CR-282 Oven Controlled Crystal Upgrade for the R-75 Receiver

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Installing the CR-282 oven controlled crystal in the R-75 receiver is straight forward using the instructions provided by ICOM in the Instruction Manual. I obtained a new CR-282 through eBay for about $104 plus shipping in 2008. The CR-282 fits in the fenced area on the Phase Locked Loop (PLL) board occupied by the factory standard CR-275A crystal. It uses different pads than the CR-275A and the CR-275A must be removed first.

The printed circuit board holes to be occupied by the CR-282 are plugged with solder at the factory. I used a Hakko 808 desoldering tool to remove the solder and also to remove the existing CR-275A. The CR-282 has four pins on the bottom but is not keyed in any way. It can be installed backwards if you are not alert. However, to aid in proper orientation, the printed circuit board is silk-screened with crystal and resistor symbols adjacent to the CR-282 crystal holes as shown in Figure 1. The new crystal has matching symbols, and it is only necessary to make sure the symbols are in the proper direction.

Before removing the PLL board and CR-275A crystal, I measured the oscillator frequency with a recently calibrated Instek GFC-8131H frequency counter. Frequency measurements are made at the end of a coaxial jumper, one end of which is first removed from J491 on the main board. I let the counter warm-up for about 30 minutes before making the initial measurements. When first turned on, the CR-275A crystal frequency measured 60.000002 MHz, or within 2 Hz of specification. I expected the CR-275A crystal temperature and frequency to stabilize after 30 minutes but found it was still drifting. It finally stabilized after about one hour at around 59.999940 MHz, or 60 Hz low. I made the measurements in my lab, which is a temperature stable environment.

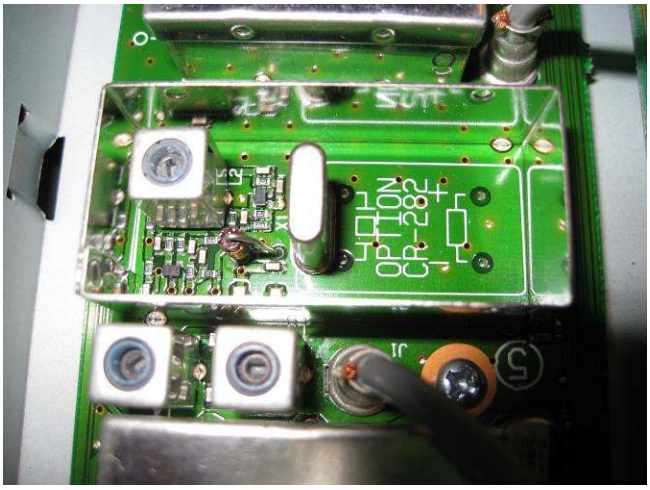

Figure 1 – Original CR-275A Crystal on the PLL board (middle of picture). Inductor can L2 is to the left and the four landings for the new CR-282 crystal are to the immediate right of the existing crystal. The symbols silk-screened on the board show the proper orientation of the new crystal.

The five screws holding the PLL board to the chassis must be removed and the board tilted upside down to gain access to the bottom for desoldering and soldering. There are several coaxial jumpers that connect the PLL board to the main board, but they do not have to be removed except the one for frequency measurements. I used a piece of tape as a third hand to hold the new crystal in place while I soldered it with a WD-1 soldering tool and 0.032 in. diameter Kester solder. The new crystal is shown in Figure 2.

Figure 2 – New CR-282 Oven Controlled Crystal (top center of picture) installed in the oscillator fence after removal of the original CR-275A crystal. The CR-282 provides significantly higher frequency stability over a wider temperature range than the plain crystal it replaces and is recommended for mobile installations and fixed installations that require higher stability. The oscillator frequency is adjusted with L2, which is the variable inductor can below the new crystal.

After installing the new crystal, I reconnected the frequency counter and turned on the R-75. See Figure 3. The initial frequency was 59.999897 MHz, or 103 Hz low. It stabilized in less than 10 minutes. I let the radio run for a couple hours and measured 59.999880 MHz, or 120 Hz low. I then used an insulated tuning wand to adjust L2 to the correct frequency of 60.0000000 MHz. For this measurement I set the gate time on the frequency counter for 0.1 Hz resolution. L2 is quite sensitive when trying to adjust within a tenth of a Hz.

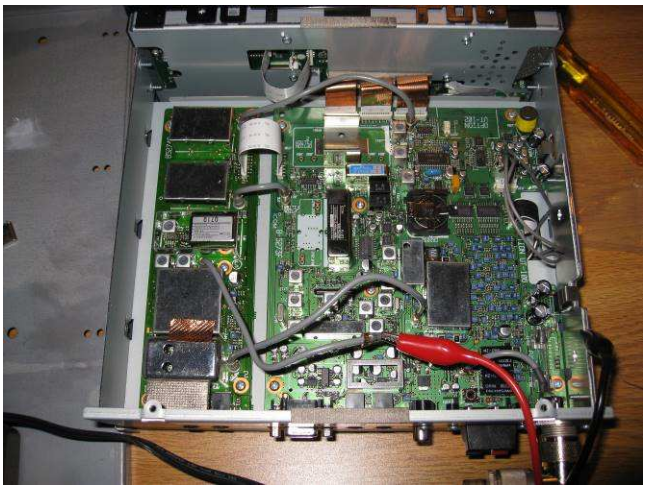

Figure 3 – CR-282 Oven Controlled Crystal oscillator under measurement. The CR-282 is visible in the middle-left of the picture. The frequency counter test leads are at the lower-right and are connected to P1 on the coaxial jumper cable from the PLL board to the main board. After frequency measurement and adjustment the cable is plugged back into J491 on the main board and the top cover is replaced.

The above installation was made in 2008. Since then I have upgraded the crystal in three additional receivers. In all cases, only slight adjustment of L2 was required.