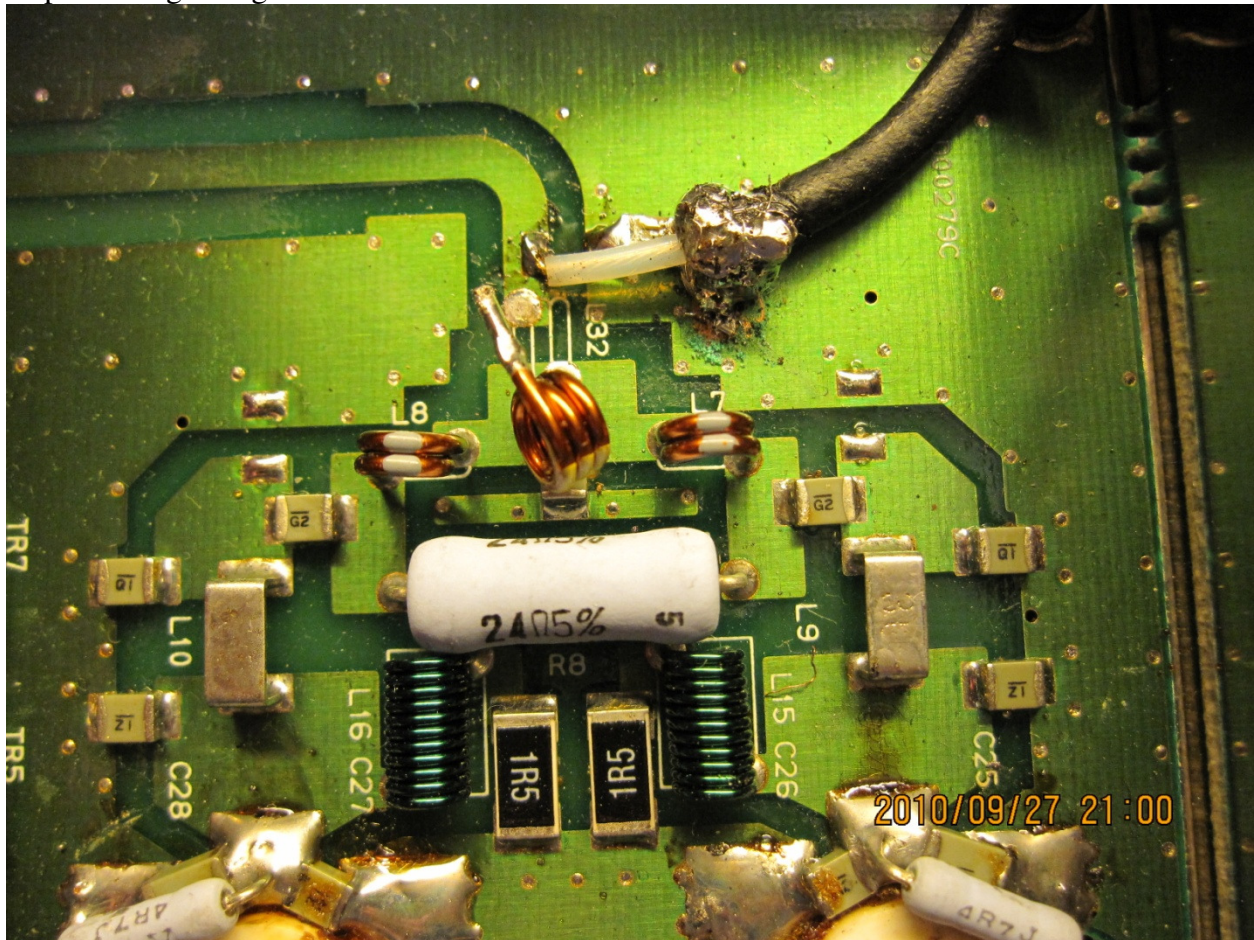


Figure 12. L32 lifted and C15 removed to bypass the Output power amplifiers input section.

On the input side of the directional coupler, just prior to the T/R switch, at the Z7, Z8 and Z9 strip lines, remove C46 and L19 to bypass the output amplifiers output side. Figure 13.

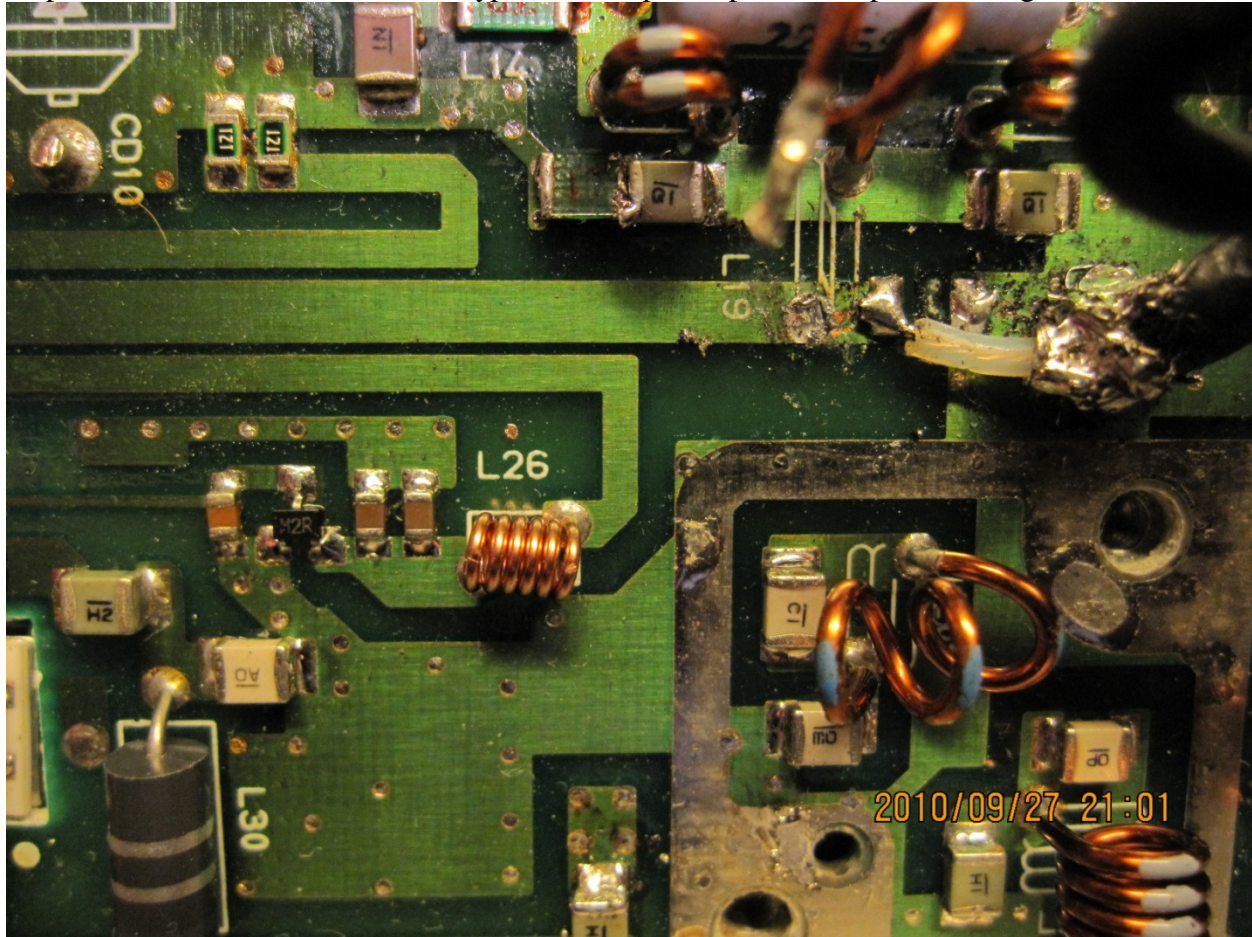


Figure 13. C46 and L19 removed to connect up the 220 power modules output coax to the T/R switch.



See Figure 14 below.

Solder a length of RG-174 50 ohm coax or similar from the power modules output line to the T/R switches input line.

One end of this coax is soldered to the 50 ohm trace where L32 and C15 were connected to HC-1, the S-AV15s, output at PIN4.

See figure 13 above and 14 below for the overall picture:

Solder the other end of the above 50 Ohm coax jumper to the end of Z7 where C46 and L19 were connected to at the T/R switch input side.

Solder the shield of this coax jumper at each end to an adjacent ground plane (scrape the solder mask away to solder these coax grounds).

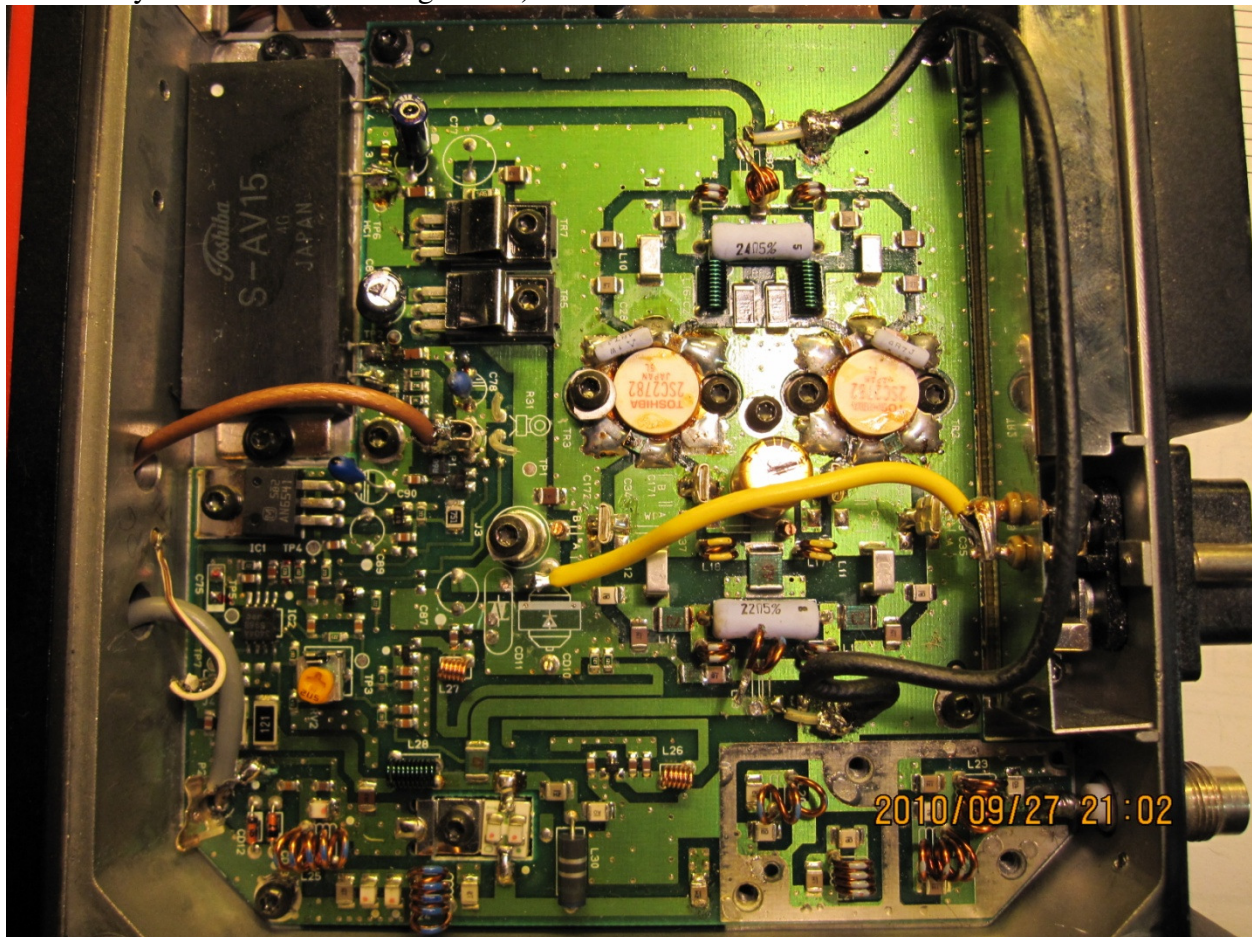


Figure 14 The black coax on the far right is the 50 ohm jumper connecting the new 220 module, HC-1 rev-220, to Z7's input end.

**PROGRAMMING the radio:**

Use Orion Programmer version 17 and program with 220 test frequencies of 220, 221, 222, 223, 224 225 and 226 MHz transmit and receive.

Programmer Vs17 can be found on the yahoo Orion radio group in the files section.

Load the file 70MHz + sc4 into the proper Radio Programmer directory so that you may program 220 frequencies in the original VHF split range.

This SC4 file requires frequencies being entered with a minus 70 MHz offset, for example; 223.500 MHz is entered as 153.500MHz.

Do not place the covers over the synthesizer or output filter section until the radio is aligned and tuned next.

NOTE: All VCO adjustments are made with a DC voltmeter on test point TP201 in the VCO section of the receiver/synthesizer board.

**RECEIVE VCO initial adjustment:**

Set the radio frequency from 220 and 226 MHz and Adjust CV240 and spread or compress the turns of L242 so that the tuning voltage is between 3.5 and 7.5volts across the radios operating range when measured at test point TP201.

**Transmitter VCO initial adjustment:**

**Connect a suitable 50 watt or greater dummy load and a microphone to the setup.**

Set the radio frequency from 220 to 226 MHz, while transmitting adjust CV280 and spread or compress the turns of L282 so that the tuning voltage is between 3.5 and 7.5volts across the radios operating range when measured at test point TP201

When the TX and RX VCO's are initially aligned place the cover over the VCO section and recheck the settings of the transmit and receive VCO's to make sure that the cover has not shifted the tuning range, if necessary adjust CV240 for receive and CV280 for transmit at TP201.



## **Receiver tuning.**

***NOTE: You may have to set the radios squelch open for the following adjustments***  
**Remove the radios microphone.**

**Set the radio to 223 MHz and Inject a signal at 223 MHz modulated with a 1KHz Tone at 3 KHz deviation to the antenna connector.**

**Adjust the RF generator for a noisy signal, if you have a sinad meter then set the RF gen for 12 dB sinad and adjust L436(L36), L437(L37), CV432, CV431, L01(L401), L24 and L25 for best sensitivity.**

Lower the RF generator as required to maintain a slightly noisy signal or 12 dB sinad and then set the radio and the generator frequency between 222 and 225 MHz and confirm that the sensitivity is within +-1 dB of the reading at 223 MHz.

Make any required adjustments to L436(L36), L437(L37), CV432, CV431, L01(L401), L24 and L25 for best sensitivity.

You should be able to adjust the receiver for better than or equal to .3 uV for 12 dB Sinad.

## **Transmitter tuning:**

Connect a dummy load with a suitable RF power meter to the radios antenna connector and set the transmitter to 225 MHz.

Transmit and using an insulated tuning tool spread or compress the turns of inductors L20, L22, L23 and L21 for a minimum of 20 watts output.

You shouldn't have to make large deviations in the turns spacing of these inductors from what they were set at in the beginning of this document as these settings gave a large margin for greater than -60 dBc harmonic attenuation.

Step up in frequency from 222 to 225 MHz and make any adjustments so that the transmitter output power is a minimum of 20 watts.

When properly adjusted the power flatness should be within +- 1 watt from 222 to 225 MHz..

If a spectrum analyzer is available then confirm that all harmonics are under -40 +10log of Pout or greater than -60 dBc.

The preset values for inductors L20, L22, L23 and L21 at the beginning of this document were for a measurement that resulted in > -60 dBc for harmonics as measured on a HP8920 Communications test set along with >= 20 watts of output power.

When finished replace the cover over the low pass filter section and the VCO/synthesizer/receiver sub shield and finally secure the sub shield over the transmitter and then the top cover.

Program in your final frequencies making sure to remember the -70 MHz offset for the SC4 file being used and recheck receiver sensitivity and transmitter output power.