DigiVFO / DigiBrain Upgrade

by

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I was recently the recipient of a somewhat dated and slightly apart piece of hardware; a DigiVFO / DigiBrain. This Direct Digital Synthesis VFO was described in the May 1995 and March 1996 QST magazines. After doing some studying of its design, construction, and capabilities, I figured I could improve its functionality a bit. The way that it was originally designed, it was configured in a one-time programmable CPU for a particular radio's VFO frequency range (such as 5.05MHz to 5.55MHz). If you wanted to use it with a different radio that had a different VFO frequency range, you needed a completely different unit or another pre-programmed CPU that you could swap into the circuit board… well, you didn't absolutely need the different unit or CPU, it was just that the display readout would be a challenge to keep track of where you were as the "zero" wouldn't be correct anymore. And, then, there was even a different version for use when using the DigiVFO / DigiBrain as a general purpose signal source.

I decided to upgrade the DigiVFO / DigiBrain by replacing the MC68HC705 CPU with a PIC16F648. This processor was easier for me to program and develop code using freely available tools from Microchip (www.microchip.com). Also, the PIC CPU has 256 bytes of EEPROM memory storage that can be written and read by the CPU itself during run time. This would allow one to have changeable VFO frequency ranges for different brands of radios and it would also allow it to remember a particular frequency setting through a power off cycle.

The schematic for the CPU change is shown in the file "VFO_Upgrade.pdf". That circuit was point to point wired on a small vector board. The vector board plugs into a socket that was installed at the U1 (MC68HC705 CPU location).

Next a feature upgrade schematic was created to add another output to the DigiVFO / DigiBrain. This new output has sine-wave, square-wave, 35nsec positive pulse and 35nsec negative pulse output along with a simple amplitude adjustment capability. The schematic for these added functions is shown in the file "Pulse_Gen.pdf".

The new firmware source code and the hex object file for the PIC16F648 CPU is also included in the zip file.

Figure 1: Front View Upgraded DigiVFO/DigiBrain

Figure 2: Rear View Upgraded DigiVFO/DigiBrain

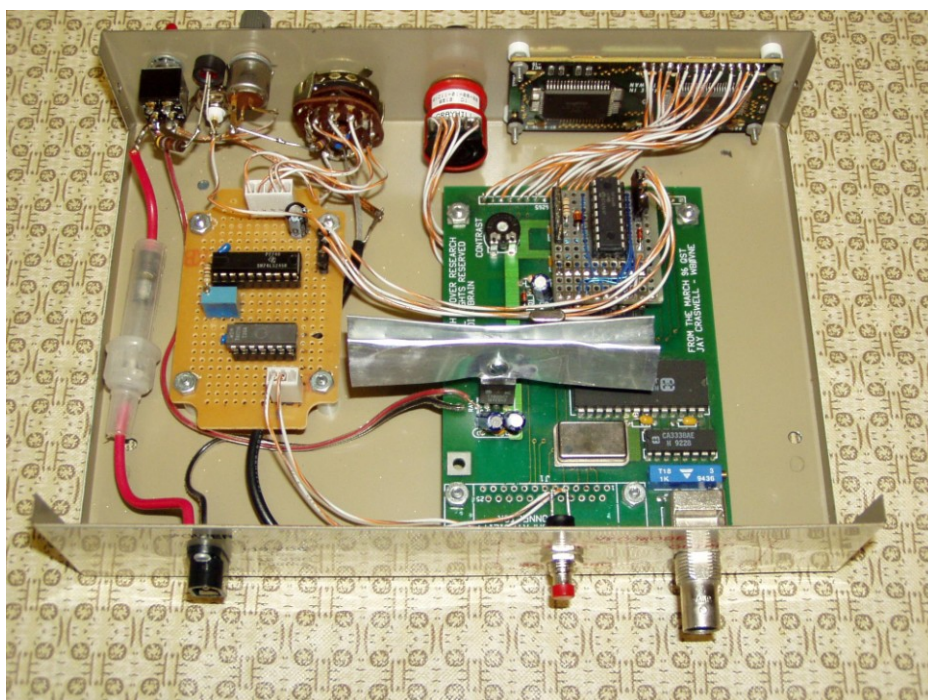**Figure 3: Internal View 1 Upgraded DigiVFO/DigiBrain**

Figure 4: Internal View 2 Upgraded DigiVFO/DigiBrain

With the new firmware and hardware installed; to set a VFO base frequency, one puts the mode switch to sine-wave, square-wave, positive pulse, or negative pulse, dials in the new desired "base" frequency they want for a particular radio's VFO range, and then pushes the rear panel "STORE BASE FREQ" push button switch. That loads the dialed in frequency to the "base" and the readout display puts up a message "NEW BASE STORED". Now when the front panel mode switch is set to VFO, the display will now read "FREQ:--.000.000" when at the bottom of the VFO range and the VFO frequency will be present on the rear panel BNC connector. As one moves up in frequency, the readout will then move up, such as, "FREQ:--.230.000". The dashes are present to indicate that the user needs to read the radio's band selection switch to determine the actual MHz value being operated on, such as 20 meters… the user would be on 14.230.000.

If the upgraded DigiVFO / DigiBrain is used as a general purpose signal generator the front panel mode switch is set to sine-wave, square-wave, positive pulse, or negative pulse and the waveform is available at the front panel BNC connector. The amplitude of the signal can be raised and lowered with the front panel Level control. If one wants the upgraded DigiVFO / DigiBrain to power up on a particular frequency, use the "STORE BASE FREQUENCY" push button on the rear panel to store the desired power up frequency.

73!, and enjoy your upgraded DigiVFO / DigiBrain.

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