

## FOXDELTA FC2-A LCD FREQUENCY COUNTER CONSTRUCTION NOTES

The frequency counter appears to be a very well conceived and laid out design. The documentation is not very intuitive and I have prepared these notes for both myself and others who may have trouble configuring the intermediate frequency (IF) offsets.

The current version has two sets of DIP switches. The upper bank under the LCD readout controls these functions:

S1 - turns on the backlight for the LCD

S2 through S4 are the divide bys: for use with the 400 MHz version to extend the counter into the VHF range.

In my situation, I was interested only in using the device as a digital frequency readout for a homebrew High Frequency 7 tube superhet receiver. The intermediate frequency (IF) was 455 KHz and I wanted to program that offset into the LCD readout.

The board that I used has an error on the silkscreen component numbering for Q1 through Q3.

Q1 and Q2 are physically very close together. This is the J309 device. Q3 is not labeled on the board. Instead, it is mis-labeled as Q1. The 2N3904 is some distance away from Q1 and Q2, in the slightly, below center of the board.

If you are not used to capacitor numbering conventions, make up or download a chart that shows the relationship between 0.1 mF and 100 nF and 104.

<b>CODE / Marking</b>	<b><math>\mu</math>F microfarads</b>	<b>nF nanofarads</b>	<b>pF picofarads</b>
<b>1R0</b>	<b>0.000001</b>	<b>0.001</b>	<b>1</b>
<b>100</b>	<b>0.00001</b>	<b>0.01</b>	<b>10</b>
<b>101</b>	<b>0.0001</b>	<b>0.1</b>	<b>100</b>
<b>102</b>	<b>0.001</b>	<b>1</b>	<b>1,000</b>
<b>103</b>	<b>0.01</b>	<b>10</b>	<b>10,000</b>
<b>104</b>	<b>0.1</b>	<b>100</b>	<b>100,000</b>
<b>105</b>	<b>1</b>	<b>1,000</b>	<b>1,000,000</b>
<b>106</b>	<b>10</b>	<b>10,000</b>	<b>10,000,000</b>
<b>107</b>	<b>100</b>	<b>100000</b>	<b>100,000,000</b>

## FC2-A PIC Frequency Counter

After construction, carefully and meticulously check for solder bridges. The components are well-made and will withstand a second soldering to make certain there are no cold joints or bridges.

The LCD may not light up at all when you first apply power. Turn the 10K potentiometer (P1) right and left to show the digits. Also, flip upward, S1 on the upper bank of DIP switches to turn on the backlight.

I have 1.5 inch diameter home made oscillator and antenna coils in my receiver. I placed a three turn loop above the oscillator coil. It now consistently reads the difference frequency, that is, the displayed frequency is 455 KHz lower than the real, transmitted frequency. Check this with another frequency counter to be certain.

I did not need to further calibrate the device. I have an Instek 10 MHz Function Generator and the FC2-A read 980 Hertz high when the Instek was producing a 10 MHz sine wave into the device before any configuration changes were made.

### Configuration

There are four pushbuttons, PB1 through PB4 on the lower edge of the board. Each one is in parallel and thus comparable to the bank of DIP switches S1 to S4 on the lower border of the board. These correspond to specific pins on the 16F84A. DIP switches S1 to S4 input into RB1, RB2 and RB3. The three pin header, S4, inputs into RA2

The offset frequency must be entered as a hexadecimal number, WITHOUT, the tens (10's) value. Thus, 455 KHz becomes 45500. Convert this value to hexadecimal: 00 B1 B6. The two zeroes are added on the left since the input requires three pairs of hexadecimal input values.

Be careful if using a handheld calculator. Many of them show the letter 'B' in lower case. This could be erroneously read as '6'.

A separate three pin header is labeled on the board as S4. A jumper is included to select the lower two or upper two pins. The upper two pins jumpered together will show, for frequencies below 10 MHz, 6 digits. 0 to 9 on the far left of the display, a decimal, three digits, a decimal, two digits, a space, and then 'MHz'.

Above 9.999.999 MHz, there will be a total of 7 digits displayed. If you select 6 digits from the setup menu you will

lose a lower value digit (the hundreds place). The tens place is not shown on the display in either 7 digit or 6 digit mode.

The pushbuttons can be very sensitive. It is easy to skip an address. You must then re-scroll through the list, but it is only 00 to 0F in the case of PB1.

### **To set a positive offset frequency of 455 KHz.**

1. Turn off the power.
2. Move S1 upward and turn on the power.
3. The LCD screen will read: EEPROM MODE Ver 1.2
4. Flip S1 downward and then the LCD will read:  
ADDR:00 DATA:0D
5. Using PB3, scroll downward to hex value '00'.
6. Press PB4 until you see 'SAVED' on the LCD screen.
7. Press PB1 to advance to ADDR:01. You will see 'BB'.  
Using either PB2 or PB3, scroll to 'B1' and then press PB4 to see the saved screen again.
8. Advance to ADDR:03 DATA:A0 by pressing PB1. Enter the last set of hex values: 'BC' then press PB4 to save the value.
9. Next, using PB1, scroll to address 0A. The value there may be 00. Using PB2, advance the DATA value one unit to '01' and then press PB4 to save this value. You must have this value, NOT 00, in order to use the offset function.

Exit from the configuration process by turning off the power. When the power is restored, you should see 0.455.00 MHz on the LCD screen if you have the jumper set on the bottom two pins of the header at S4. There is also an annoying, blinking, dotted rectangle in place of the leading digit of the display.

Pushing up on S2 will turn off the 455 KHz offset and allow you to use the meter as a direct reading device.

If you want to restore the meter to a direct reading device, remove the jumper from the header at S4 and power off. Flip S1 up and power on into the EEPROM MODE. Flip S1 downward and then scroll via PB1 to ADDR:0F and set the DATA to 01 via PB2. Save via PB4 and power off. When you restore the power, there will be an INIT of the addresses and then there will be a direct readout of the device without any offsets. You can put the jumper across the top two pins of header S4. In my device, if the jumper is on the bottom two pins the annoying blinking rectangle is present.

## FC2-A PIC Frequency Counter

If your IF is 1600 KHz and you need to ADD this value to the frequency readout you will need to program the following hexadecimal value into ADDR 00, 01 and 02: **02 71 00**. Again, this value represents a converted decimal value but without the tens value of: 1,600,00. You must set ADDR:06 to either 01 or FF if you want a positive offset and move the jumper on **S4** to the bottom two pins of the header.

If there is a need for a NEGATIVE offset then the second bank of addresses must be changed in the same fashion and saved. These are addresses 03, 04 and 05. Address 06 must also be changed to either 01 or FF. Then on power up, jumper the upper two pins on S4 and you should be seeing the correct transmitting frequency.

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