

## DFD2 instructions.

After completing assembly, carefully inspect all of your solder connections, and the polarity of the diodes, voltage regulator, the electrolytic capacitor, and the IC's.

Adjust the contrast control fully counter-clockwise. Apply power from 8 to 18VDC. You should see some frequency displayed. Adjust the contrast control for the desired effect. Adjust the coarse and fine trim-pots until the IF frequency of your unit is displayed. (Custom micro-controllers have this value pre-stored and it should be displayed). It is best to remove the 4046 chips during setting of the offset to prevent noise from triggering the inputs.

Install the zero ohm jumpers on the four post header to determine the +/- of each frequency input.

Top Jumper off is plus for  $RF = HFO + VFO \pm BFO(IF)$ ,

jumper on is minus for  $RF = HFO - VFO \pm BFO(IF)$ .

Bottom jumper off is plus for  $RF = HFO \pm VFO + BFO (IF)$ ,

















jumper on is minus for  $RF = HFO \pm VFO - BFO (IF)$  .

If you can't figure this out, just try all four combinations and see which one gives the right answer.

Using the LED back-lit display [\(see diagram below\)](#)

The back-lit module has a block of LEDs behind the LCD display. It is powered from terminals A (anode) and K (cathode) with A being plus and K being minus (usually ground). The voltage drop across the LEDs is 4VDC. The current can range from 20ma. To 150ma. The dropping resistor required is  $R = (V-4)/I$  where I is the desired current and V is the supply voltage.

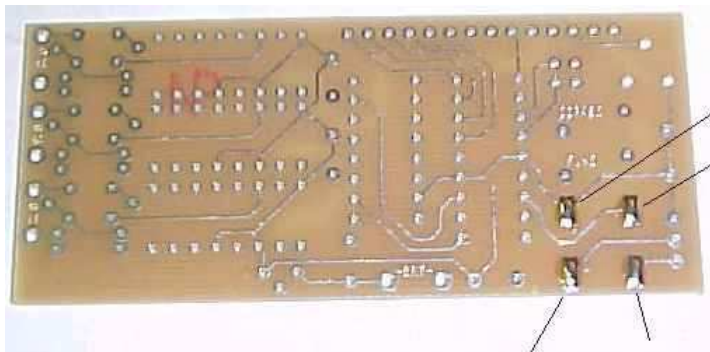
### PARTS LIST

D1, D2, D3, D4, D5, D6	1N4148		U1, U2, U3	74HC4046	
R1	100ohms Brown-black-brown		U4	74HC153	
R2, R3	1000 ohms brown-black-red		U5	PIC16C71 Labeled according To the model DFD2	
R5, R6	10K 15 turn trimpot <b>not supplied with custom units.</b>		U6	78L05 Voltage regulator	
R4	10K trimpot <b>contrast control adjust fully CCW</b>		U7	20MHz TCXO	
	25 Turn trimpot value may vary		H1	2 pin header 2 Pin jumper	
C1, C2, C3 C4, C5, C6 C7, C8, C11	.1uF <b>C1, 4 and 6 Mislabeled on schematic</b>		J1	Female connector	
C12	10uF		P1	Male connector	

Use pins 1-14 of the display module. If 16 pins are available, last two are not used. Backlit option is powered by supplying current (a current limiting resistor **MUST** be used) from the A(anode) to K(cathode) connections on the edge of the module. **See schematic for details.**

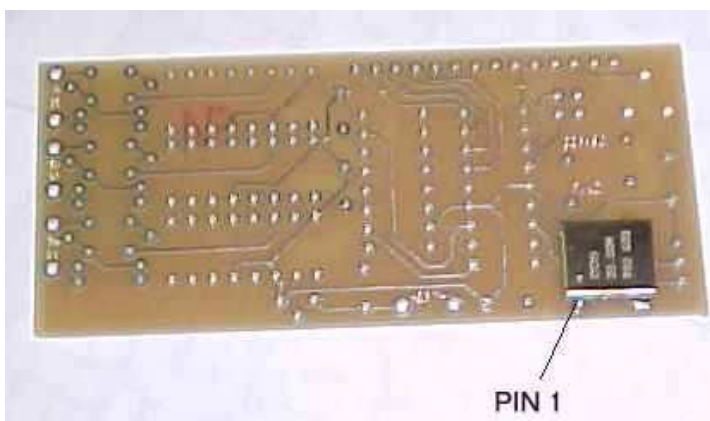


## DFD2 assembly instructions.

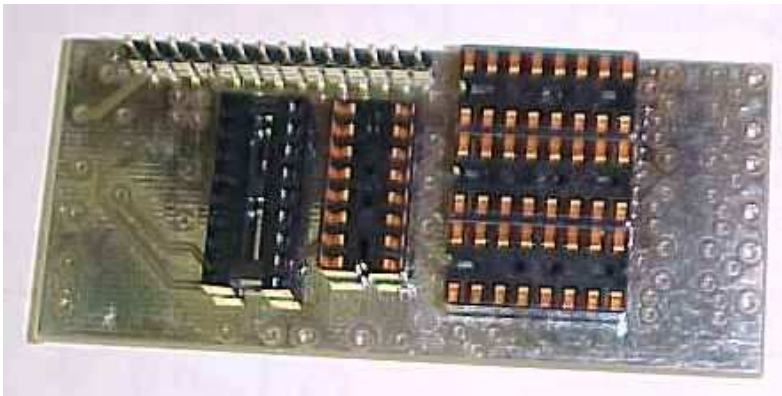


Begin by placing solder globs on the four rectangular pads for the surface mount TCXO.

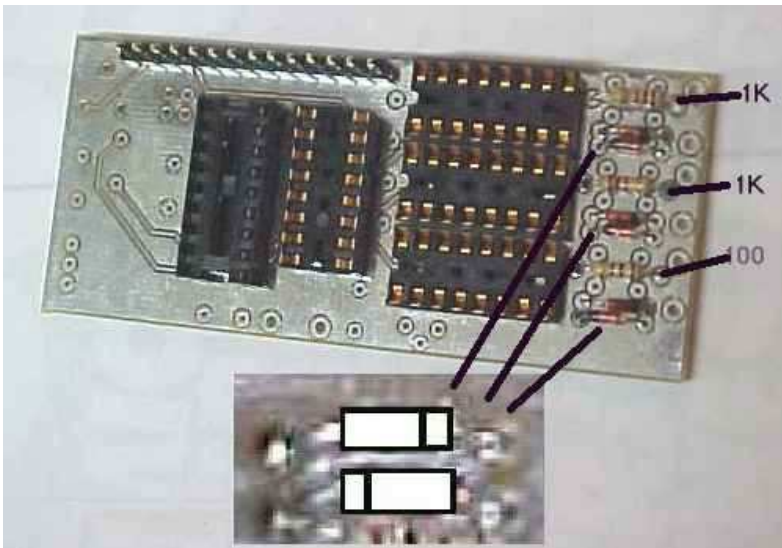
**If I pre-installed the TCXO, I could not test it. If unit displays only 8 black squares then check and reflow the solder on its four corners.**



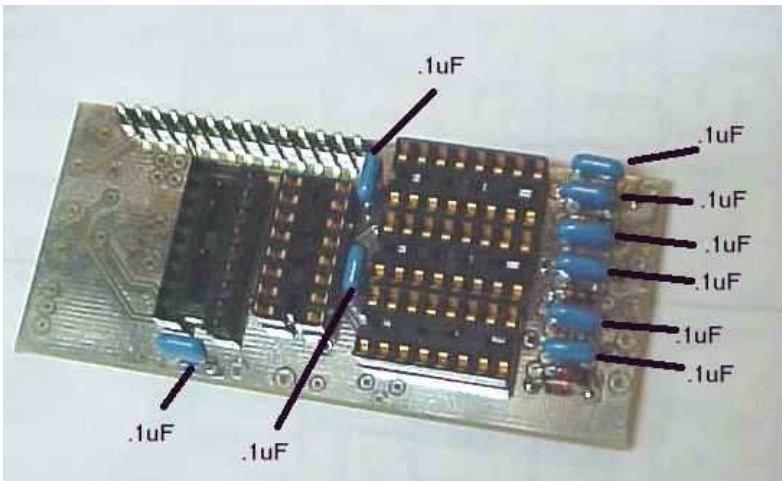
Carefully Position the TCXO with pin 1 as shown and remelt the solder globs while pushing down on that side of the device until all four pads of the TCXO are soldered. You can check by looking at the edge view to verify that solder has flowed onto the TCXO terminals. If later the unit shows only 8 black squares on the display it may be because one or more of these terminals did not properly reflow solder.



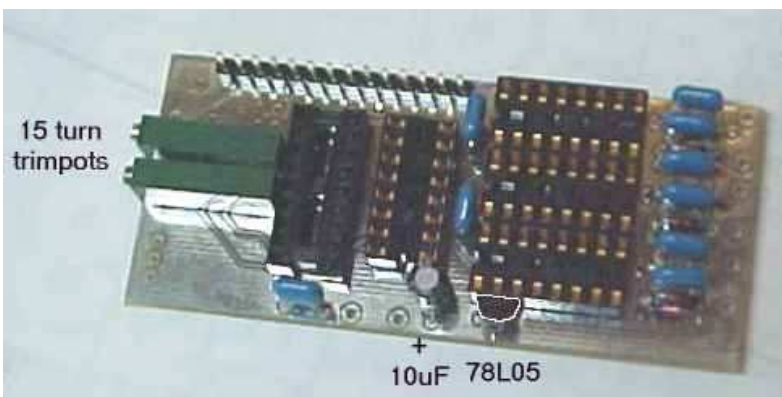
Next mount the IC sockets and display header.



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

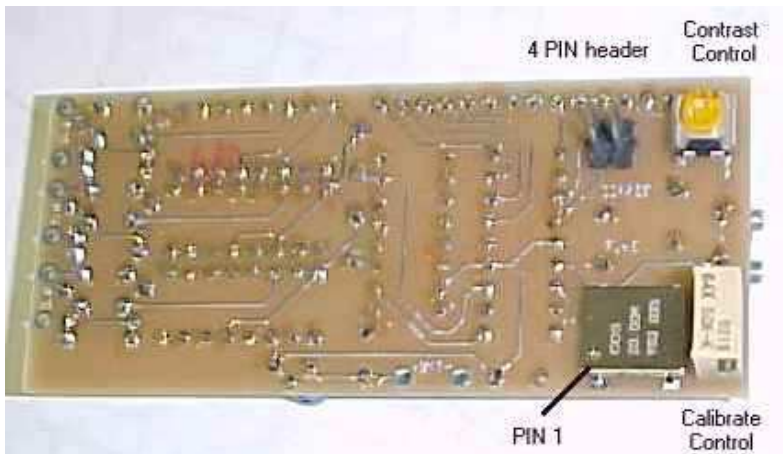


Then install and solder 9 each .1 uF capacitors **Caps can be blue or brown.**

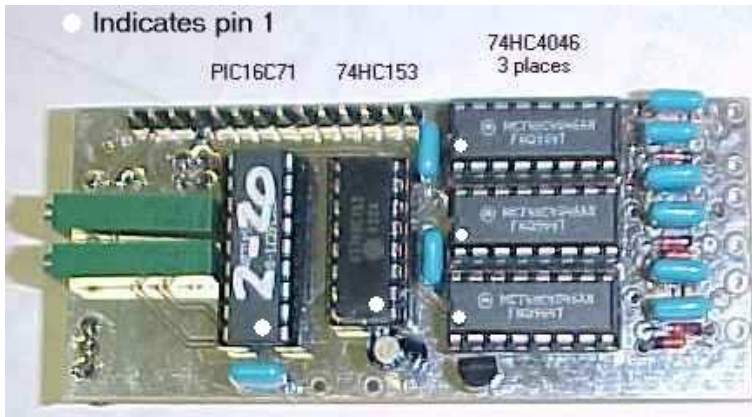


Next install the 78L05 voltage regulator, the 10uF electrolytic and, **if a general purpose programmable DFD2,** the two 15 turn trim pots. These are not used with custom chips for Collins, Kenwood etc.

+ Terminal of 10uF electrolytic in hole closest to edge of PCB. Flat side of 78L05 toward IC sockets.



On the back side of the PCB install and solder the 10K contrast control (**adjust it fully CCW**) and the 25K calibration control.



Next, Install the ICs. **Leave the 74HC4046 chips off until you have set the IF offset. This will insure that the input frequencies are all zero.**



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 DFD2 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. What you see at this point is not important as some inputs are still floating until final assembly in your enclosure. **Set the IF offset by adjusting the 15 turn trimpots. Then install the 74HC4046 chips. If only 8 black squares appear, either the TCXO has not been soldered on all 4 points or there is a solder problem on the circuits between the 18 pin chip and the display connector, or on the display module connector.**

## Setting OFFSET (general purpose DFD2 only)

Top trimpot is COARSE, bottom is FINE. Set offset by first turning CCW until reading of zero is obtained. Adjust COARSE CW until frequency just less than desired offset is displayed. Then adjust FINE CW until desired offset is obtained.

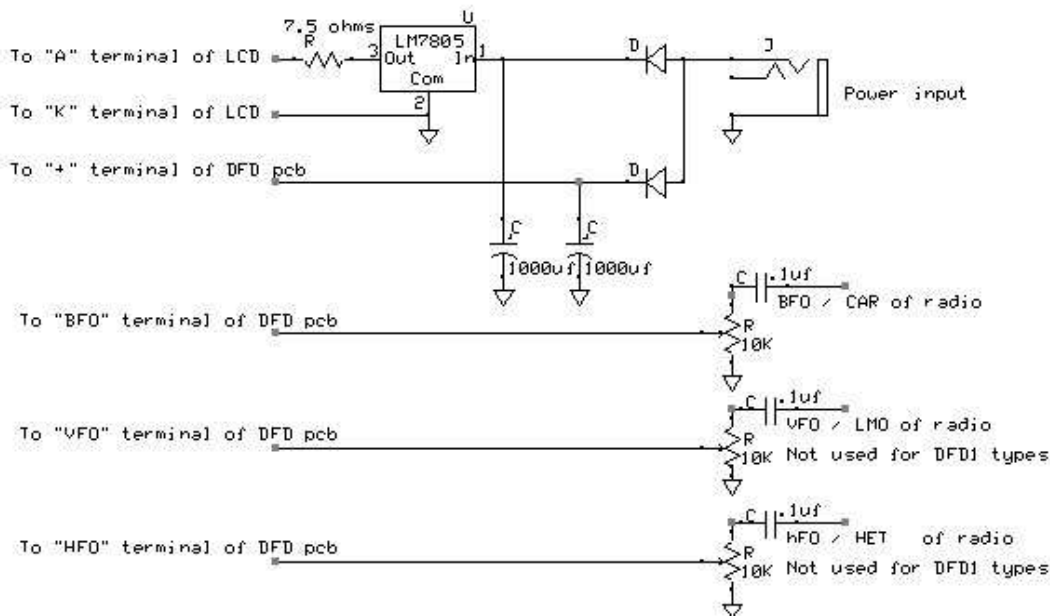
## CALIBRATION

- 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 generator's frequency with the counter.
  - Adjust the 25 turn trimpot on the back of the PCB to obtain the WWV frequency (20 MHz) on the counter's display.
  - Or listen to TCXO on receiver while zero beating it to WWV on 20MHz.
- Any other KNOWN frequency can also be used.

## Installation

It is possible to overdrive the inputs causing erratic frequencies to be displayed. A 10K trimpot can be used to set the levels going into the DFD2.

The levels should be set only slightly greater than required for a stable display. Set the BFO input first, then the VFO and finally the HFO (usually on 10mtr band).



### Power Conditioning module for DFD1 and DFD2 applications

**This is the power conditioning module supplied as part of the plug-n-play fully assembled digital dials. Something similar is recommended for DFD2 applications to provide level controls.**

Only one input is required for a DFD1.

**The 7805 part is to power a backlit display option.**

For additional installation hints see

<http://www.aade.com/applications2/app2.html>

# Digital Frequency Display 2

