Gamma Vacuum
QPC Controller Firmware Download Procedure
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Purpose

To explain the process of downloading firmware to QPC controller.

Scope

Applies to Gamma Vacuum QPC controller running Loader version 1.1.

Section 1
Architecture of the QPC controller

QPC contains two separate programs:
1. Loader program. This is the tool used for updating controller's firmware. This program is installed at the factory.
2. Ion pump control program. This is normal operation environment program.

Section 2
QPC firmware download process

In order to download new firmware to QPC controller, the controller must load up and run the loader program.

Note:
If firmware download is to be performed over Ethernet, using TFTP server, one should configure TFTP server address prior to starting the loader program. See section 5.

There are three ways to achieve this:
1. Via touch screen
From the home screen, go to MENU, FIRMWARE UPGRADE, and press 'Start loader program'.
Cycle power with front panel switch and loader program will start up at unit power up.

2. Via hardware switch located on the controller's top cover
Power up QPC controller while holding down the hardware switch.

3. Via serial port command
Issue serial command CMD_SYS_SET_FIRMWARE_DOWNLOAD (0x8F).
After command is issued, cycle controller power and the loader program will start up at power up.

Section 3
QPC Firmware Download Sequence Chart

Section 4
Downloading QPC firmware over serial connection using Xmodem or Ymodem file transfer protocols

If the loader program is invoked using via touch screen or serial command, auto firmware download over Ethernet is attempted in 30 seconds after loader program starts up.
User can cancel auto download by pressing the 'Cancel' button on the screen.

If loader program is invoked via hardware switch, user is presented with an option to calibrate touch-screen and auto firmware download process is not attempted.

1. Connect computer to QPC controller using the cross-over (null-modem) serial cable.
2. Start Terminal Emulation Program (TEP) of your choice on the computer. (Example here is done using TeraTerm program that is available on the internet)
3. Make sure the comm. port parameters are set to 115200 baud rate, 8 data bits, no parity, 1 stop bit, no flow control.
4. Select serial connection by pressing on 'Serial Interface' button.
5. To update CPU1 firmware, press 'Update CPU1 Firmware' button.
6. The characters “D:C” should appear on the TEP window.
If characters do not appear, there is a problem with either the TEP configuration or serial communication link.
Verify connection and communication port setup parameters.
7. The character “C” will appear in (approximate) 2-second intervals on the TEP window.
This is an indication that the QPC is ready and waiting to accept the new firmware image.
The transfer of the firmware image file can be performed using either
Ymodem or Xmodem file transfer protocols. Ymodem transfer is faster.
8. From the TEP window, select 'File', 'Transfer', 'Ymodem', 'Send' option.
Select CPU1 firmware image file and press 'Ok' to initiate the file transfer.
9. When file download is completed, the QPC status line will indicate successful download.
10. If needed, repeat step 8 to update CPU2, HV board 1, and HV board 2 firmware using corresponding firmware files.
11. When competed, cycle controller power. Upon power up controller will run new firmware.

Section 5
Downloading QPC firmware over Ethernet connection using TFTP file transfer protocol

Prior to starting QPC loader program, one should configure TFTP server IP address where software image files are hosted.

This is can be done in two ways:
a. Using front panel
From the main screen, go to 'Menu', 'Firmware Upgrade'. Set TFTP server IP address.
b. Using serial command
Command code 0x4F sets the IP address of the TFTP server to be used during download process.
For example, '4F x.x.x.x' where 'x.x.x.x' is the IP address of the TFTP server that will host firmware image files.

Note:
Firmware files must be named per below, otherwise, Ethernet firmware download process will fail.
CPU1 firmware file – 'qpc_cpu1.bin'
CPU2 firmware file – 'qpc_cpu2.bin'
HV board firmware file – 'qpc_hvbd.bin'
Note:
DHCP server must to be running on the network in order for controller to acquire valid IP address.

After the TFTP server IP address is configured, controller can start the loader program.

If the loader program is invoked via touch screen or serial command, the auto firmware download over Ethernet is attempted in 30 seconds after power up.
User can cancel auto download by pressing the 'Cancel' button on the screen.

If loader program is invoked via hardware switch, user is presented with an option to calibrate touch-screen and auto firmware download process is not attempted.

1. Select Ethernet interface by pressing on 'Ethernet interface' button.
2. Select TFTP server IP address. Two options are available:
 Option 1 - Using user configured address
 Option 2 - Using DHCP acquired address. The TFTP server address is set to match controller's IP address acquired from DHCP server where last octet is changed to 199.
3. Start download process by pressing on the 'Start' button.

For question or comments contact Gamma Vacuum at:

Gamma Vacuum
2915 133rd Street West
Shakopee, MN 55379
USA
(t) 800.237.3603
(p) 952.445.4841
(f) 952.445.7615
www.gammavacuum.com
info@gammavacuum.com
Creating the purest vacuum environments on earth.