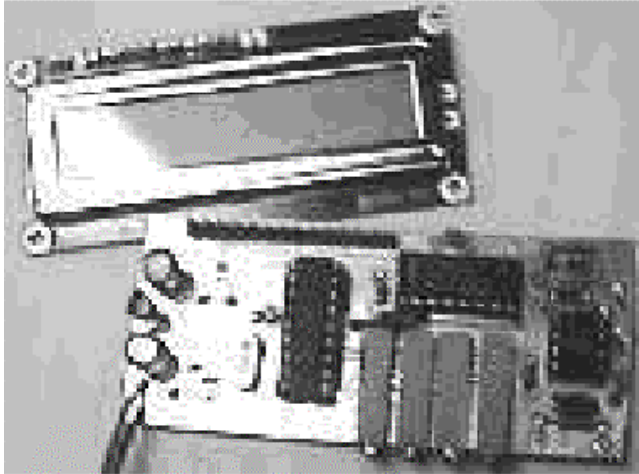


DFD4 / DFD4A assembly instructions.

(DFD4A has no offset capability and is for test equipment only)



SPECIFICATIONS:

HF 0-30MHz, Hi-Z, 5V p-p max

(input protected for overvoltage)

UHF 10-3000MHz, 50ohm, 15dbm max.

MODES:

1) HF SLOW - resolution 1Hz, gate time 1 Sec

2) HF FAST - resolution 10Hz, gate time 0.1 Sec

3) UHF SLOW - resolution 100Hz, gate time 1.28 Sec

4) UHF FAST - resolution 1000Hz, gate time 0.128 Sec

(mode displayed momentarily when changed)

IF OFFSET:

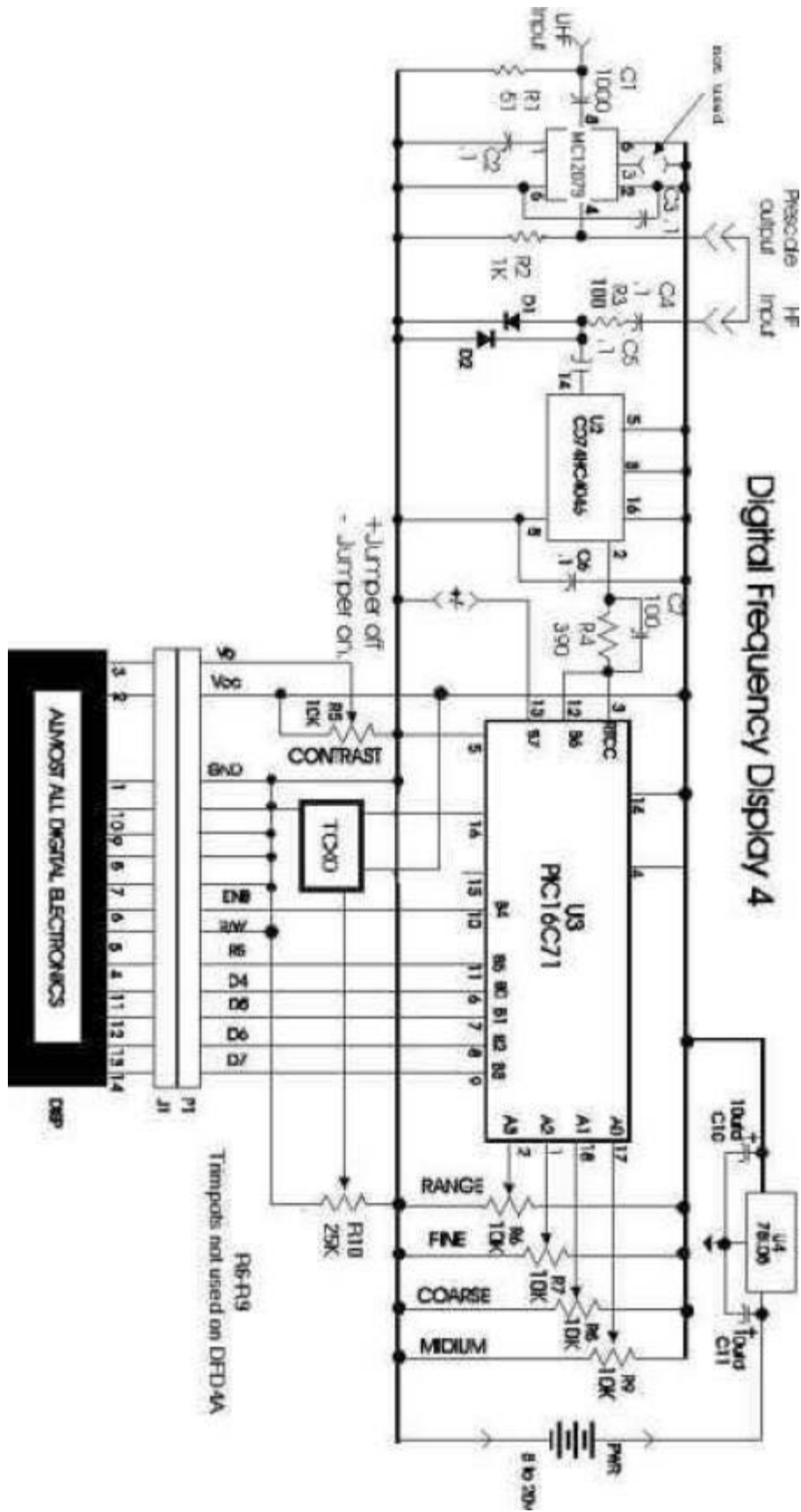
+/- 0 to 2 GHz in 1KHz steps

Jumper on = -

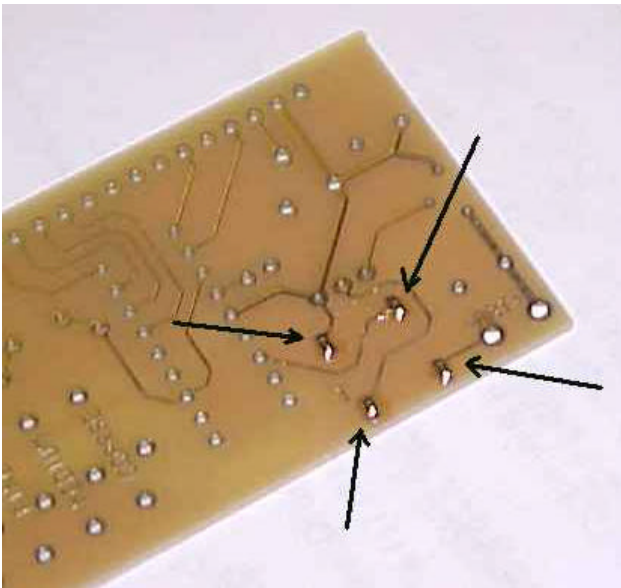
Jumper off = +

PARTS LIST

D1, D2	1N4148 black band is cathode		U1	MC12079P prescaler	
R1	51 ohms not normally installed, see below		U2	74HC4046	
R2	1K brown-black-red		U3	PIC16C71 Labeled 4 or 4A	
R3	100 ohms Brown-black-brown		U4	78L05 Voltage regulator	
R4	390 ohms Orange-white-brown		U5	20MHz TCXO	
R6,R7, R8,R9	10K 15 turn trimpot Not included with DFD4A		H1	2 pin header 2 Pin jumper	
R5	10K trimpot		J1	Female connector	
R10	25 Turn trimpot value may vary		P1	Male connector	
C1	1000pF		C2,C3,C4, C5,C6	.1uF	
C7	100 pF		C8,C9	10uF	

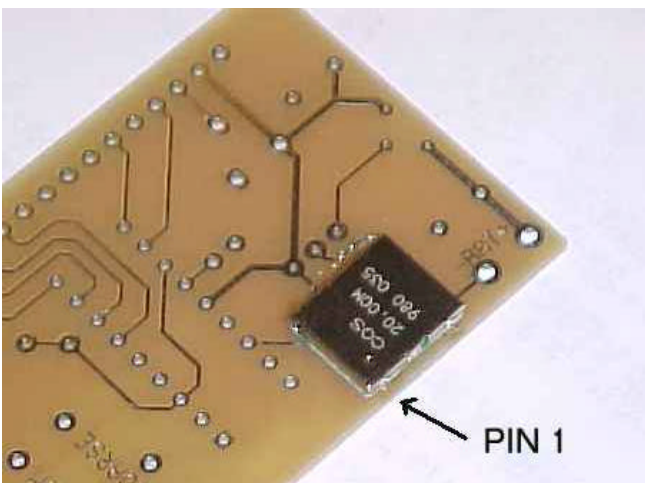


There is a layout drawing on page 5 if you cannot read the pictures.

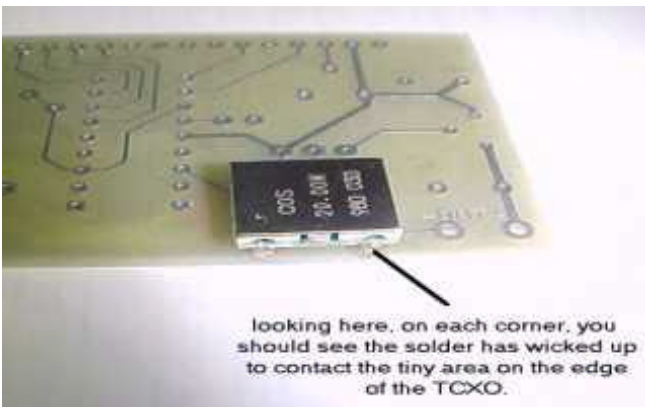


Begin by placing solder globs on the four rectangular pads for the surface mount TCXO.

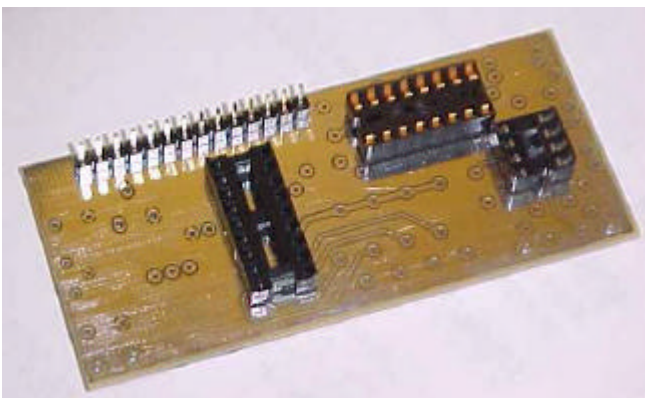
I may have installed this for you but obviously
Could not test it so read troubleshooting tip below.



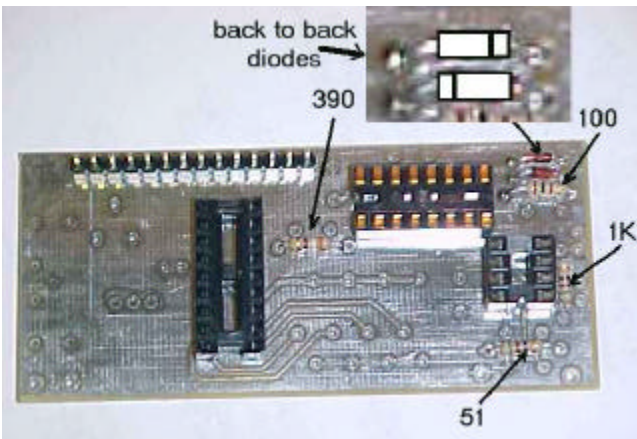
Carefully Position the TCXO with pin 1 as shown and remelt the solder globs while pushing down on that side of the device until all four pads of the TCXO are soldered.



You can check
by looking at the edge view to verify that solder has flowed onto the TCXO terminals.
If later the unit shows only 8 black squares on the display it may be because one or more of these terminals did not properly reflow solder.

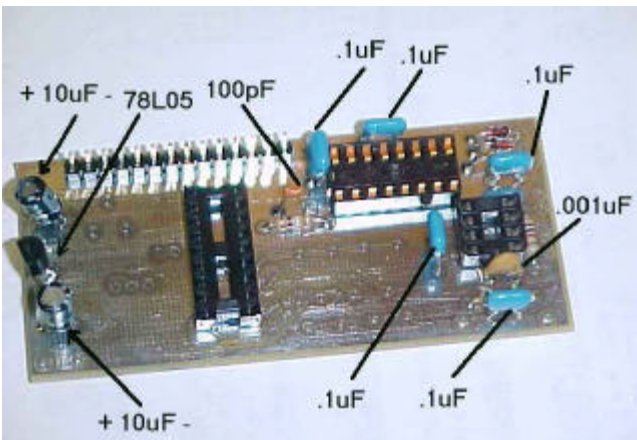


Next mount the IC sockets and display header.

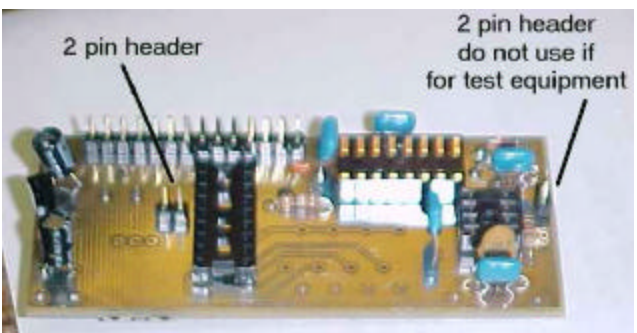


Next install and solder all resistors and the two back to back diodes.

Install the 51 ohm resistor ONLY if you want to terminate the UHF input in 50 ohms. Sensitivity is reduced if the resistor is installed.

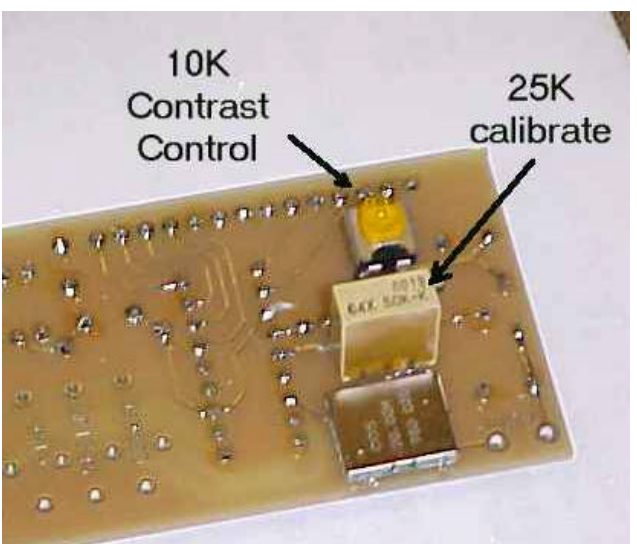


Then install and solder all capacitors and the 78L05 voltage regulator.

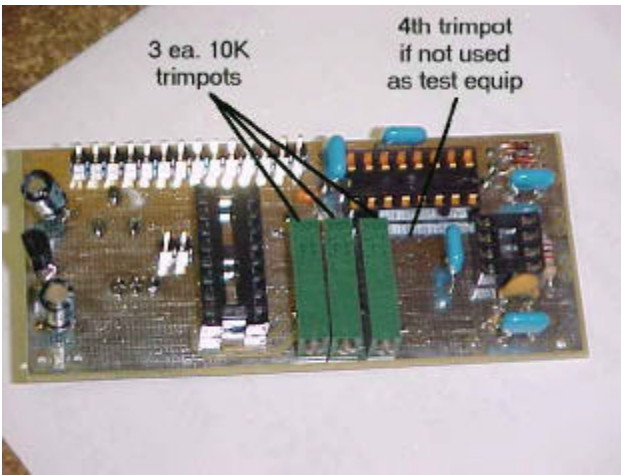


Then the two 2 pin headers. The one next to the 18 pin socket is always installed.

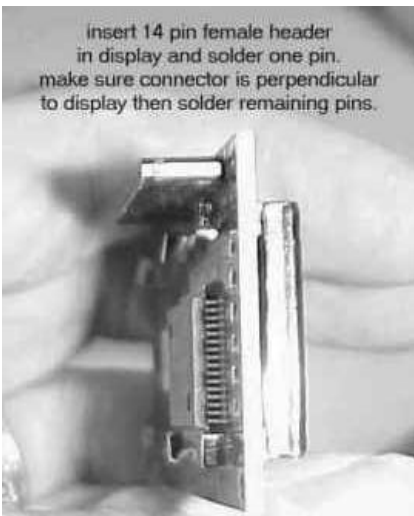
The one next to the 8 pin socket is installed only if you DO NOT intend to use it as test equipment.



On the back side of the PCB install and solder the 10K contrast control (adjust it fully CCW) and the 25K (value may vary) calibration control. Later when assembly is complete calibration consists of connecting the unit to a known accurate frequency, or by zero beating the TCXO against 20MHz WWV, and adjusting this 25 turn pot.

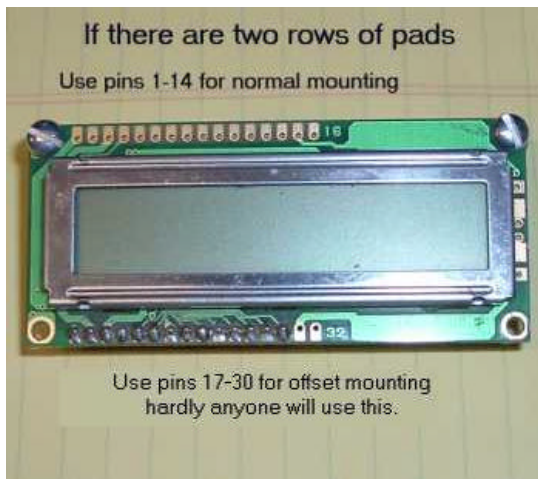


Next install the green 15 turn trimpots. **(these are not included or used with DFD4A).** Install the fourth trimpot if DFD4 is NOT going to be used as test equipment.



insert 14 pin female header in display and solder one pin. make sure connector is perpendicular to display then solder remaining pins.

Mount the 14 pin female header on the display module soldering only one pin. Then verify the connector is at a right angle to the module, remelting the soldered pin and adjusting the connector if necessary. Then solder the remaining pins. Plug the module into the DFD4 PCB.



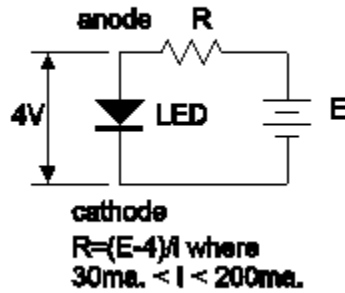
At this point you can plug the counter board into the module and power them with a 9 volt battery. You should see something displayed momentarily such as "FAST HF" then a frequency. What you see at this point is not important as some inputs are still floating until final assembly in your enclosure.

If so, you are ready to proceed to final assembly in your enclosure. When used as test equipment, wire the unit to the external controls using the connection diagram below.

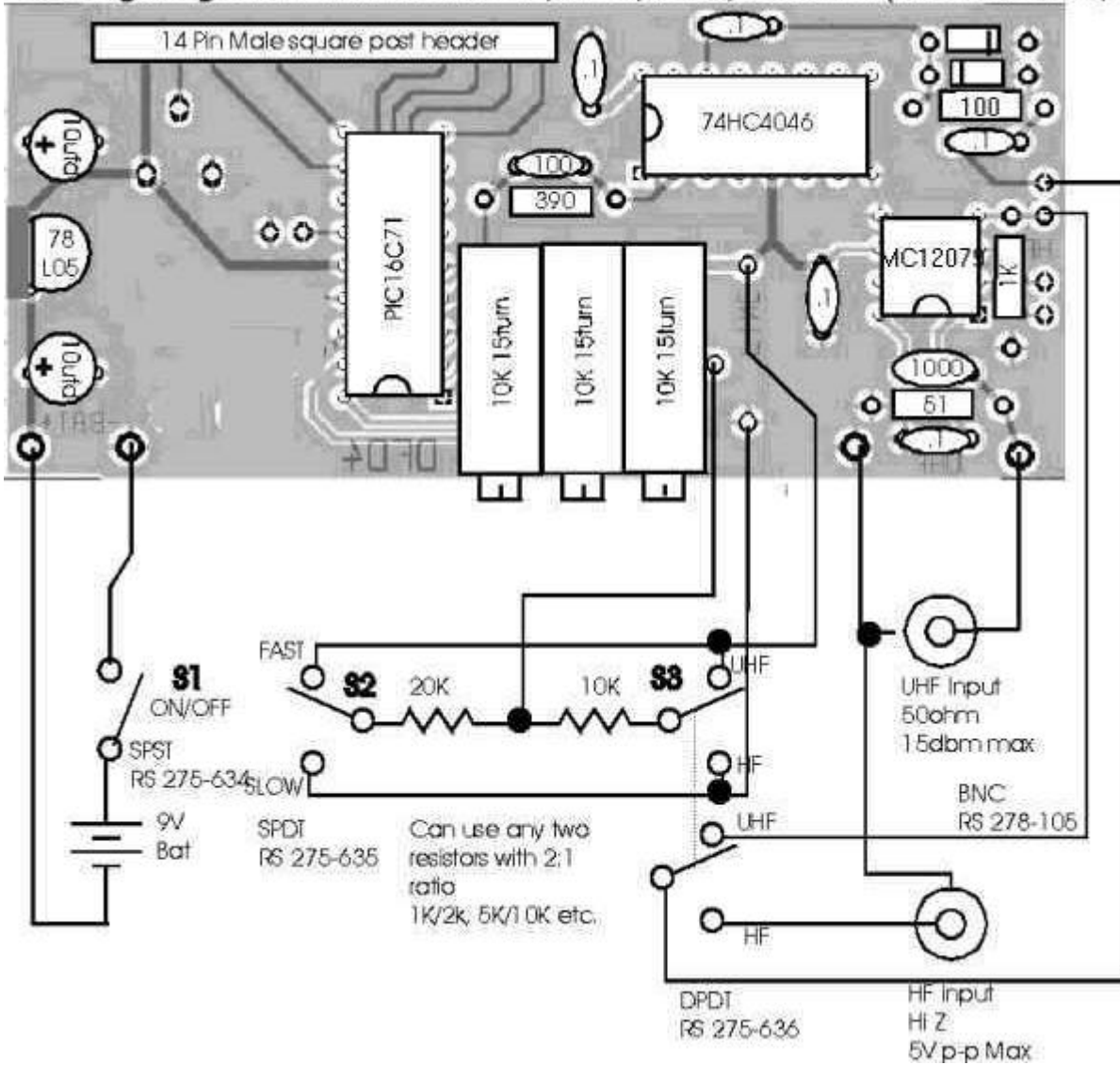
LED Backlit display module notes

I have two kinds of backlit displays
Type 1 has 16 pins at the top
Pins 1-14 are the display
Pin 15 = LED anode
Pin 16 = LED cathode.

Type 2 has 14 pads at the top and
2 pads along the edge
A = LED anode
K = LED cathode



Configuring DFD4 as a bench top frequency counter (Radio Shack part numbers)



For an example of a unit visit the web at

<http://www.aade.com/DFD4A/dfd4a.htm>

Setup

**In HF mode it may indicate erratic frequency displays when there is no signal connected to the input.
In UHF mode it will oscillate at about 2GHz with no signal connected to the input.**

MODE

- The mode input is actually an analog voltage dividing the 5V supply into four parts. Each part represents a mode. The analog voltage is developed by a trimpot unless the unit is configured as a bench top frequency counter. When configured as a bench top counter it is developed by a two bit D/A converter from panel switch contacts.
- The unit displays the mode momentarily whenever it is changed. When using a trimpot, adjust it until the desired mode is displayed and then continue to turn it one additional revolution for thermal stability.

OFFSET

- The offset is input via three 15 turn trimpots which represent a 21 bit number. FINE is bits 0-6, MEDIUM is bits 7-13 and COARSE is bits 14-20. This 21 bit number is multiplied by 1KHz to produce a maximum offset in excess of 2GHz.
- Offset should be setup with the HF input shorted to ground to prevent noise from being counted.
 - Jumper between HF input and prescaler output must be removed first.
 - Optionally, remove the 74HC4046.
- Start Fully counterclockwise on all trimpots which should be zero offset. Adjust each trimpot for minimum displayed frequency.
 - Set COARSE to display the value just below the desired value.
 - Set MEDIUM to display the value just below the desired value but closer to it than COARSE could provide.
 - Set FINE to display the desired value.
- Set the ADD/SUBTRACT jumper as required by your application.
 - This jumper does nothing if the offset is zero for a bench top frequency counter. Adding or subtracting zero does not change the answer.

CALIBRATION

- There are many ways to calibrate a frequency counter depending on available test equipment.
- The simplest is to zero beat a signal generator against WWV (receiver bfo off) while measuring the generators frequency with the counter.
 - Adjust the 25 turn trimpot on the back of the PCB to obtain the WWV frequency on the counters display.
 - Or listen to TCXO on receiver while zero beating it to WWV on 20MHz.
- Any other KNOWN frequency can also be used.

Backlite

To power the backlite option Simply connect a resistor from the + terminal of your supply voltage (not from the 5v regulator on the counter as it cannot supply that much current) to the **A** terminal on the edge of the display module and connect the - terminal of your supply voltage to the **K** terminal on the edge of the display module. The backlite is isolated from the logic so they do not have to share a common ground but it is alright if they do. Select the desired current, (100ma recommended) and calculate the resistor as $R = (\text{supply voltage} - 4) / \text{current}$. Don't forget that the power dissipated in the resistor is $(\text{supply voltage} - 4) * \text{current}$ and chose resistor that is at about 4 times that many watts so it will not run too hot.