

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.

Calibration: Electric Energy - 049

Thermocouples

Current Value >	Stack	Probe	Chiller	Aux	DGM A	DGM B	Trap	Console
0°F	168	617	180	184	173	176	605	172
100°F	227	231	226	224	213	221	229	234
200°F	423	427	423	423	409	420	422	432
300°F	612	616	612	614	597	610	609	622
400°F	796	802	797	802	782	798	792	808
500°F	986	992	989	997	973	991	981	1000
700°F	1376	1381	1378	1392	1360	1384	1366	1391
1000°F	1972	1978	1976	1997	1958	1986	1955	1991
1300°F	2566	2570	2568	2598	2549	2585	2543	2587
1600°F	3143	3147	3147	3183	3125	3166	3112	3166
2000°F	3874	3878	3880	3926	3855	3906	3836	3901

Click on button to set Value to the current reading for that

Vacuum

Current Value	CH A	CH B
Lo	1534 0	1505 0 inHg
Hi	4801 14.2	4827 15.2 inHg

Mass Flow

Current Value >	CH A	CH B
0	1716 0	1684 0 sccm
200	2971 275	2971 275
400	3530 452	3530 452
600	4059 661	5207 601
800	4364 808	5751 801
1000	4673 945	6375 990
1100	5039 1140	6500 1101
1300	5400 1335	6750 1301
1500	5638 1518	7000 1501
1700	5902 1721	7250 1701
1900	6142 1921	7500 1901

Serial Numbers

Console: XC6KEPC-049

DGM-A: 8003162

DGM-B: 8003067

DGM Gamma

DGM-A: 1

DGM-B: 1

Pumps

CH A + CH B +

Propor. Vals.

CH A + CH B +

0 - 0 - 20 - 20 -

Porpor. Vals. Adj. -> Coarse Fine

Vacuum

Current Value: 1474

Lo: 1534 0

Hi: 4801 14.2

Mass Flow

Current Value: 1717

0: 1716 0

200: 2971 275

400: 3530 452

600: 4059 661

800: 4364 808

1000: 4673 945

1100: 5039 1140

1300: 5400 1335

1500: 5638 1518

1700: 5902 1721

1900: 6142 1921

DAC Board ID: 456C-6563-7472-6963

User Assigned Console Name: Electric Energy - 049

Protected Password:

Calibration Screen 2

Monitor Scr.

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.

Save To File

Restore From

Save

Exit / RESET

Reset Console on Exit

DGM Gamma

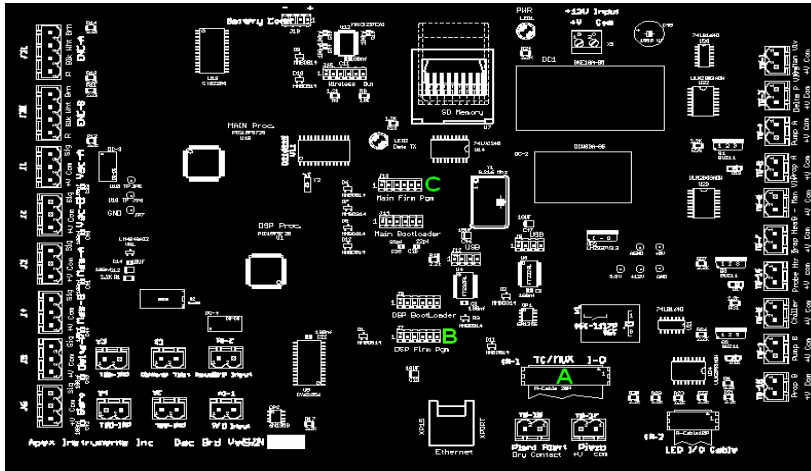
Calibration Screen

Programming the XC6000 Firmware

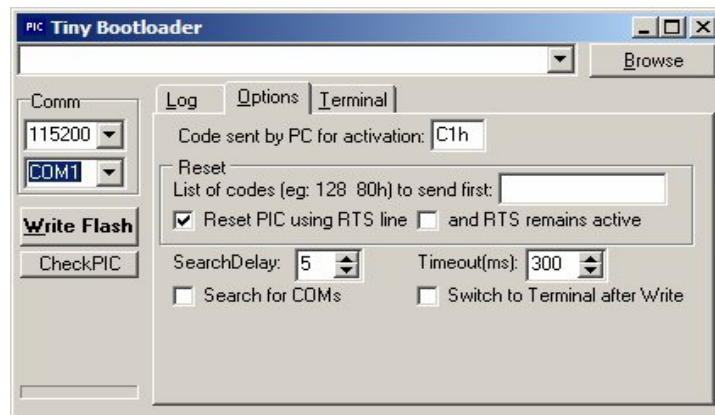
1. Ensure XC6000EPC console is powered off. Disconnect any connecting cables from the console, and remove the console from its rack enclosure. Remove the nine (9) screws from the top of the unit and the six (6) screws from the outside left and right edges of the rear panel, and open the lid of the console 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

4. Remove the 20-pin ribbon cable from the XC6000EPC TC/MUX board.
Reference: Figure DAC-1 below, item A.
5. 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.



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



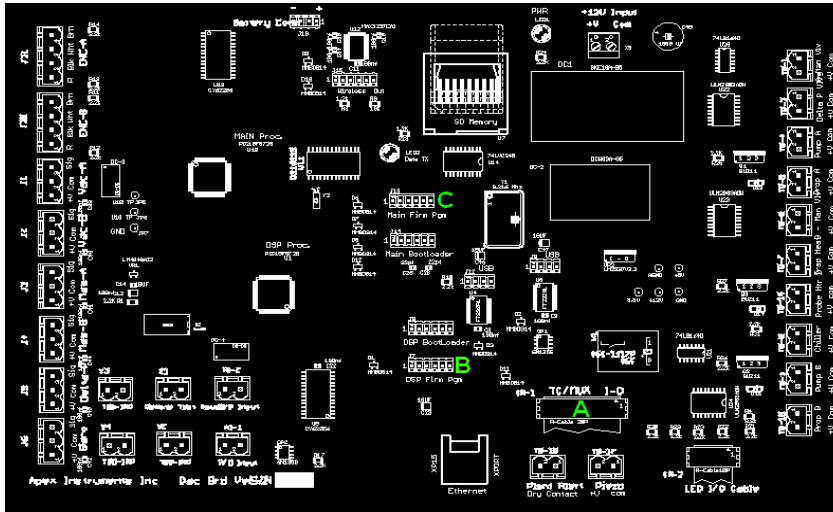
DL.EXE - Tiny Bootloader

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

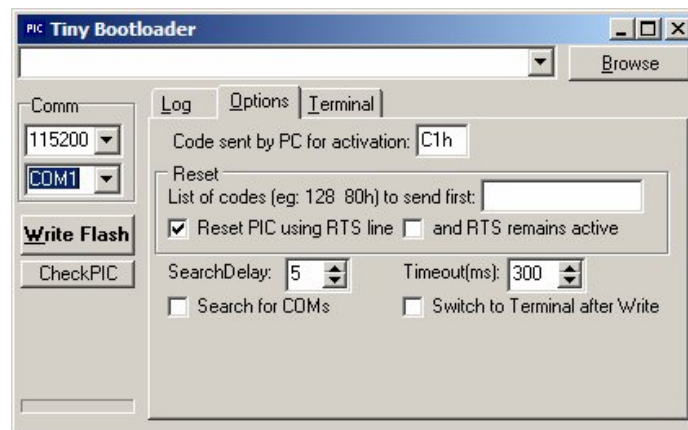
XC6000 Firmware Upgrade Procedure Cont.

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.

XC6000-Calibrations Screen 2 of 2

Delta P

Current Value	ADC Value	[0-5 inches]
Lo	30	0 inH2O (x.xx)
Hi	6175	5 inH2O

Barometric Pressure

Current Value	ADC Value	inches
5816	3880	30.3 inHg (xx.xx)

External Inputs

Input Type: **Current** <-- Change

Flow Rate:

Current Value	Voltage	Current
0V	1	4mA
10V	3977	20mA

Moisture:

Current Value	Voltage	Current
0V	1	4mA
10V	4822	20mA

Heaters Proportional Adj. (max % Power)

	Trap	Probe		
	Delta (°F)	Max % Pwr	Delta (°F)	Max % Pwr
1	1	40	1	40
2	3	50	3	50
3	6	60	6	60
4	12	65	12	65
5	25	70	25	70
6	50	75	50	75
7	75	80	75	80
8	100	99	100	99

Heater->FrontLED ☐ Single Heater Unit

Load Button Save Button

Accept Button Return Button

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.

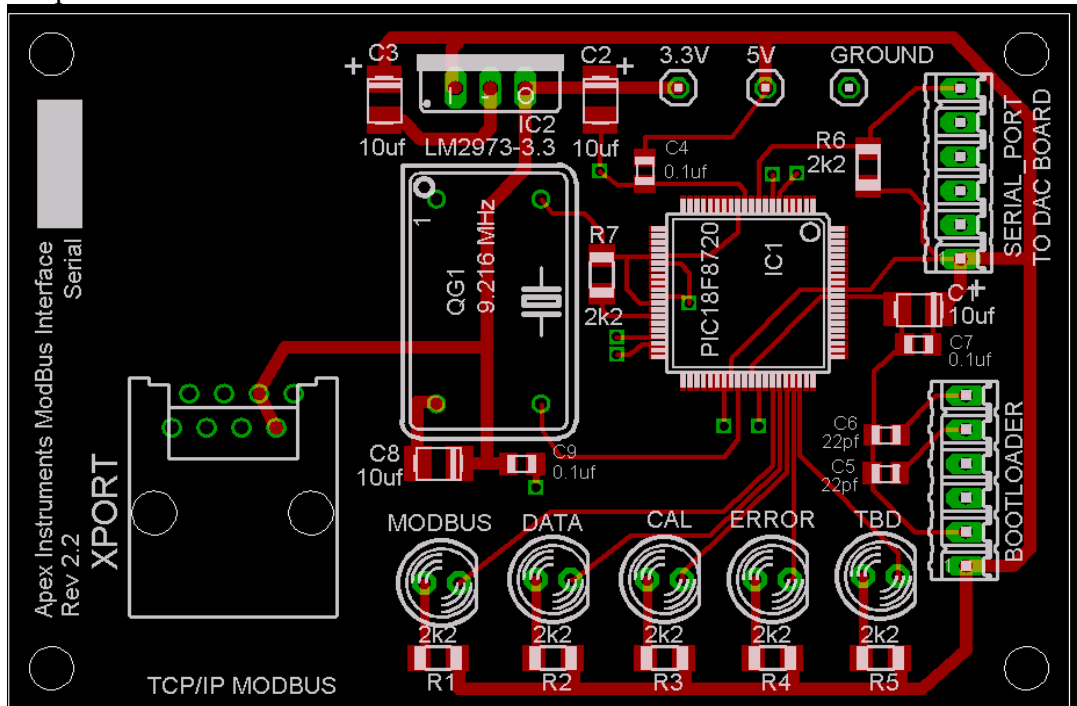
Once the calibration table is loaded, enter “Gamma” (no quotes, capital G) into the password field. On the lower left of the calibration screen, enter the dry gas meter gamma (“Y”) from the dry gas meter calibration sheet. The XC6000 will correct for the meter error automatically.

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

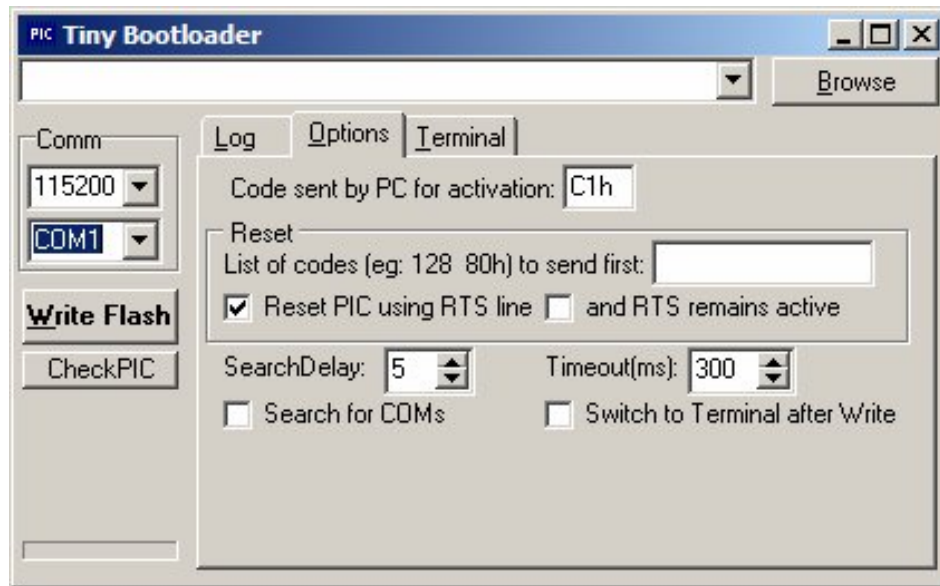


A

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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