

## 565 Synthesizer Alignment Procedure

Start on the 80 meter band, LSB, 1kHz tuning step.

Set 44.55MHz TCXO on frequency at J4.

Check for presence of DDS output at TP1. DDS frequency runs from approx. 2MHz to 9.425MHz and rolls over four times in the 80 meter band.

Monitor synthesizer output frequency at J3.

Connect digital voltmeters to TP3 and TP10 to monitor VCO control voltages.

Start with all four VCO trimmers at minimum (triangle on trimmer rotor points to flat side of trimmer).

Watch TP10 and tune all the way up the band (>4.0MHz) to the highest VCO control voltage. Use VCO4 trimmer C157 to set this voltage to 5.5 volts. This is called the "set voltage".

Now use VCO2 trimmer C64 to set TP3 to the "set voltage" (usually 5.5 volts). Tune down from the top of the band to find the first roll over point. TP10 voltage will take a step down at rollover. TP3 should move smoothly through rollover without a big step. The frequency counter on J3 should show 1kHz steps through the rollover area.

Continue tuning down the band watching both TP3 and TP10 voltages. The absolute limit is that the TP3 voltage must remain within +/-10% of the TP10 voltage. We reject a synthesizer if the voltages differ by more than 8% at any point in the tuning range. Sometimes the "set voltage" can be fudged a little to keep the voltages within 8%. We allow a range of 5 to 6 volts for "set voltage". The original "set voltages" of TP3-TP10 can be spread apart (less than 8%) if this helps keep the lower voltages in tolerance. Check the TP3-TP10 voltages for less than 8% spread across 20, 12, and 10 meters and also for minimum voltage of no less than 2 volts on 12 meters (minimum voltage is not adjustable).

This completes the alignment for the bands where VCO SEL = 0 (J7 pin 5). These bands are: 80, 30, 20, 12, and 10 meters.

Switch to the 160 meter band and follow the same procedure using first VCO3 trimmer C127 and then VCO1 trimmer C35. TP3-TP10 voltage spread should be less than 8% across 160, 60, 40, 17, and 15 meters (VCO SEL = 1). The minimum voltage on 17 meters should be greater than 2 volts.

This completes the setting of all four VCO trimmers.

At some point during the test, the output divider control lines BAND0 and BAND1 (J7 pins 3 and 4) should be checked for the following pattern: BAND0 is high on 20 through 10 meters. BAND1 is high on 160, 80, and 20 meters.

A good indicator of proper synthesizer operation is the appearance of the waveforms on TP5 and TP6. Both signals should be CMOS-level clipped sinewaves or squarewaves on the same frequency as the DDS output on TP1. We have a program that steps the radio through a random sequence of frequencies on all bands, while the technician watches TP5 on an o'scope for any indication of unlock. This can be simulated pretty well by randomly punching the band buttons. Also check that the synthesizer returns to the same frequency when the power switch is cycled off-on. Band change or power-up fault indicates a problem with the presteer circuits.

We have been assuming that a synthesizer that makes it through these tests is also good on transmit. A less extensive transmit check is done into a dummy load, observing a 2-tone test on each band while slewing the frequency around between the band edges. Occasionally a synthesizer problem will be observed as break-up of the 2-tone pattern.