

# Xref Versatile

## Yaesu FT-847 Installation Sheet

### 1. Overview

The XRef Versatile is a replacement Reference Oscillator for a variety of amateur transceivers, intended to be installed internally within the radio.

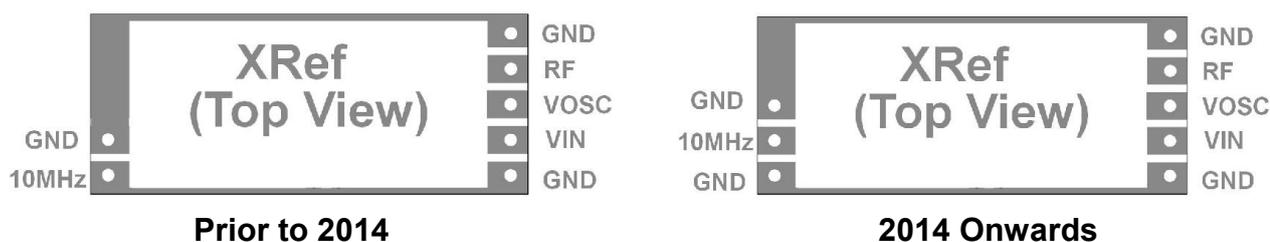
The board takes a 10 MHz reference signal from a GPS reference or other high-accuracy source and generates a precision reference for the radio. It also provides a backup in the case where a 10 MHz source is not available.

In the case of the Yaesu FT-847, the Reference Frequency is 22.625 MHz.

The version of the XRef that should be used with the FT-847 is the Xref-VT with onboard TCXO. This completely replaces the radio's own reference oscillator with the TCXO being used when the external 10 MHz reference is not connected.

### 2. Technical Specifications

At the start of 2014, a new version of the board was produced with different connections for the 10MHz Reference Input as shown below:

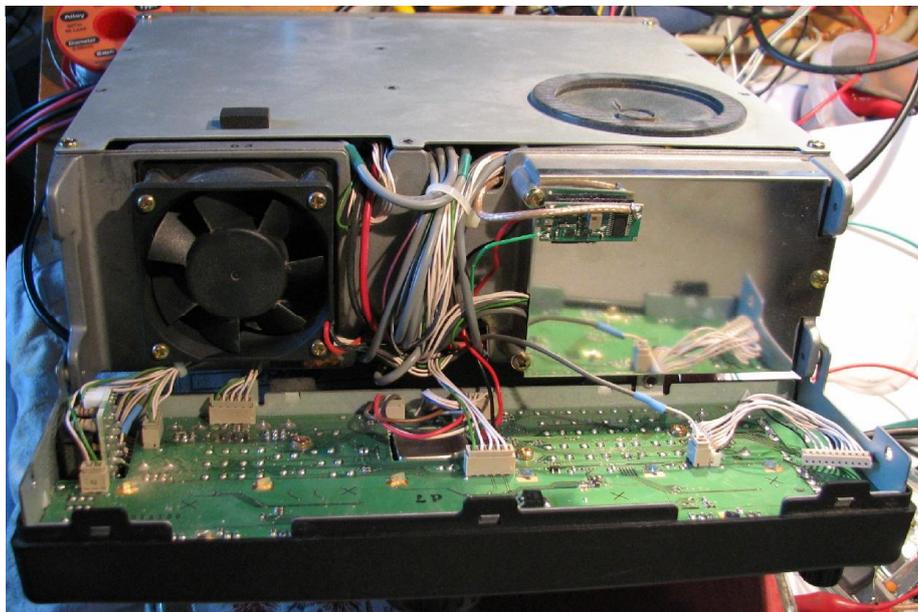


Connection	Description	Specifications
VIN	Supply for Xref	5 to 16 V 20 mA for XRef
VOSC	Not Connected	
RF	Reference frequency out to Radio.	Radio dependent
10 MHz	10 MHz Reference Input	0 to +15 dBm (0.5V to 3.6V p-p)

### 3. Circuit Modifications

Circuit modifications involve cutting the power to the internal reference oscillator and injecting a reference signal from the XRef board. The extract from the circuit diagram in Figure 1 shows where modifications are to be made.



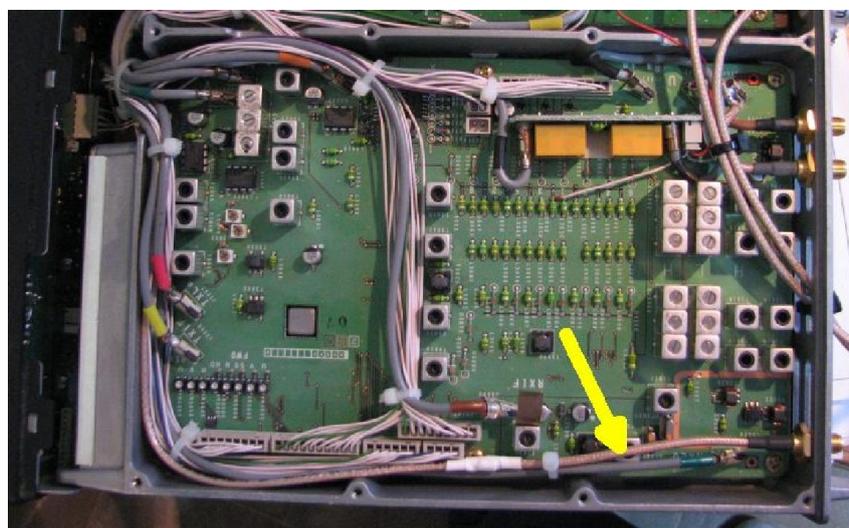


**Figure 3. – XRef Mounting Location**

Run a thin coax cable from the point in Figure 2 marked "Osc Output" to the output of the XRef (see page 1 for connections).

I found +5V and ground points on the front panel for powering the XRef. You could also run a wire for +5V from right-hand pad where R1109 was removed.

To feed the 10 MHz in, I used a bulkhead-mounting SMA socket through the ventilation slot at the top left of the rear panel. A length of coax cable is routed along the edge of the radio to the front of the rig and across to the XRef. See Figure 4 (yellow arrow).



**Figure 4. – 10 MHz Input**

Before putting everything back together, you might want to do some preliminary testing. Connect a 10 MHz source to the rear panel connector and check that the radio is working correctly. Turn the radio off, disconnect the 10 MHz source, turn the radio on again and check that it is still working.

You might also want to align the Carrier Oscillator. See section 6.

Finally, re-assemble the radio and enjoy your new level of frequency accuracy and stability!

## 5. Operation

The board only tests for the presence of the external reference when power is first applied. Therefore, if you plug/unplug the 10 MHz lead during operation, you must cycle power to the radio for it to operate correctly.

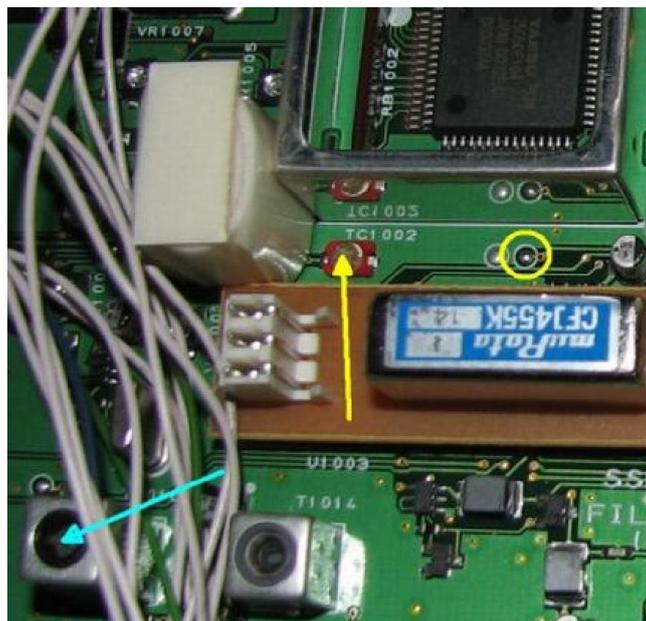
The onboard TCXO was set to the correct frequency during testing. However, the TCXO may drift due to aging during early days of operation. The TCXO frequency is set by the multi-turn trimpot on the XRef board.

It is important that a clean source of 10 MHz be used as a reference. The board is, in effect, converting the signal you are supplying to the reference frequency of the rig, including whatever imperfections there may be. The old adage *garbage-in, garbage-out* applies here.

It is also important that the 10 MHz reference is stable in frequency before the radio is powered up. The synthesiser chip used in the Xref does a self-calibration when powered up based on the actual output frequency. If the reference frequency is varying, this calibration can fail. If using a GPSDO or Rubidium reference, wait for it to lock before switching on the radio.

## 6. Carrier Oscillator

The FT-847 also has a separate SSB Carrier oscillator that contributes to overall frequency stability, although to a lesser extent. Therefore, it is worthwhile insulating the crystal from temperature changes. I made an insulating sleeve from several layers of foam tape and slipped it over the crystal (top left of Figure 5).



**Figure 5 – Carrier Oscillator and Alignment Points**

Referring to Figure 5, the yellow arrow points to the Carrier Oscillator alignment trimmer, and the yellow circle shows the test point. Warm the rig up for a while first. Then, with an accurate frequency counter connected to the test point, adjust the trimmer to give 6.710900 MHz.

While we're at it, the blue arrow points to the inductor that sets the FM carrier frequency. Switch the rig to FM on 70cm and adjust the inductor to give the correct output frequency.

## 6. Support

If you have any difficulties, you can contact David Smith VK3HZ either:

- by email : [xref@vk3hz.net](mailto:xref@vk3hz.net)

- by telephone : (+613)/(03) 9013 1919