Elcom Technologies Synthesiser Modification

Model ILCDFSL – 1201

The Elcom synthesiser is the basis for a good microwave frequency source, but has limitations in it's original form.

These were:

1. Limited frequency selection – frequency could only be selected in 3.33Mhz or 10Mhz steps (20Mhz when doubled to 24Ghz). This meant choice of IF frequency was limited.

2. No control of PLL chip parameters (phase detector current and frequency).

3. Internal TCXO difficult to adjust to frequency and stability marginal for SSB operation (assuming not using external reference)

The modifications as completed have allowed the following:

1. Frequency can be programmed to meet most requirements depending on phase comparison frequency selected. These are all programmable parameters that can be loaded into the controller. For example I have my unit set for 11814Mhz to allow a 420Mhz IF at 24048Mhz.

2. The PLL onboard reference doubler was enabled to allow a 20Mhz phase detector comparison frequency thereby improving phase noise and the phase detector current was selected to again achieve best phase noise. The measured phase noise at 2362.8Mhz (the VCO frequency) is -106dB at 10Khz offset, allowing for the multiplication of 10 (to obtain the final frequency) the phase noise should increase by 20dB (20log-n) to -86dB at 23628Mhz.

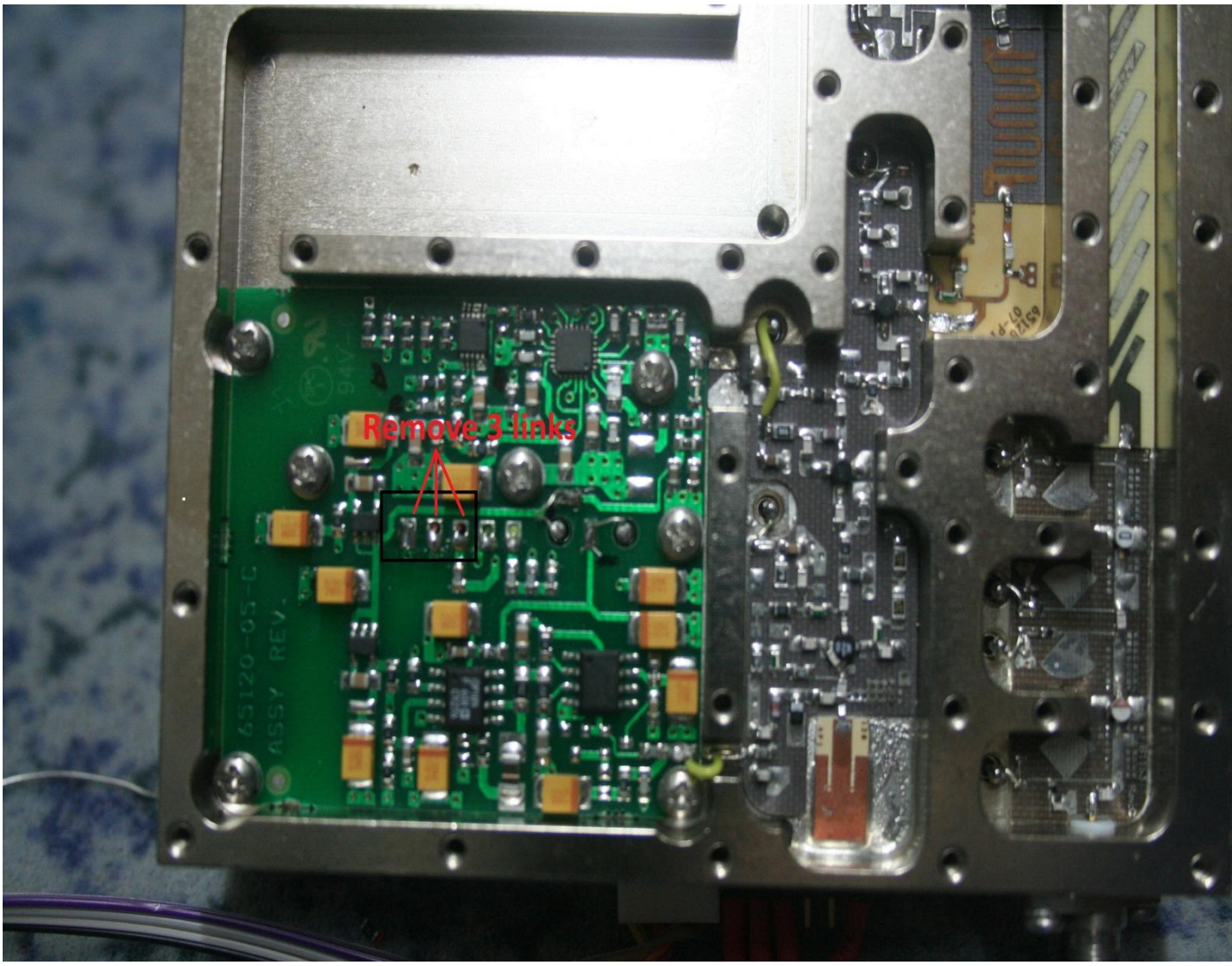
3. The internal TCXO was difficult to adjust to frequency and the stability was insufficient for SSB operation. Looking at the PCB there is a section next to the TCXO that was setup for a DIL package OCXO. I removed the TCXO and installed an OCXO with adjustment potentiometer. This allowed the frequency to be easily set and stability was greatly improved. This is a useful mod when external references are not readily available.

4. External PLL lock detect function has been extended to the controller board for monitoring and control.

An external controller based on a PIC18F2520 microprocessor was designed and software written to allow the Elcom synthesiser to achieve the objectives above. The controller loads the frequencie into the synthesiser at power on and monitors the out of lock (O/L) signal. The O/L signal can be used to light a led to indicate a fault and/or prevent transmission to avoid operating on an unknown frequency. The controller software is easily modified to allow multiple frequencies to be selected at power on.

Modification to allow external frequency control

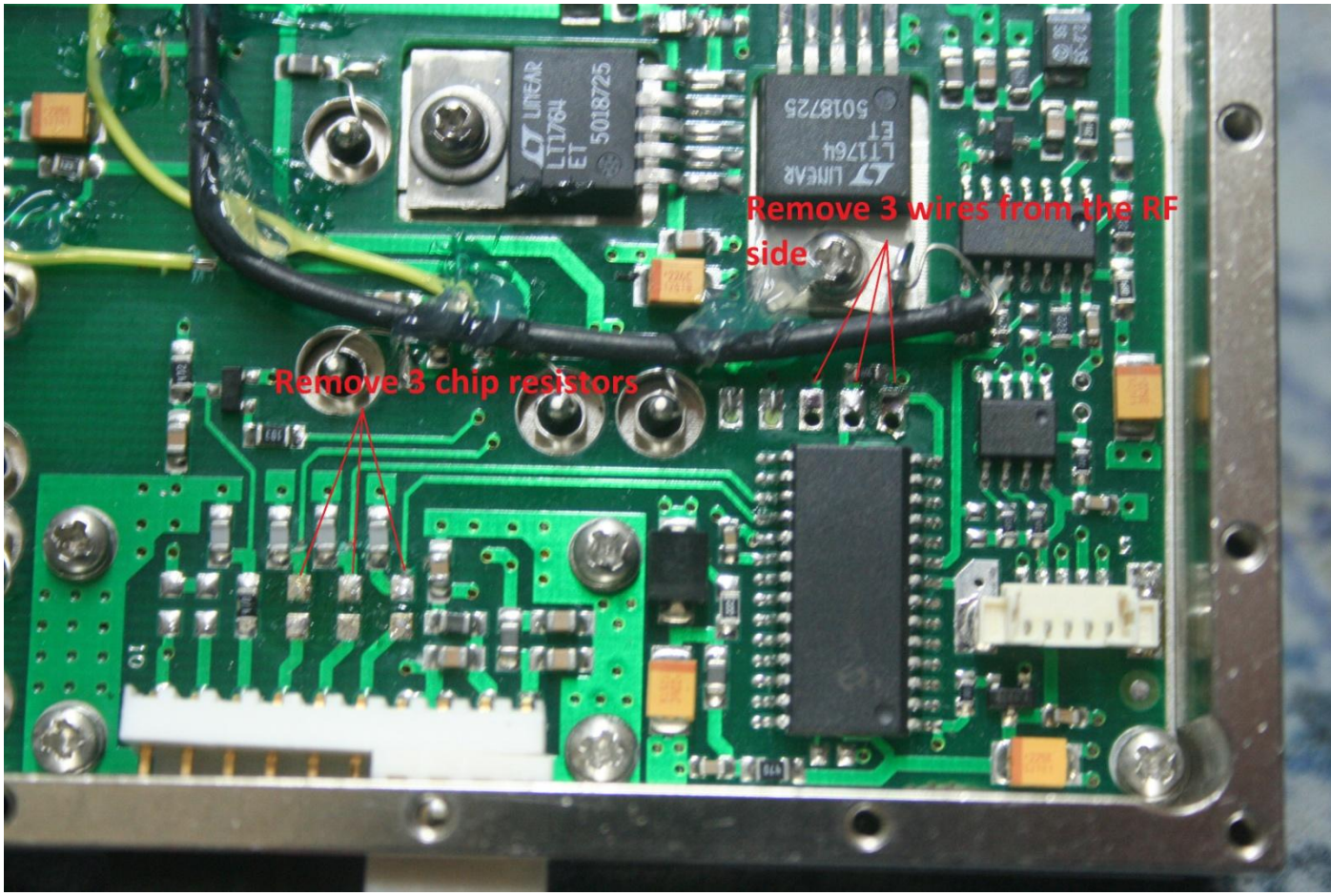
All covers for the unit have to be removed.
There are 5 interconnecting cables between the PLL board and the control board, 3 of these have to be removed.
On the PLL side de-solder the 3 links indicated and lift the wires so they are clear of the pcb.



Modification to allow external frequency control

(Continued)

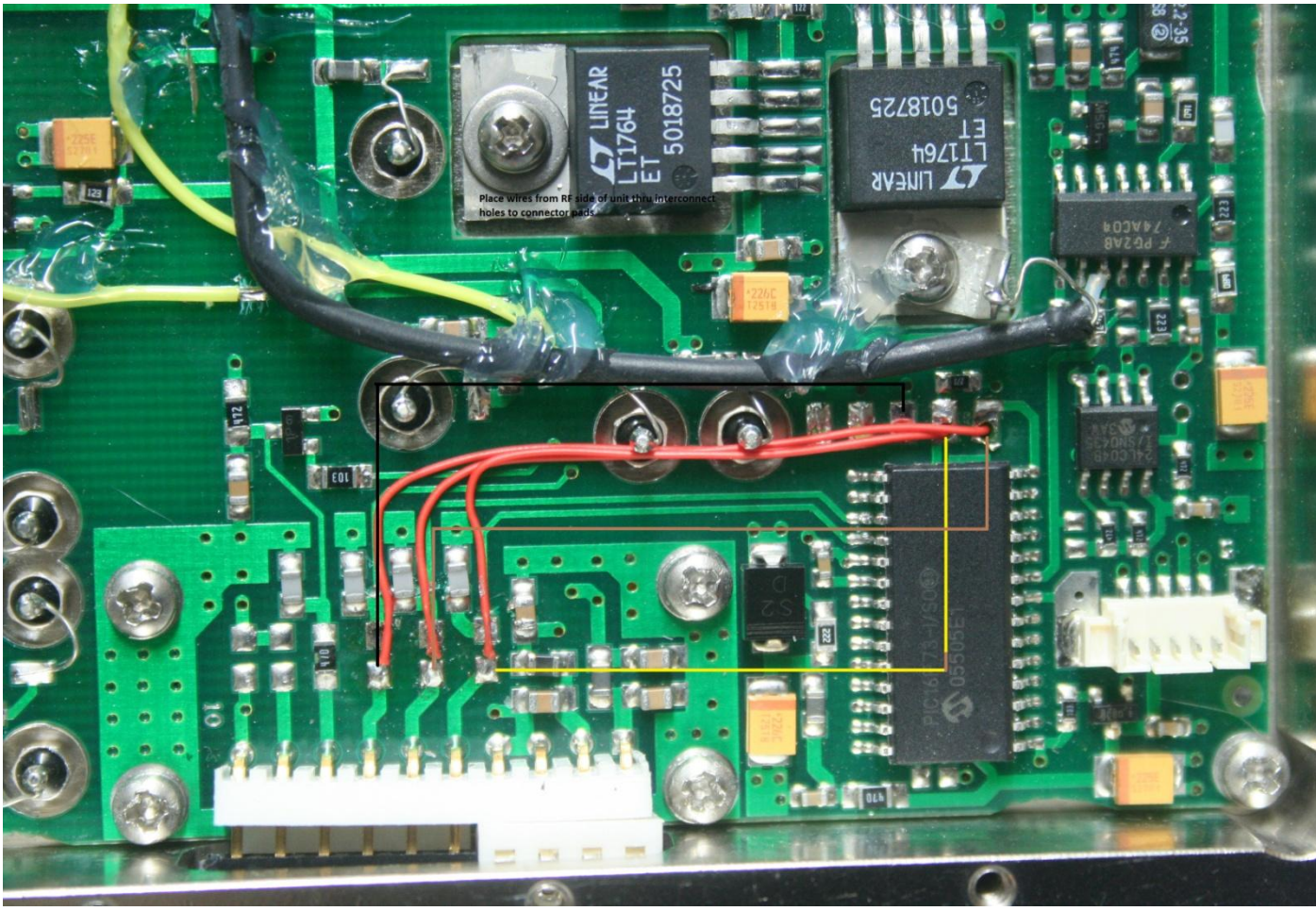
On the control board the same 3 wires have to be unsoldered and removed. In addition 3 chip resistors have to be removed in preparation for the replacement wiring.



Modification to allow external frequency control

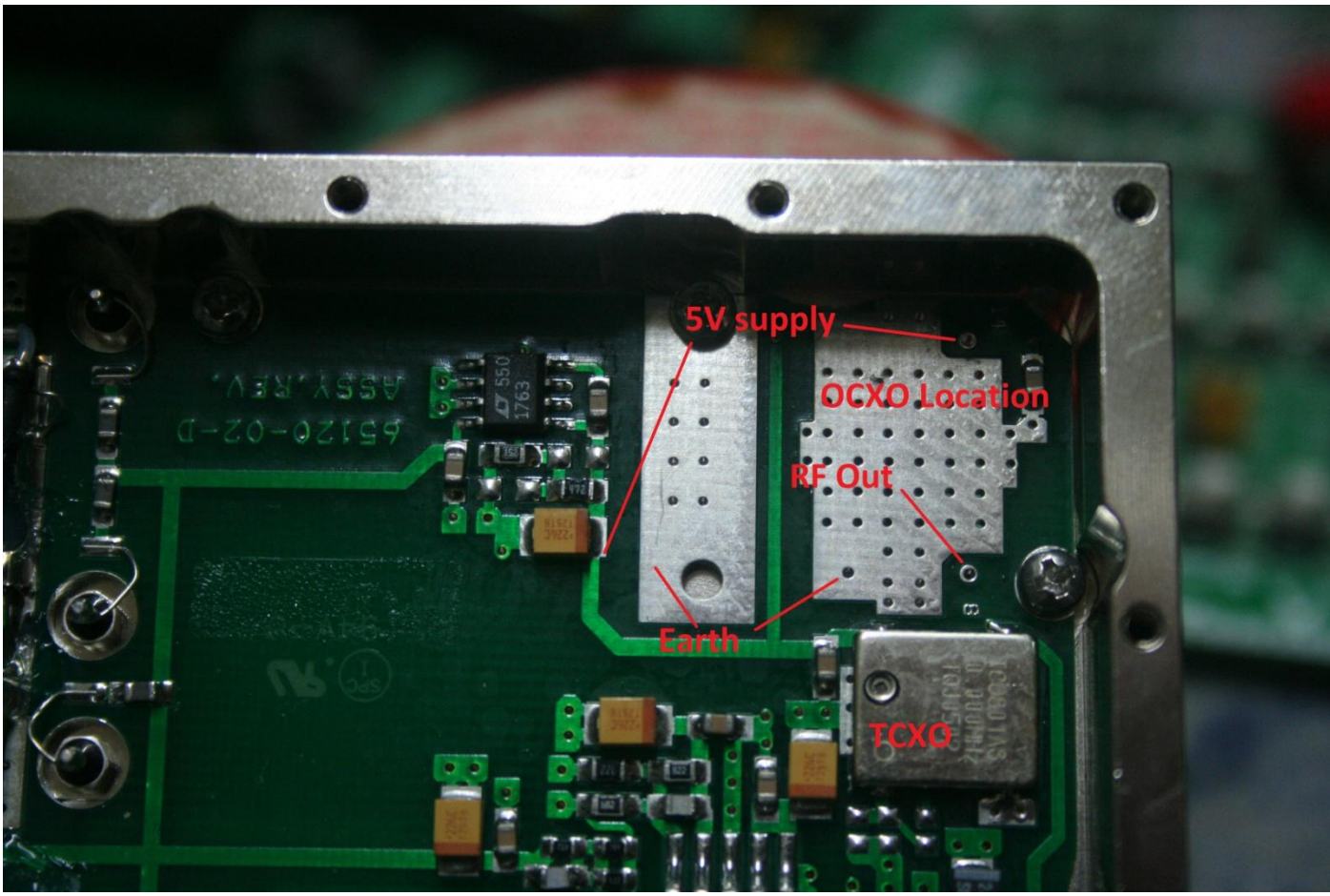
(Continued)

To complete the wiring 3 connections need to be added from the RF PCB to the Control PCB. Using thin Teflon or wire wrap wire strip one end of the wire and from the control board side push the wire thru to the rf board side and solder the wire to the pad. On the control board side run the wire to the pads where the chip resistors were removed as per the picture. There is no connection to the control board pads where the connections were originally located. (Note the connection diagram which shows where each wire is connected)



Modification for OCXO Installation

Locate the TCXO (Temperature Compensated Crystal Oscillator) and remove the unit. Note the location above the TCXO where the OCXO (Oven Controlled Crystal Oscillator) is designed to be fitted.

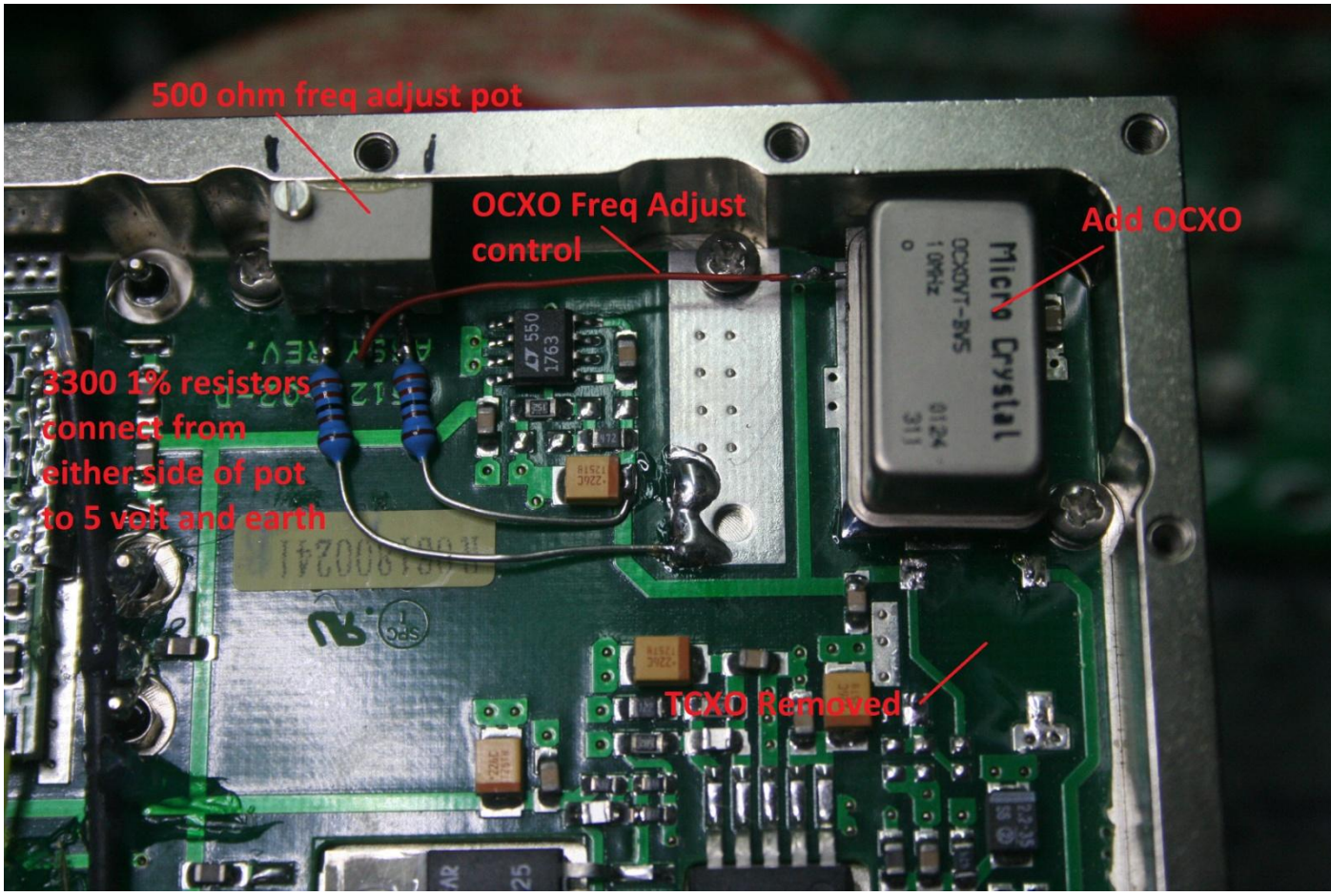


Modification for OCXO Installation

(Continued)

Remove the TCXO and fit the OCXO. The OCXO can be installed without removing the PCB by carefully soldering the pins from the underside of the OCXO.

Bend the control voltage pin of the OCXO from under the unit so it can be connected at the side of the unit.



Glue a 500 Ohm 10 turn potentiometer to the side of the case as shown, then connect 3300 Ohm 1% metal film resistors from either side of the potentiometer to both the 5 volt rails and earth. The voltage divider gives a fine tuning range allowing the frequency to be more easily set. From the center winding of the potentiometer connect a wire to the control voltage pin of the OCXO.

Apply power and wait at least 5 minutes then adjust the OCXO potentiometer to give the correct output frequency.

Mark and drill the lid of the box to allow adjustment of the potentiometer when the lid is on.