Instructions for DFD1

Digital Frequency Display 1

A miniature digital frequency counter designed to display the frequency of operation of HF, VHF, UHF and SHF superhetrodyne (with an adjustable IF offset) and direct conversion (without offset) receivers and transmitters. Also can be used as a bench top frequency counter or built into other test equipment. Usable to 40 MHz. (8GHz with an external prescaler)
The unit uses a PIC16C71 microcontroller which has a built in A/D converters connected to 15 turn trimpots. These trimpots are used to input a frequency offset, usually equal to the IF frequency of the receiver or transmitter, and other functions described below.

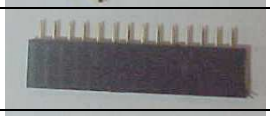
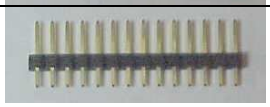
- Trimpot (1) Fine offset in 1KHz steps
- Trimpot(2) Coarse offset in 128KHz steps
- Trimpot(3) Multiply (multiplies frequency and offset by 1 to 256)
    - *(IF and RF resolution is degraded by the value of the external divider N). IF resolution=N*1000 Hz, RF resolution = N*10/100 Hz.

The unit then measures the Local Oscillator frequency and adds or subtracts the IF frequency offset. The result is a display of the actual receive or transmit frequency.

The unit has two jumpers with which the user can change it's function.

- **Bottom)** ADD/SUBTRACT causes the unit to add (jumper off) or subtract (jumper on) the offset from the measured frequency. This input can be remoted from the bandswitch of band-imaging receivers/transmitters to provide correct frequency display in both bands.
- **Top)** 10/100 Hz causes the unit to display with 10 Hz resolution (jumper off) or 100 Hz resolution (jumper on).

PARTS LIST

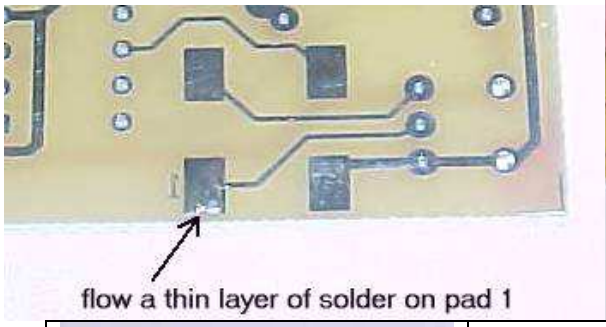
D1, D2	1N4148		U1	74HC4046	
R1, R8	100ohms Brown-black-brown		U2	PIC16C71 Labeled according To the model DFD1	
R2	390 ohms Orange-white-brown		U3	78L05 Voltage regulator	
R3,R4,R6	10K 15 turn trimpot		U4	20MHz TCXO	
R5	10K trimpot		H1	2 pin header 2 Pin jumper	
R7	10K ohms Brown-black-orange		J1	Female connector	
	25 Turn trimpot value may vary		P1	Male connector	

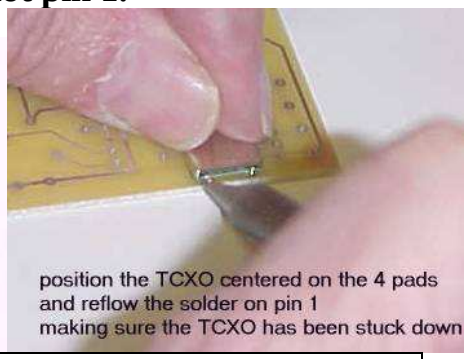
C1,C2,C3,C5	.1uF may be brown or blue		C4	100 pF	
C8,C9	10uF				

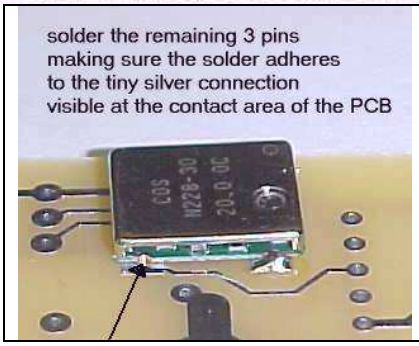
DFD1 assembly instructions with built-in TCXO

Install the TCXO (if I have not already done that)

Pin 1 is a tiny dot in the corner of the device. It may have a screw driver adjust hole that is not used and is not pin 1.







If I installed the TCXO I cannot test it
So, if the unit does not work check the connections per this illustration

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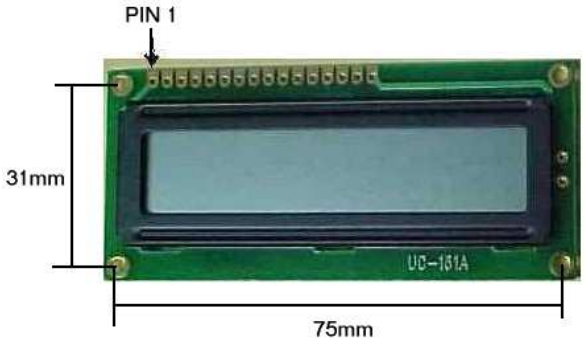
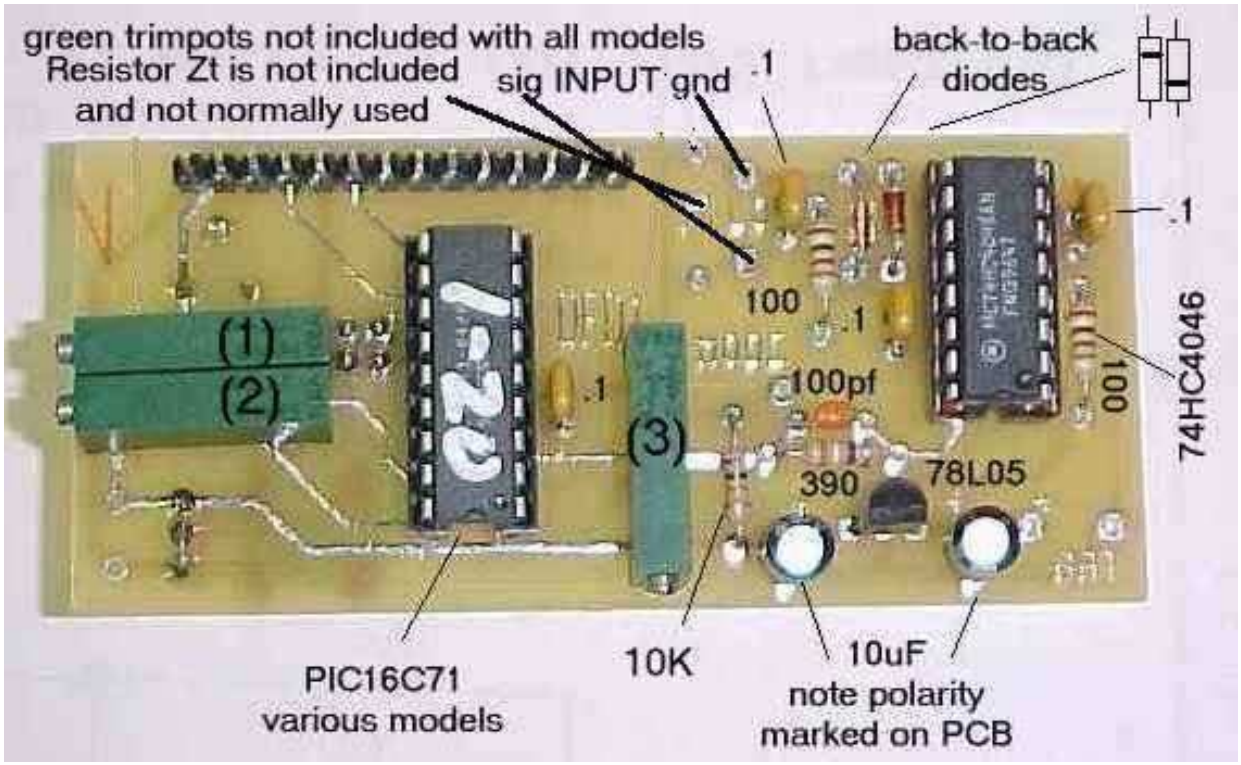


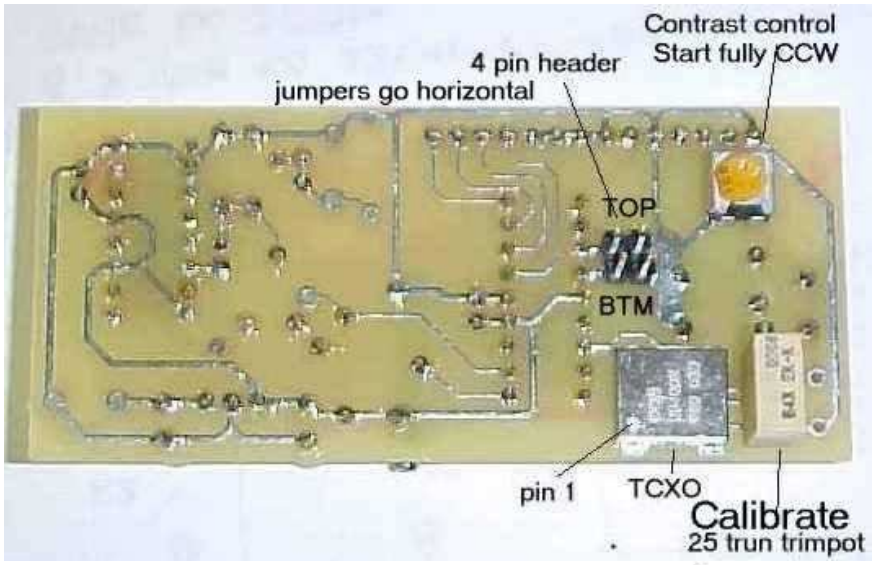
solder the female 14 pin connector in pins 1-14 of the display module

Solder only one pin then check to make sure connector is at right angle with display. Then solder remaining pins.



Install the parts as shown in the above and below illustration.
Resistor Zt is not included and not normally used.
Input signal goes to LO terminals, one ground, one signal.

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.



Trimpot functions

DFD1 - Fine

DFD1 - Coarse

DFD1 - Multiply

For installation hints see

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

ADJUSTMENT PROCEDURE

remove 74HC4046 chip to insure zero input frequency

1) Turn trimpot 3 CCW to display minimum frequency.

2) Turn trimpot 2 CCW to display minimum frequency

3) Turn trimpot 1 CCW to display zero Hz.

Reference TCXO Alignment procedure. (Done while the offset is set to zero)

A) connect the counter to a KNOWN frequency source and adjust the display to read that frequency.

B) or zero beat the TCXO to 20MHz WWV.

C) or, after setting correct offset connect to radio, tune to KNOWN frequency and adjust TCXO to display that frequency.

(This may not be very accurate depending on the accuracy of your radios IF frequency.)

If you are going to use the multiply by N capablity of DFD1 then decide what that will be (this is used when radio uses frequency multiplier after local oscillator such as in the SWAN 250 which triples the LO, then N = 3). In this case, using trimpots 1 and 2, set the offset to the desired final value divided by N.

4) set trimpot 2 CW until freq is one step above the desired offset then back off until one step below.
5) set trimpot 1 CW to display desired offset (steps are 1KHz),
6) then set trimpot 3 CW until displayed value is multiplied to the desired final offset.

Mode select input

The unit can be made to display various operating modes by placing or switching resistor values from the MODE pad on the PCB to ground. Modes displayed and the resistor values associated with them are shown below.

Resistor Value +/- 5%	Displayed Mode
open circuit	'blank'
65K	AM
27.5K	FM
15K	CW
8.75K	USB
5K	LSB
2500	FSK
short circuit	FAX

There are pads on the PCB to install a termination resistor, Zt, if desired. Almost nobody does that.

For applications information see:

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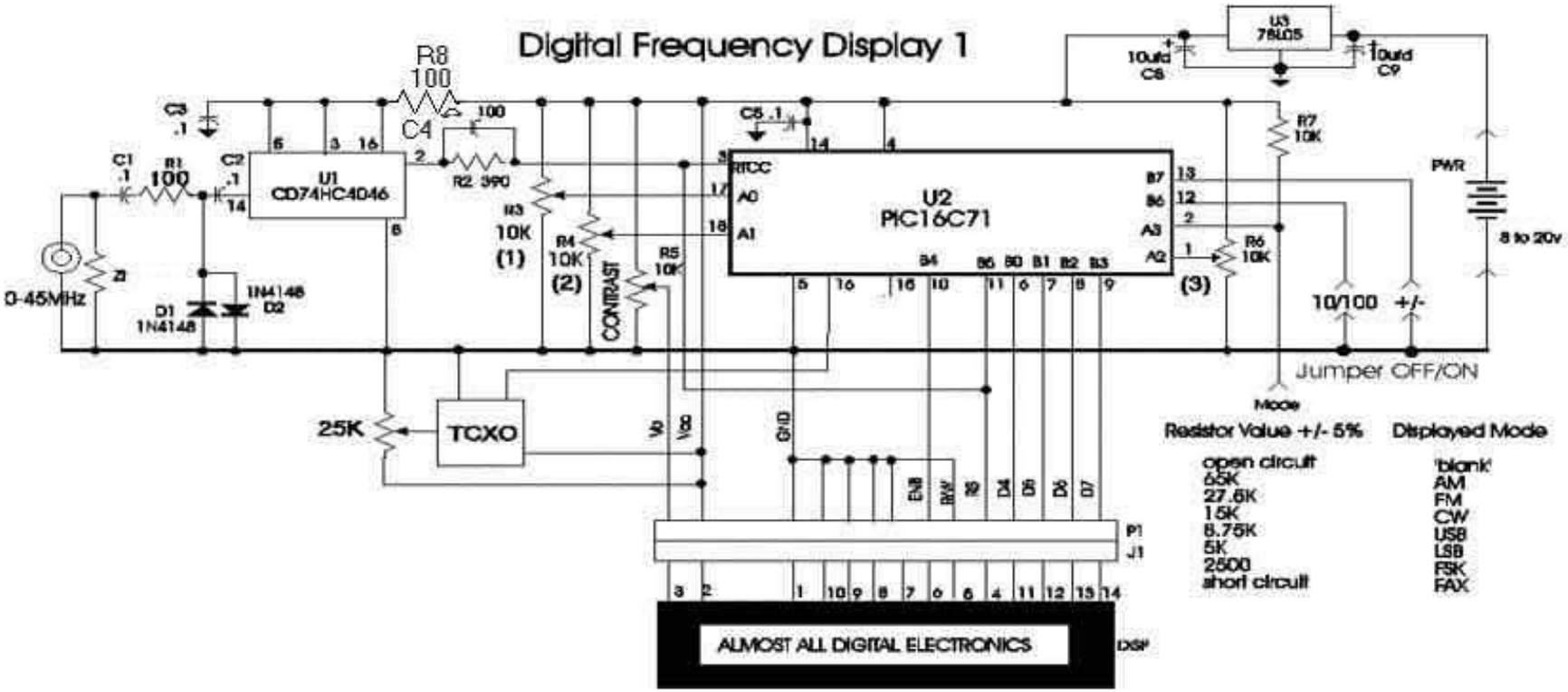
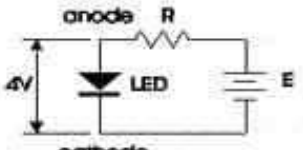


LED Backlit display module notes

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



R=(E-4)/I where
30ma. < I < 200ma.