

# Updating the PicoPak Clock Measurement Module Firmware

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The PicoPak Clock Measurement Module PIC16F1847 microcontroller firmware can be updated to correct problems and/or add new features. While that process is normally done by returning the unit to the factory, it is possible for a knowledgeable and properly-equipped end user to perform it in the field. This document describes the equipment, tools and software needed, and the steps required.

## • Equipment, Tools and Software

The following equipment, tools and software is required to update the PicoPak firmware:

1. PicoPak module to be updated.
2. Windows® PC, XP or later.
3. Microchip .hex file with the new firmware (plus any readme or other notes).
4. Microchip PICkit3 programmer.
5. PicoPak programming cable.
6. Two A/B USB cables.
7. Microchip MPLAB-X IDE program.
8. TeraTerm or other ASCII terminal program.
9. Medium size Phillips screwdriver.
10. Tweezers (optional).

A photograph of the PicoPak firmware programming setup is shown below:



The new PicoPak firmware .hex file can be obtained via e-mail from Hamilton Technical Services. It should be copied to the Windows desktop or other convenient place on the PC. The inexpensive PICkit3 programmer can be bought from Microchip. The free MPLAB-X program can be obtained from the Microchip web site. The free TeraTerm program can be found via a web search.

The programming cable uses the standard pinout arrangement as described in the PICkit3 documentation except for a 1x6 2mm (rather than 0.1") female connector that plugs into a mating connector on the PicoPak board. A set of individual M-F jumper wires could also be used.

## • PicoPak Firmware Updating Procedure

1. Disconnect the USB cable to remove power from the PicoPak module.
2. Open the PicoPak module. The PicoPak module can be opened by simply removing the two screws holding the front cover to the case, and sliding out the front panel along with the circuit board by pushing on the USB connector. It is not necessary to remove the SMA connectors or the rear panel.
3. Remove the jumper. There is a two-terminal jumper at the center of the board near the left edge that must be removed to program the PicoPak microcontroller. If available, a set of tweezers can be used to remove the jumper.
4. Connect the PICKit3 programmer to the PicoPak using a custom programming cable or leads. Pin 1 is closest to the edge of the board.
5. Apply power to the PicoPak module via its USB cable from the PC.
6. Launch the MPLAB IPE program.
7. Follow the instructions provided with MPLAB-X to program the PicoPak PIC16F1847 device from the .hex file. The general procedure is:
  - a. Select Device and Tool
    - Family: Mid-Range 8-bit MCUs
    - Device: PIC16F1847
    - Tool: Pickit3 with its S/N
  - b. Source
    - Hex filename (Browse for it)
  - c. Connect and Program Device
8. Remove power from the PicoPak module, disconnect the programming cable, and replace the jumper.
9. Reconnect the USB cable to the PicoPak module.
10. Launch TeraTerm or another ASCII terminal program. Establish communications with the PicoPak module using its virtual COM port set at 115,000 Baud, 8 data bits, no parity, 1 stop bit, and no flow control.
11. Send an "R" command to reset the PicoPak module. Note the new firmware version number. Note also that the S/N is 100, the default.
12. Read the actual module S/N on its rear panel. Send an "N=XXXX" command, where XXXX is the module S/N in hex (consult a decimal to hex table or suitable calculator as necessary).
13. Send an "N↵" command to confirm the correct S/N.
14. It may also be necessary to refresh the PicoPak OSCTUNE and Cal values.
15. Disconnect the USB cable from the PicoPak module.
16. Slide the PicoPak board into its cover using the bottom extrusion slot while aligning the USB connector in its rear panel opening as needed. Reinstall the two front panel screws.
17. The PicoPak is now ready for use with its updated firmware. Be aware that a new version of the PicoPak Windows® graphical user interface application may also be needed.

File: Updating the PicoPak Firmware.doc

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