<u>AIM4170 Options Guide</u>

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Input Overload:

If the input is subjected to a DC voltage or excessive RF, the input resistor R22 may be burned out. This is a 1% surface mount resistor in an 0805 size chip. This can be fixed with a leaded resistor if a surface mount resistor is not available.   Even a 5% carbon composition resistor can be used. The value can be 36 ohms to 47 ohms. The exact value is not critical because the calibration procedure automatically takes care of the resistor value and the associated lead inductance.

The points labeled RF can be tested with a scope when the AIM is programmed for **Constant Frequency** with the frequency set to 1 MHz.
Click **Function -> Constant Freq** to enter this mode. The output will be constant and the Red Led should be on. You can also see the signal at the RF connector if R22 is ok.
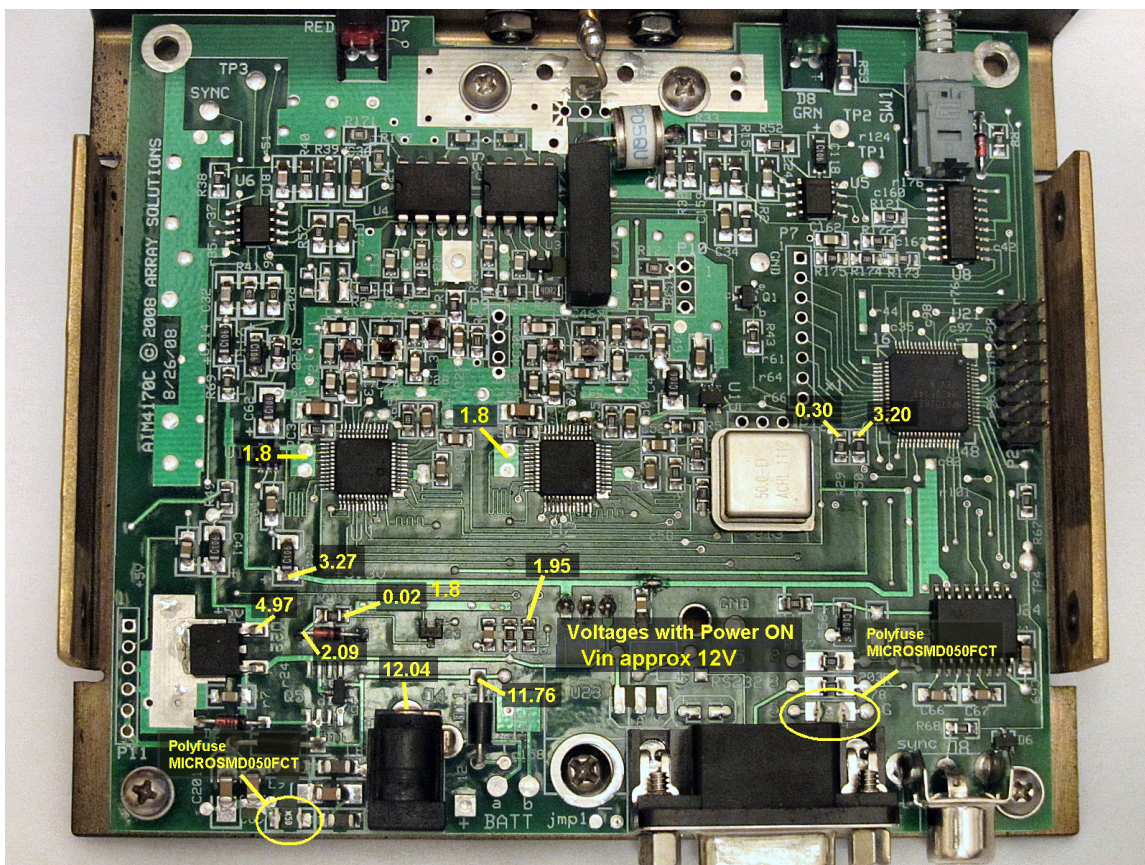
Power ground protection:

To protect the AIM ground circuits from large currents due to ground loops, there are two **polyfuses** in the new models. The polyfuse resistance is normally less than one ohm. When the current exceeds the limit, the polyfuses heats up and its resistance changes to a large value to limit the current and protect the circuits. After the current is reduced to a safe level, the polyfuse cools off and returns to a low resistance value.

Early versions of the AIM4170 can be retrofitted with these polyfuses. The part number is **MICROSMD050FCT** (or similar) and they are available from Digikey or Mouser.

In the early models of the AIM4170, there was a 10 ohm resistor for R69 or R179 (near the RS232 connector). If the green led of the AIM blinks when the power is turned on, the DC power is ok. If there is no communication with the pc, check the resistance of R179. If this is greater than 200 ohms (or open), it should be replaced with a polyfuse. It can be replaced temporarily with a 100 ohm resistor if the polyfuse is not available.

This picture shows the location of the **polyfuses** and some of the typical DC voltages for testing purposes.

Temperature Compensated Crystal Oscillator (TCXO)

The crystal oscillator in the AIM4170 runs on 3.3V. It is spec'ed for +/-30 ppm temperature stability. This is good for measurements of antennas and most passive components. When measuring quartz crystals for filters, a more stable oscillator may be desired. The standard oscillator can be easily replaced with a TCXO for greater accuracy. The early models of the AIM have 20 MHz oscillators, while the newer models have 50 MHz oscillators. These can be replaced with oscillators like the Conner-Winfield DV75D-020.0M, D75J-050.0M or TB512-050.0M which are available from Digikey for about $20. These oscillators are spec'ed for 1 or 0.5 ppm. The programmed frequency of the AIM4170 can be calibrated with a frequency counter or a standard radio station like WWV. This is done using the **Constant Frequency** mode. Program the AIM4170 frequency in fine increments to match the desired standard freq, 10 MHz. Then click **Calibrate**. The calibration factor is saved in the init file and used for all subsequent frequency programming, including the scanning mode.

The original oscillator can be removed after unsoldering four pins on the back side of the board. Alternatively it can be removed in a brute force manner by gently twisting it a few times while holding the square oscillator can with pliers. This is generally quicker and easier that trying to unsolder it. It probably damages the originally oscillator but it is not needed anyway. The cost of a new oscillator is about $1.50.

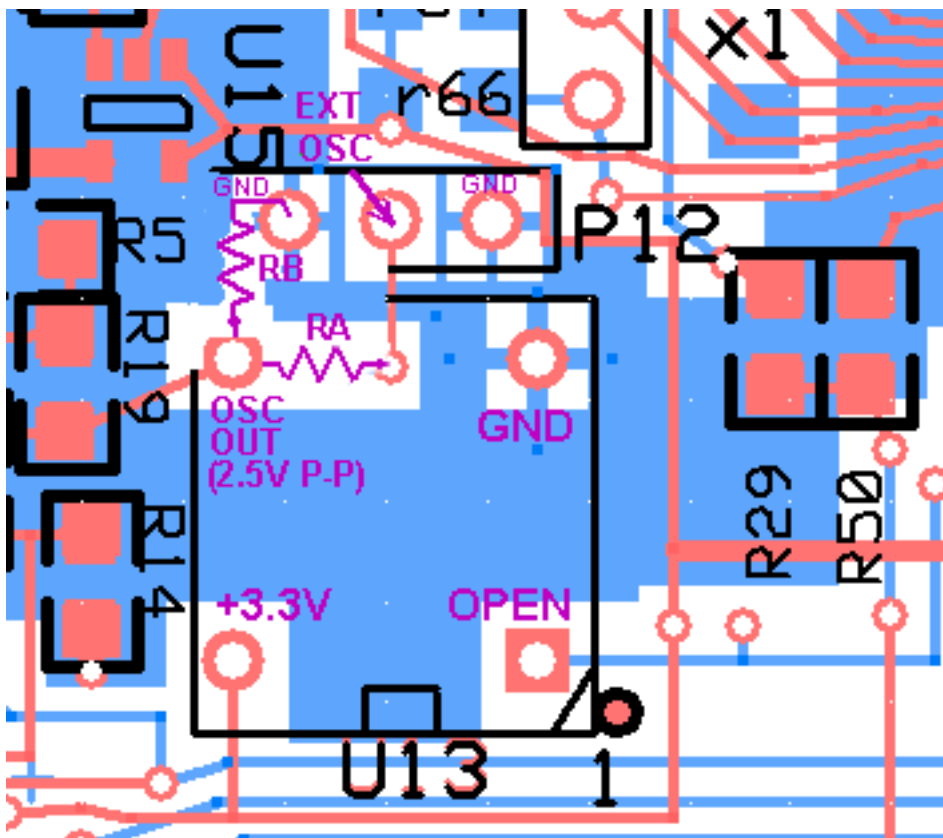TCXO oscillators are typically designed for surface mounting.
The new oscillator may require fine wires to be soldered to four corner pads and then it is attached to the board like a four legged spider.   One of the pins is not actually connected to the circuit. Only three pins are active: +3.3, GND, and Output. The firmware and PC software will run the same as before.

This picture shows the pin out of the crystal oscillator. The pins of the new oscillator will be in the same sequence, so the leads line up properly.

P12 is presently not used. It can be used to connect an external oscillator, as shown in the following section of this document.

AIM4170C Crystal Oscillator (top view):
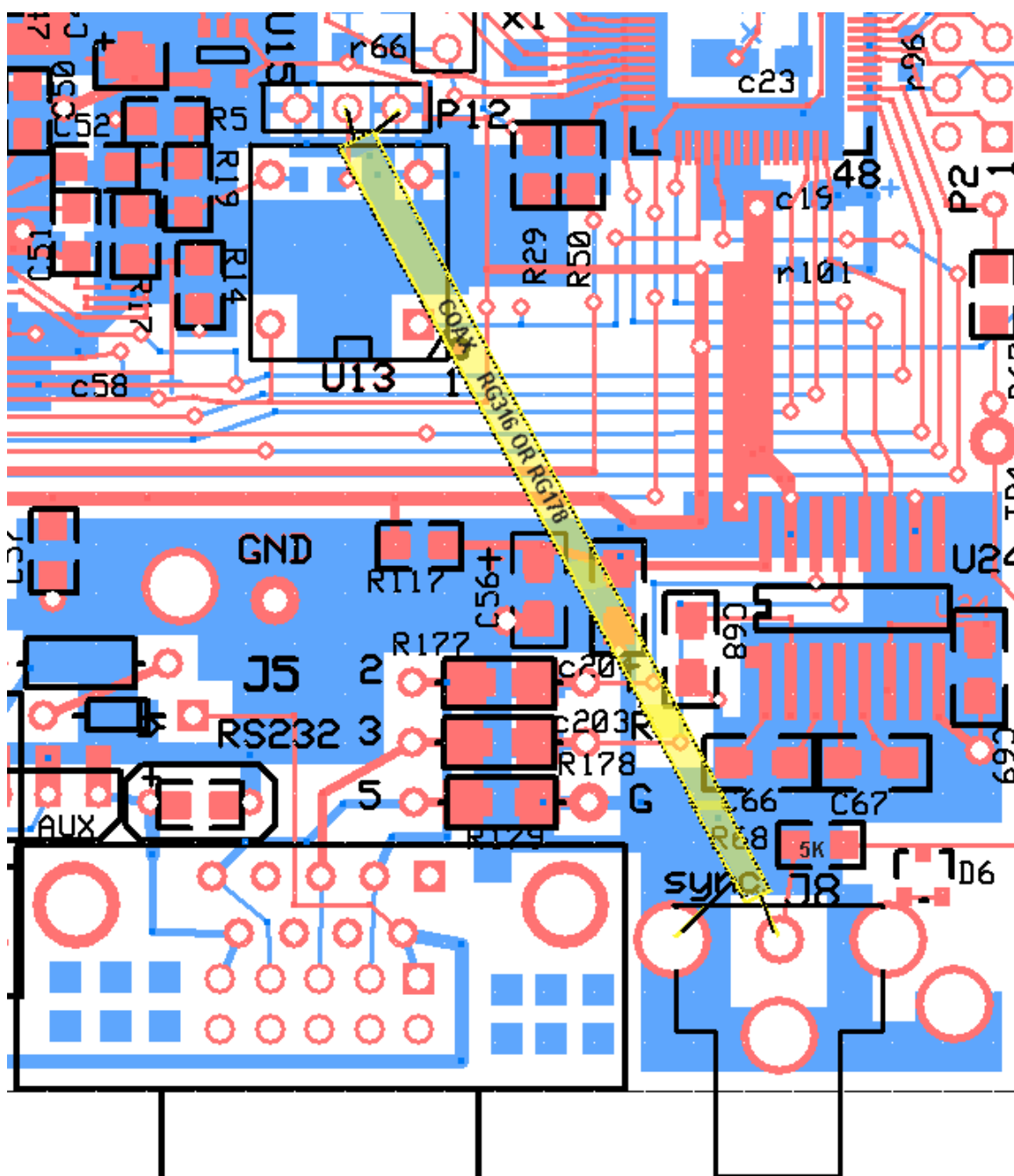
External Reference Oscillator

An external laboratory oscillator can be used to drive the DDS for very high accuracy. This can be connected to P12 with optional resistors (RA and RB) for attenuating the signal if necessary**. The oscillator frequency has to be the same as the frequency of the crystal that was originally supplied with the AIM4170 (20 or 50 MHz**). The reference signal can be a sine wave or a square wave. It's amplitude (after the optional attenuator) should be approximately 2.5V peak to peak. If the external oscillator needs to be terminated in 50 ohms, the internal resistors can be selected to provide the attenuation factor while also providing the 50 ohm termination.

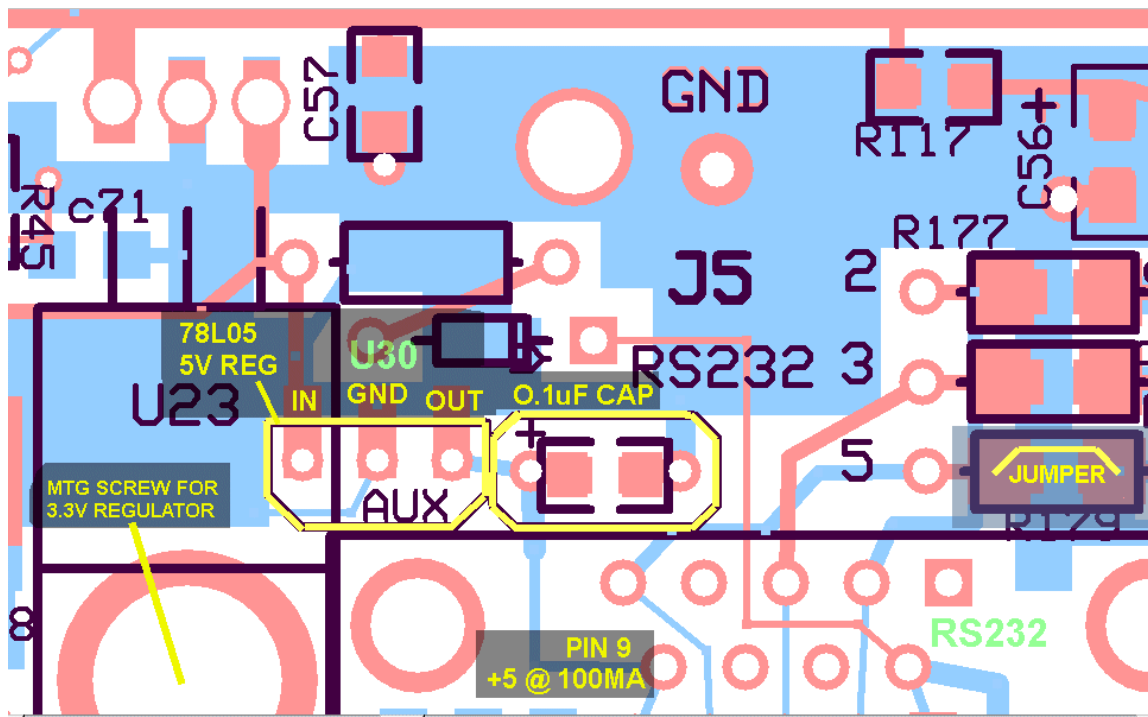*The original circuit resistance at the point labeled OSC OUT is 750 ohms to ground.*

The external oscillator signal is AC coupled on the AIM board, so it's DC offset can be in the range of +5 to -5 volts.

The **external oscillator** can be connected to the internal oscillator feed point by using the phono connector, J8, on the rear of the AIM4170B and AIM4170C. A short piece of coax like RG316 or RG178 can be used to go from J8 to P12. There is a 5K ohm resistor, R68, already connected to the phono connector but this is so large it can be ignored in a 50 ohm circuit.
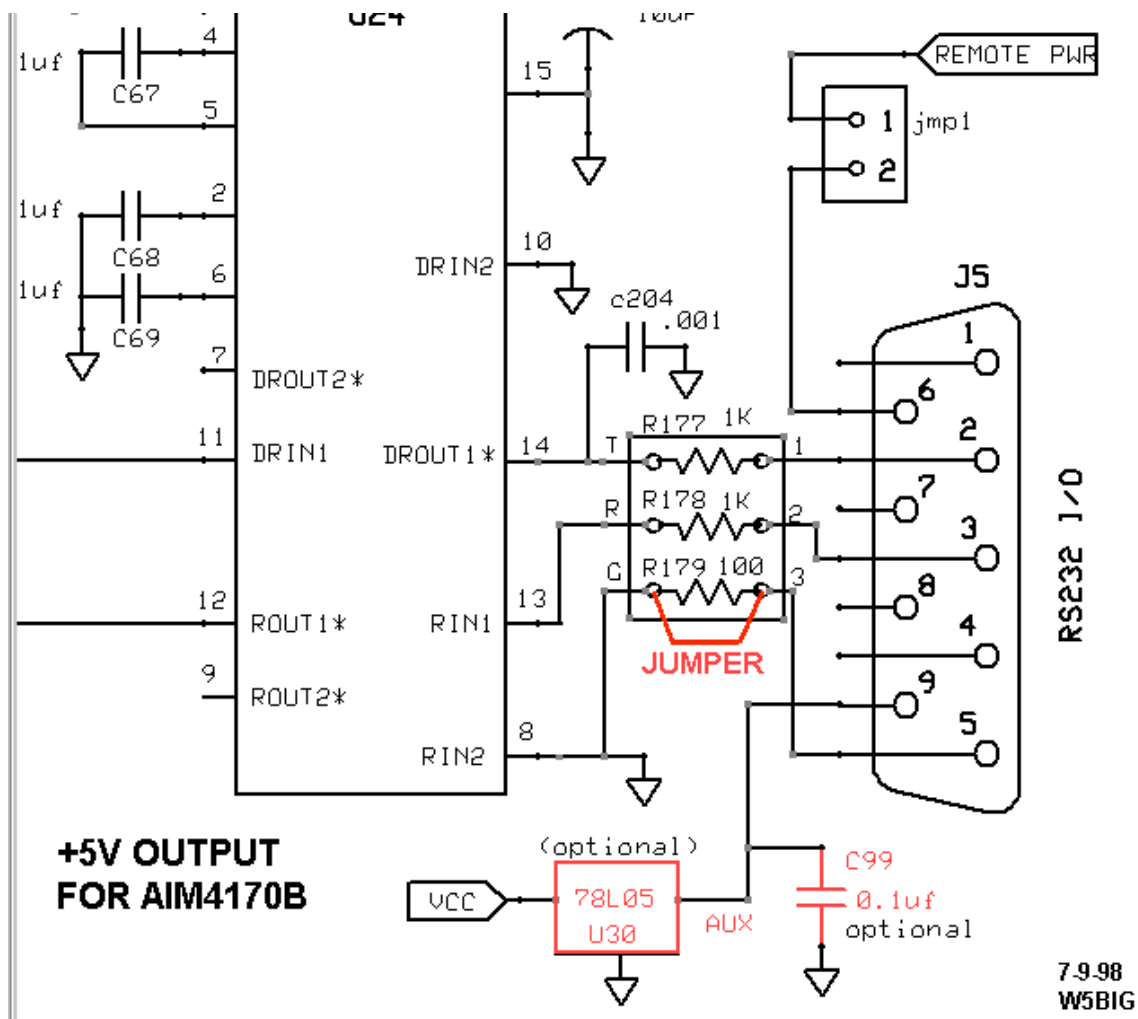
Bluetooth power supply:

When a bluetooth adapter is used with the AIM4170, a source for the 5V power supply can be installed with a few components as shown in this picture:

Note*: the 5V power source already on the board cannot be used because the bluetooth adapter injects too much noise on the 5V line.*

Bluetooth power supply schematic:

This schematic says AIM4170B but the same circuit applies to the AIM4170C.

The AIM4170 RF connector can be changed to a type-N or UHF connector using the technique shown in this document, thanks to Phil Salas:

http://www.ad5x.com/images/Presentations/AIM Upgrade.pdf