

WJ-8617B/WJ-8618B VCO Alignment Notes

By Spencer Bahner

I had a couple of W8617B/8618B receivers that would display the following symptoms (most frustrating was the 'completely tested and working receiver' I had bought from ANA Instrument on eBay):

- The receiver appeared to not receive on the tuned frequency
- When tuned, signals on the CRT would appear to jump as the receiver was tuned through the 1 MHz transition
- Slow tuning rates did not result in observable change in tuned signals on the CRT

I thought this over a bit and emailed my touch stone for WJ advice (and occasional repair when a problem eludes me). He suggested that this sounded like a 2nd local oscillator (2nd LO) problem and that I should start there. He suggested that this sounded like a A4A3 Transition Oscillator module loss-of-lock. This made sense since the receiver only tuned in 1 MHz steps and finer tuning steps are derived from the 2nd LO. He also indicated that a simple alignment usually solved the problem.

Note that the inability to tune in large steps (1 MHz) would be a sign that there was a problem with the 1st LO VCO, which is far more involved to repair. The factory manual indicates that 1st LO loss-of-lock is not field serviceable and there are apparently no recommended field alignment adjustments.

I started to review circuit operation, module block diagrams and circuit schematics and recognized that the key adjustment was capacitor C7 on the VCO Buffer (the A4A3A1 circuit board on the A4A3 Translation Oscillator module using the WJ module numbering scheme. This module also includes the 4.5-5.5 MHz Amplifier circuit board, A4A3A2, and the Phase Detector circuit board, A4A3A3). Capacitor C7 adjusts the VCO voltage range.

All other adjustments on the 2nd local oscillator assembly are wire coils that are squeezed and pulled to adjust their resonant frequency. The factory alignment of these coils is quite involved. A pair of small LEDs on the phase comparator board indicate VCO lock. These are visible through a pair of small holes on the 2nd LO module cover plate.

Translation Oscillator Module

To measure the VCO voltage, connect a DVM ground probe to chassis ground and measure the voltage at the available test point using the 'hot' probe. Note that the A4A3 Translation Oscillator does not plug into an edge connector on the receiver motherboard. Instead it is connected to the receiver by a number of coaxial cables and a single multi-wire plug. If the module is fitted with the external VCO test point described later, checking the VCO voltage is possible without any special gymnastics. If not, the module must be slid out of the chassis for checking the voltage. In both cases, VCO adjustment requires access to the side of the module and the module must be adjusted removed from the chassis and lying next to the receiver.

If the module is one where the VCO test point is accessible only from the side of the module (through a hole in the module shield as described later), the VCO voltage checking process requires removing the module from the chassis, laying it next to the receiver and reconnecting each of the small coaxial cables and multiwire cable. There is just not enough of a service loop to get at the module with this test point configuration without removal.

VCO Test Point Location

In one 8617B I have, the test point (as specified in the manual) is feedthrough capacitor C5 which passes the tuning voltage between the VCO Buffer circuit board and the Phase Detector circuit board. In this receiver, the capacitor had a small access hole through the shield on the side of the module that allowed for connection of the DVM probe. Be careful to not short this test point out to the surrounding module housing when checking the voltage. C7 is located through a hole in the side of the module and must be adjusted with a non-metallic tuning tool. The voltage will change as the tuning tool is removed so multiple 'tweaks' will be required to get the voltage set to the nominal 7.0 VDC level.

In another 8618B I have, there is a different style of VCO board. On this version of the Translation Oscillator, there was an externally accessible test point (with no markings obvious) that when I took the module apart, was effectively the same point as feedthrough capacitor C5. This test point is accessible without doing anything to remove the module and makes VCO voltage checking very easy. To adjust this module requires removal of the module as described previously since the adjustment location is located on the side of the module.

VCO Voltage

In the version of the manual that I have, a VCO voltage of 7.0 VDC plus or minus 0.2 V is the target value. The receiver should be set to 20.5 MHz when this voltage is set. No other front panel settings impact VCO voltage setting. I noted that this appears to be the close to the peak value obtained when adjusting C7 through its tuning range. I also noted that while one receiver met the 7.0 VDC level, others seemed to max out around 5.5 to 6.5 VDC. In all cases, the receivers work fine over the entire tuning range (all my RXs cover either 2-1100 MHz or 20-1100 MHz and all lock fine at all frequencies with VCO voltage values set between 5.5-7.0 VDC at 20.5 MHz)

Miscellaneous Notes

I would only recommend setting the VCO voltage (at least for the first time) with a factory manual close at hand so you can identify modules, cable connections and circuitry details. That said, after doing this a couple times, it's pretty easy to figure out. In any case, there are no warranties express or implied in my notes. Please proceed at your own risk. Your mileage may vary...