

# APEX INSTRUMENTS, INC

## **XC6000 Firmware Upgrade Procedure**

### **Upgrading Firmware**

From time to time, Apex Instruments may release updated device firmware for the XC6000EPC console. These firmware upgrades may add additional functionality or capabilities to the console, and may be required in order to use the latest version of the monitor / control client software. If the XC6000 software displays a message regarding your firmware revision number, please contact Apex Instruments to get more information.

The XC6000EPC firmware may be programmed using a PC and the Apex Firmware Programming Cable. PLEASE NOTE: The drivers for the programming cable and the version of the XC6000 firmware most current at the time of shipment are installed along with the Apex software. Please install the Apex XC6000EPC software before attempting to upgrade the firmware.

The Apex Firmware Programming Cable uses a USB Serial Converter similar to the one in the main console. When connecting the Firmware Programming Cable to the PC for the first time, the Found New Hardware Wizard may appear.

Early revision program cables have a 6-pin Molex connector on one end, and a 9-pin D-sub connector on the other. These cables are supplied with a USB serial adaptor (usually made by Belkin.) Please follow the same directions as detailed above in Software Installation, directing the wizard to the “C: \Apex\F5U109 USB Serial Port Driver” folder. Once the drivers are installed, please re-open the Device Manager and note the COM number of the new serial port installed by the Apex Firmware Programming Cable.



**DB-9 Serial Plug**



**USB-A Plug**

For later revision programming cables with the 6-pin Molex connector and a 4-pin USB A connector on the other, please use the same steps as for connecting the XC6000 to the PC via USB. The later programming cables use the same USB converter as the XC6000 so no additional drivers are necessary. The COM port installed may not be the same as the XC6000 virtual COM port, so please re-open the Device Manager and note the COM number of the new serial port installed by the Apex Firmware Programming Cable.

## Important Notes About Upgrading Firmware:

The older versions of the XC6000 firmware lack several important new features of the current consoles. These include the ability to set alarms based on test conditions, the optional ability to sample at flow rates above 1 Lpm, and the provision for communication with the optional ModBus module. In addition, the calibration tables for the older versions are not immediately compatible with the newer versions, and some conversion must be performed. In addition, the XC6000 Modbus module may be upgraded to communicate over either ASCII or RTU protocols.

**To upgrade the XC6000 Modbus module only, please skip to the PROGRAMMING THE MODBUS MODULE section.**

Before upgrading your XC6000 firmware, please connect the console to your current software and make a note of the application and firmware version.



The application version is visible before the console is connected. Once the console makes connection, the firmware revision is displayed to the right of the application version number, separated by a dash: “80530-94.” Make a note of these version numbers.

Once connected, enter the Config / Utilities screen and then the Calibration screen.

## XC6000 Firmware Upgrade Procedure Cont.

Enter the word “enable” (no quotes) into the protected password space on the Calibration screen. Press the “Save to File” button. Choose a location for your saved table, and give it a unique name.

The screenshot shows the 'Calibration: Electric Energy - 049' interface. It is divided into several sections:

- Thermocouples:** A table with columns for Stack, Probe, Chiller, Aux, DGM A, DGM B, Trap, and Console. Rows show temperature values from 0°F to 2000°F.
- Vacuum:** Displays current values for CH A and CH B, along with low (Lo) and high (Hi) pressure limits in inHg.
- Mass Flow:** Displays current values for CH A and CH B across a range from 0 to 1900 sccm.
- Serial Numbers:** Fields for Console (XC6KEPC-049), DGM-A (8003162), and DGM-B (8003067).
- DGM Gamma:** Fields for DGM-A (1) and DGM-B (1).
- Buttons:** 'Save To File', 'Restore From', 'Exit / RESET', and 'Monitor Scr.'.
- Warning:** A yellow box with the text: "WARNING: Do not click on any button that you're not sure. Saving the wrong calibration value will directly affect the accuracy of the XC6000."

Annotations with arrows point to the 'Protected Password' field, 'Calibration Screen 2' button, and 'Save To File' button.

DGM Gamma

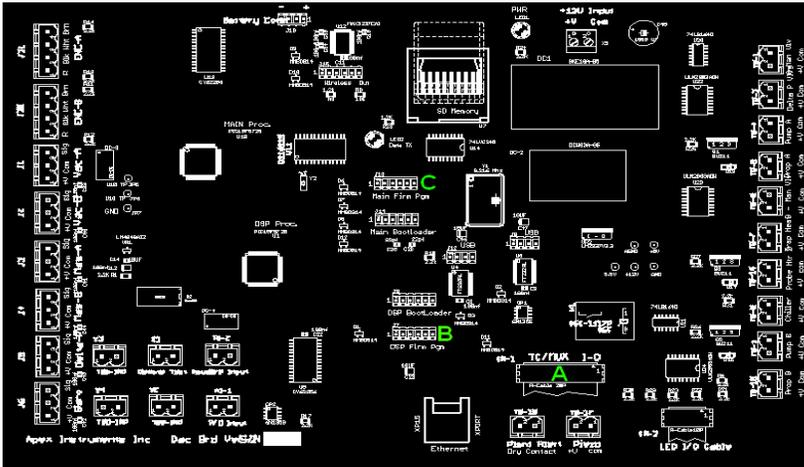
### Calibration Screen

## Programming the XC6000 Firmware

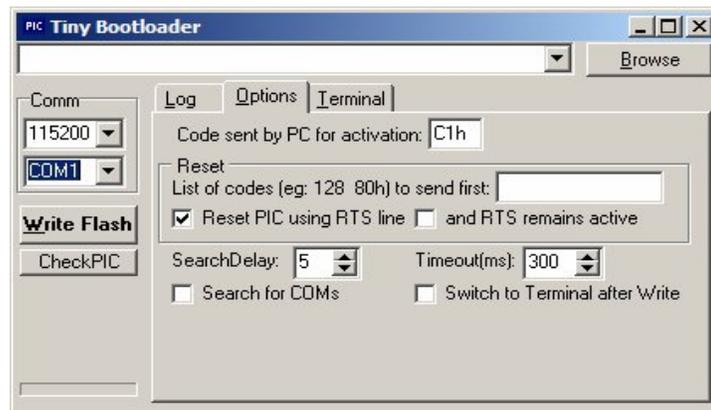
1. Ensure XC6000EPC console is powered off. Disconnect any connecting cables from the console, and remove the console from its rack enclosure. Remove the nine (9) screws from the top of the unit and the six (6) screws from the outside left and right edges of the rear panel, and open the lid of the console by lifting it up from the front. Please note: portable case units must unlatch the front panel retaining screws and fold down the front panel to access the DAC board.
2. Units installed in an environmental enclosure may have a separate firmware programming connector located on the front panel of the unit. For units in an environmental enclosure, please connect the programming cable to the front-panel connector, and proceed to Step 4.
3. Upgrading the XC6000EPC console *from* version 070904x-46 or similar to a higher firmware revision (above 46) will require the DSP processor to be programmed as well as the Main processor. If your console does not require a DSP firmware upgrade, please skip to step 15.

### Programming the DSP Processor

- Remove the 20-pin ribbon cable from the XC6000EPC TC/MUX board.  
*Reference: Figure DAC-1 below, item A.*
- Connect the 6-pin Molex connector on the end of the programming cable to the DAC board header labeled **DSP Firm Pgm**  
*Reference: Figure DAC-1 below, item B.*



- Power on XC6000EPC console
- Navigate to the install location *default: C:\Apex\Firmware*
- Execute **dl.exe**
- The Tiny Bootloader window will launch



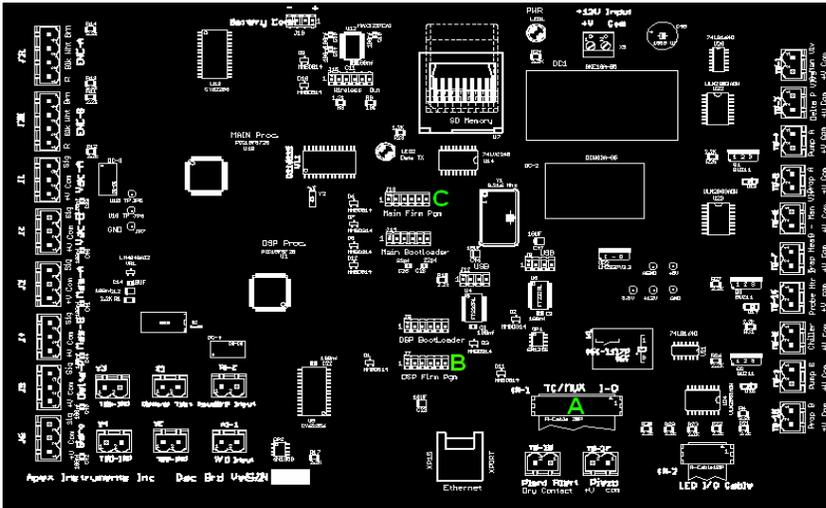
**DL.EXE - Tiny Bootloader**

- Click Browse and select ApexDSP.hex from the current directory
- Select the following options:
  - Comm: 115200
  - Comm (use the COM number noted earlier)
  - Enable Options -> Reset PIC using RTS line
- Click Write Flash
- When update is complete, Log window will read **Write OK**. The writing process should take between 3 and 6 seconds.
- Power off XC6000EPC console and remove 6-pin Molex connector on the end of the programming cable from the DAC board.

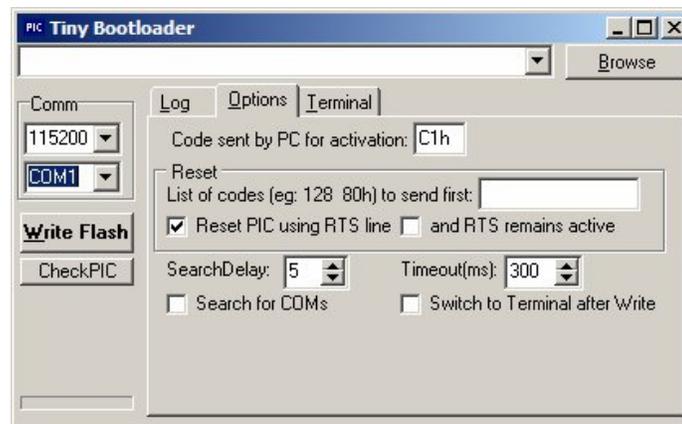
## XC6000 Firmware Upgrade Procedure Cont.

### Programming the Main Processor

15. Connect the 6-pin Molex connector on the end of the programming cable to DAC board header labeled **Main Firm Pgm**  
*Reference: Figure DAC-1 below, item C.*



16. Power on XC6000EPC console
17. Navigate to the install location  
*default: C:\Apex\Firmware*
18. Execute **dl.exe**
19. The Tiny Bootloader window will launch



**DL.EXE - Tiny Bootloader**

20. Click Browse and select ApexMAIN.hex from the current directory
21. Select the following options: (same as for DSP Processor)
  - Comm: 115200
  - Comm (use the COM number noted earlier)
  - Enable Options -> Reset PIC using RTS line
22. Click Write Flash
23. When update is complete, Log window will read **Write OK**. The writing process should take between 18 and 25 seconds.

## XC6000 Firmware Upgrade Procedure Cont.

24. Power off XC6000EPC console and remove 6-pin Molex connector on the end of the programming cable from the DAC board.
25. Replace the 20-pin ribbon cable from the TC/MUX board (item A above)
26. Power on the XC6000EPC console and connect using the XC6000EPC MercSampler application. The version number of the console should appear in the upper right of the application window once connected. Ensure that the version number that the console reports matches the version number of the supplied firmware update.

### After a successful upgrade:

Once the console has been upgraded, the calibration table will need to be converted to the new format. Connect to the console and enter the Config / Utilities screen. Press the “Set Clock” button to ensure that the XC6000 has the correct time and date set. Close the Config / Utilities screen and observe the date and time on the Main screen to make sure the time and date are correct and that the time is advancing. Then re-enter the Config / Utilities screen and go to the Calibration screen.

On the Calibration screen, enter “enable” (no quotes) into the protected password screen. Immediately proceed to Calibration Screen 2.

The screenshot shows the 'XC6000-Calibrations Screen 2 of 2' window. It features several data entry sections:

- Delta P:** Includes fields for Current Value (30), ADC Value (Lo: 30, Hi: 6175), and [0-5 inches] (0 inH2O, 5 inH2O).
- Barometric Pressure:** Includes fields for Current Value (5816), ADC Value (3880), and inches (30.3 inHg).
- External Inputs:** Includes an 'Input Type' dropdown set to 'Current' and three sensor configurations for Flow Rate, Moisture, and another sensor, each with Voltage and Current settings.
- Heaters Porportional Adj. (max % Power):** A table with 8 rows and 4 columns: Trap Delta (°F), Trap Max % Pwr, Probe Delta (°F), and Probe Max % Pwr. Values range from 1/40 to 100/99. Below the table are 'Heater->FrontLED', 'Load', and 'Save' buttons. A 'Single Heater Unit' checkbox is also present.

Navigation buttons at the bottom right include 'Accept' and 'Return'. Arrows from the right side of the image point to the 'Load', 'Save', 'Accept', and 'Return' buttons.

### Calibration Screen 2

Press the “Load” button on the Heaters Proportional Adj. box. Load the heater table provided to you in the update location (the filename will have a .cal\_heaters extension.) Press “Accept” and then click on “Return” to go back to the first page of the calibration screen.

## XC6000 Firmware Upgrade Procedure Cont.

On the first page, press the “Restore From” button and load the previously saved calibration table. The application will fill in mass flow calibration values greater than 1 liter per minute. Please keep in mind that the flow rate may not be accurate above 1 liter per minute unless a calibration is performed on the console. However, if the console is used for lower flow rates (such as the typical flow rates used in Appendix K sampling) then the previous calibration values will be correct for these flow rates.

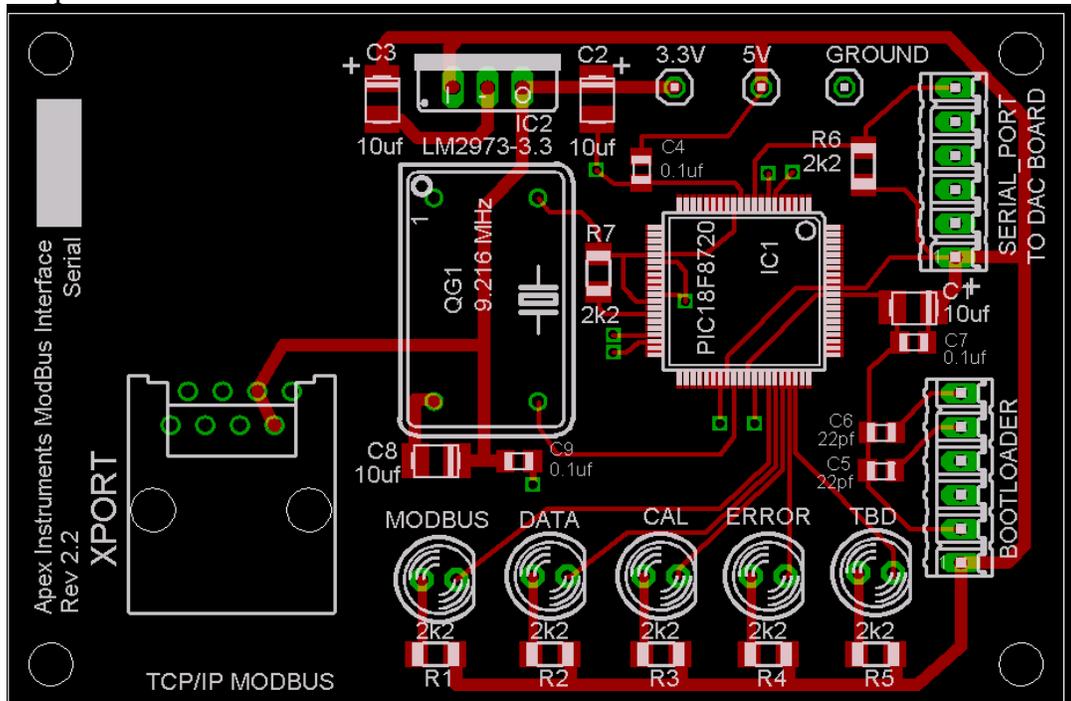
Once the calibration table is loaded, enter “Gamma” (no quotes, capital G) into the password field. On the lower left of the calibration screen, enter the dry gas meter gamma (“Y”) from the dry gas meter calibration sheet. The XC6000 will correct for the meter error automatically.

Enter “enable” (no quotes) in the password field and press the “Save” button. Once the table is saved, press “Save to File” and save a copy of the new table with a new filename. Press the Exit / Reset button to reset the console and apply the new calibration factors.

Older test profiles may cause errors when used with newer firmware. To avoid this, create new profiles for performing sample runs. If an older profile must be used, please step through the profile one screen at a time (press the “Next” button) and save the profile with a new filename. The profile should be automatically converted to the newest version.

## Programming the XC6000 Modbus Module Firmware

1. Power off the XC6000 console
2. Remove the 6-pin Molex connector from the Modbus SERIAL\_PORT (A) and place it on the BOOTLOADER (B) connector. This supplies power to the Modbus module during programming.
3. Place the XC6000 Firmware upgrade cable on the Modbus SERIAL\_PORT (A) and power on the console

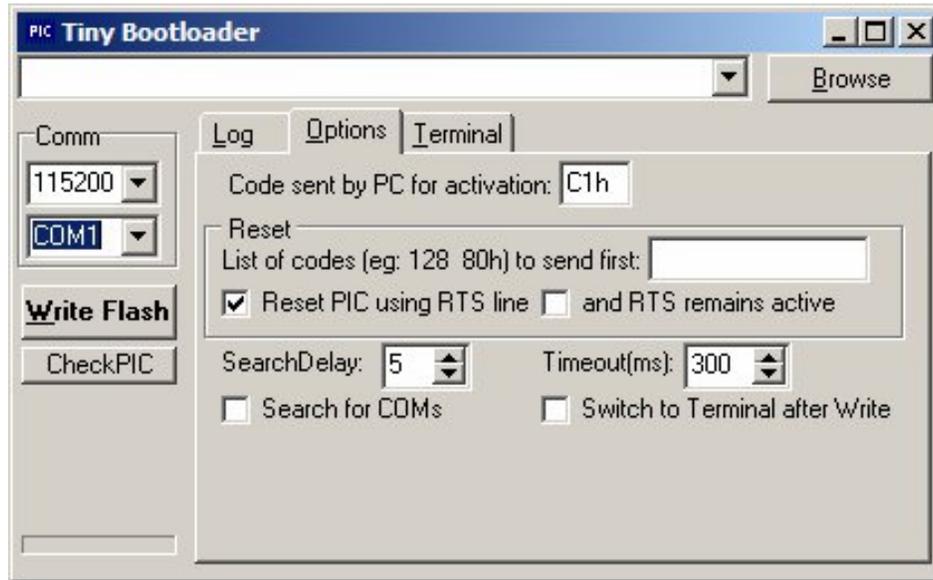


**A**

**B**

## XC6000 Firmware Upgrade Procedure Cont.

4. Navigate to the install location  
*default: C:\Apex\Firmware*
5. Execute **dl.exe**
6. The Tiny Bootloader window will launch



**DL.EXE - Tiny Bootloader**

7. Click Browse and select ApexModbus.hex from the current directory
8. Select the following options:
  - Comm: 115200
  - Comm (use the COM number noted earlier)
  - Enable Options -> Reset PIC using RTS line
9. Click Write Flash
10. When update is complete, Log window will read **Write OK**. The writing process should take several seconds.
11. Power off XC6000EPC console and remove 6-pin Molex connector on the end of the programming cable from the Modbus board.
12. Replace the Modbus serial cable on the SERIAL\_PORT and power on the console. After the initial console warm-up (front panel lights stop blinking,) the blue DATA light should flash, and the yellow CAL light should be illuminated.
13. The console must be set to communicate with the Modbus module using the desired protocol. Enter the Calibration screen by opening the Apex XC6000 application, connecting to the XC6000 console, and pressing “Config/Utils” -> Calibration.
14. Enter “enable” into the Password field at the upper right of the Calibration screen, and press the “Calibration Screen 2” button. On Screen 2, select the “Modbus ASCII” communication button if ASCII is desired, or unselect it if RTU is desired. The older revision Modbus boards (below 2.0) shipped configured as ASCII.
15. Press “Accept” on Calibration Screen 2, and then “Save” on the main Calibration screen. Press Exit and close the XC6000 application.

## XC6000 Firmware Upgrade Procedure Cont.

16. The Modbus device server must now be set to use the correct protocol. Connect to the device server by connecting to the XC6000 internal router (use the front panel Ethernet connection.) Start LANTRONIX DEVICEINSTALLER (available at <http://www.lantronix.com/device-networking/utilities-tools/device-installer.html>)
17. Connect to the XPORT at 192.168.1.3 only. Select Telnet configuration from the Device Installer menu and press the “Go” button.
18. Press ENTER to start configuration. Press “2” to access the protocol selection.
19. Press ENTER to skip the “Attached Device” option, and then press either 1 for RTU or 2 for ASCII. Press ENTER to skip “Interface Type” and ENTER again to skip “Serial Parameters.”
20. Press “S” to save the settings. Once settings are saved, power down the XC6000 console and power it up again. The Modbus module is now configured.

**Note: If you encounter any problems with this procedure please contact Apex Instruments at 919-557-7300 and ask for technical support on your XC6000 mercury sampler.**

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