

Gamma Vacuum

MPCq Controller Firmware Download Procedure

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Version 1

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Purpose

To explain process of downloading firmware to MPCq controller.

Scope

Applies to Gamma Vacuum MPCq controller running Bootloader version 1.2.

Section 1

Architecture of the MPCq controller

MPCq contains two separate programs:

1. Bootloader program.

This is 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

Starting bootloader program

In order to download new firmware to MPCq controller, the controller must be running the bootloader program.

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 bootloader program will start up at unit power up.

2. Via hardware switch located on the controller's top cover

Power up MPCq controller while holding down the switch.

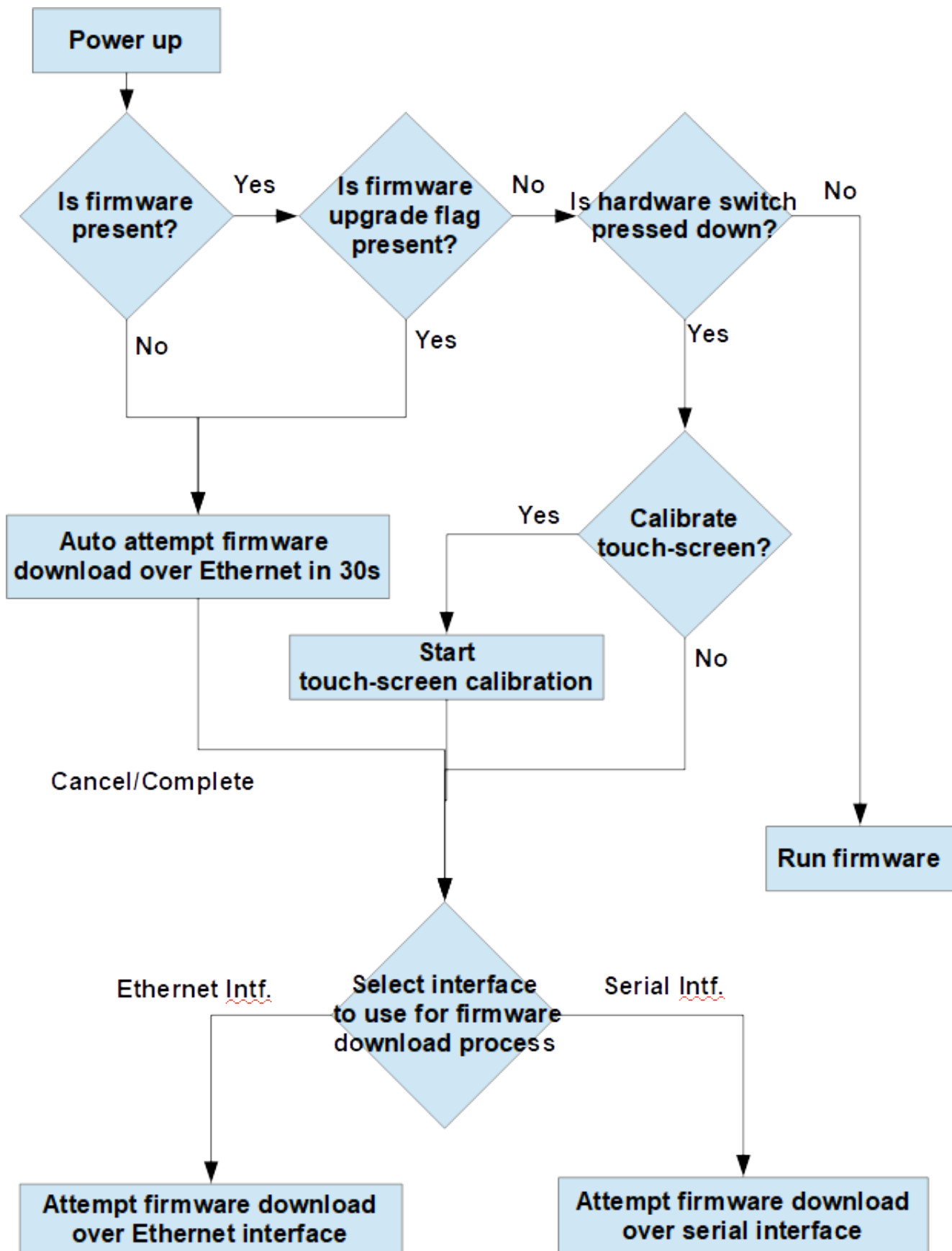
3. Via serial port command

Issue serial command CMD_SYS_SET_FIRMWARE_DOWNLOAD (0x8F).

After command is issued, cycle controller power and the bootloader program will start up at power up.

Section 3

Firmware Download Sequence Chart



Section 4

Firmware download over serial connection using Xmodem or Ymodem file transfer protocols

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

If bootloader 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 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, available on the internet)
3. Ensure TEP comm. port parameters are set to 115200 baud rate, 8 data bits, no parity, 1 stop bit, no flow control.
4. On the controller 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 in the TEP window. This is an indication that the controller 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, controller status line will indicate successful download.
10. If needed, repeat step 8 to update CPU2 firmware using corresponding firmware file.
11. When completed, cycle controller power. Upon power up controller will run new firmware.

Note, MPCq controller HV boards do not require firmware.

Section 5

Firmware download over Ethernet connection using TFTP file transfer protocol

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

This 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, issue '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'

Note:

DHCP server must be running on the local network in order for controller to acquire valid IP address.

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

If bootloader program is invoked via touch screen or via 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 IP 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. Initiate download process by pressing on the 'Start' button.

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