

Upgrading XL4 RTU firmware from Q04 to Q04 *Plus* v1.2

Q04 Plus is a major release of firmware for the XL4 RTU incorporating a real-time operating system. This application note defines the procedure for upgrading an existing XL4 RTU to use Q04 Plus firmware.

The upgrade process is different to updating firmware in an XL4 Plus RTU, which is defined in the XL4 Plus RTU User manual.

Firmware upgrades to existing XL4 RTUs can be undertaken using existing versions of the configuration software – Workbench (version 1.9.8 or later). Q04 *Plus* uses a new RTU configuration file paradigm which is only compatible with versions of Workbench version 2.0.0 or later.

For currently deployed RTUs the recommended approach is to use Workbench to undertake the firmware upgrade then upgrade Workbench if necessary to version 2.0.0 or later in order to configure the RTU. The upgrade process preserves critical settings such as calibration data of analogue i/o and the electronic serial number (ESN) of the RTU.

Q04 *Plus* also features the ability to perform self-tests at boot time (when the RTU is powered up). In this document, we provide a brief overview of tests that you may wish to run to check the operation of your RTU.

Workbench can be downloaded from the QTech web site here:

<https://qtech.co.nz/product/workbench/>

If you do not have Microsoft .NET framework installed on your PC we recommend you download and install the bundled version of Workbench from the site.

It is assumed that readers of this document are familiar with the operation and installation of the XL4 and Workbench software. If you are new to the XL4 product range, please read the user manual first.

A procedure for rolling back the firmware is also provided.

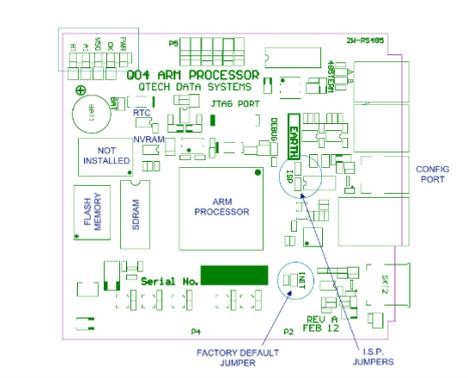
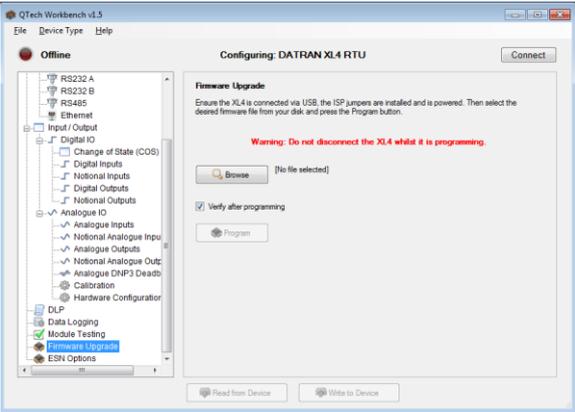
Equipment required:

- ❖ Workbench.
- ❖ XL4 RTU
- ❖ USB Cable (type A-B)
- ❖ DC Power supply and cable
- ❖ Q04 *Plus* Bootloader firmware (.hex) file (locate in a folder on the PC)
- ❖ USB drive (formatted as FAT) containing Q04 *Plus* Application firmware file and MD5 validation file (.elf + .md5)
- ❖ (optional) DIP switch jig for setting digital inputs on and off (not supplied).
- ❖ (optional) LAN patch cable if access to a local area network running DHCP services is available

The firmware application file, bootloader file and message digest checksum file (MD5) are distributed by QTech.

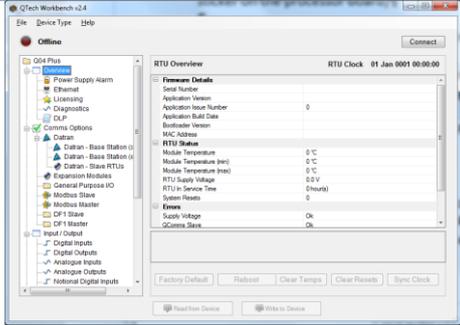
Upgrading the firmware

Procedure

Step	Procedure	Note
1	Power on the XL4 and connect Workbench via USB. Select DATRAN XL4 RTU from the workbench device type menu. Click connect to connect to the RTU if necessary.	
2	Ensure that any RTU Datalogging data on the RTU has been retrieved as it will be erased by this process	
3	Check that Workbench can read a valid serial number from the RTU. The presence of the 4 numbers in ASCII is one of the things that the Bootloader uses for detecting that RTU was previously running the old (Q04) firmware.	
4	(optional step) Check the analogue calibration factors in Workbench. The Bootloader will read and convert these into values stored in a JSON format configuration file on the RTU.	Later the values in the config file can be checked and differ from that noted in WB at this stage the unit may need recalibrating.
5	Close or disconnect Workbench, depower the RTU, unscrew and remove the RTU case cover, and <u>insert the two ISP jumpers</u> .	
6	Power up the RTU and run Workbench (No need to “connect”— just select device type as XL4 if needed) within Workbench.	
7	Go to the Firmware upgrade section of Workbench, browse to the bootloader firmware file, select it then press Program to flash the RTU with the selected file. At this stage if successful workbench will display a message and the RTU will flash the ERR led to indicate that the bootloader cannot yet find the application to boot. If the process fails at this step then: remove the ISP jumpers, cycle the power on the RTU, close then reopen Workbench,	

Step	Procedure	Note
	select device type as XL4 if necessary, in Workbench, Press Connect. Insert the ISP jumpers, repeat the instructions at the start of this section (7).	
8	Close Workbench and <u>remove the ISP jumpers</u> .	
9 (optional step)	<p>At this point the user can use the bootloader to check the FLASH and SDRAM integrity.</p> <p>These actions are triggered by first having <u>inserted the INIT jumper</u> (aka factory default jumper), plus a combination of RDI switches:</p> <p>ALWAYS REMOVE THE INIT JUMPER AFTER CONDUCTING SELF TESTS</p> <p>Activating a test will illuminate the corresponding LED on the digital input (RDI) bank.</p> <p>If the test/action “Passed” then the corresponding RDO LED will be lit after the test/action.</p> <p>When tests are executing the bank of status LEDs will flash in sequence to show the test is in progress.</p> <p>Grounding the input (assert low) selects the test.</p> <ol style="list-style-type: none"> RDI1 – Test SDRAM RDI2 – Test FLASH RDI3 – Test USB Memory Stick RDI7 – Erase the FLASH RDI8 – Erase the NVRAM <ul style="list-style-type: none"> - Set the desired switch settings (INIT jumper inserted) - repower the RTU to initiate tests. - When tests are complete the ERR led will flash. - Execute the SDRAM and FLASH tests (optional) - Do not erase the FLASH at this point as it will be reformatted anyway. - Do not erase the NVRAM, that will make the RTU lose its serial number and calibration factors, this is not advised unless those values are subsequently found to be corrupted. 	<div> </div> <p style="text-align: center;">Switch jig</p> <p>A switch jig is not required if you simply wire a RDI to the ground pin (G) on the RTU.</p> <p style="text-align: center;">Contact QTech if serial number becomes corrupted.</p> <p style="text-align: center;">Always remove the INIT jumper after performing self-tests otherwise self-test functions may be inadvertently conducted when the digital input harness is reconnected and the device repowered.</p>

Step	Procedure	Note
10 (only required if step 9 has been followed)	Turn all digital inputs off (negate) and/or remove switch jig <u>Remove the INIT jumper</u>	
11	Insert the USB drive containing the application firmware into the USB port on the RTU. The firmware must be stored in the root folder of the USB drive. <u>The USB drive must be formatted as FAT32.</u> Repower the RTU to commence programming. The bootloader will indicate that it is flashing (programming) the application firmware by illuminating the display board LEDs (in a scanning sequence). Note that the Bootloader may need to reformat the FLASH, which can take several seconds (approx. 10s). There is no LED activity during this time, so be patient and don't repower the RTU during this time.	<p>DO NOT REMOVE POWER FROM THE XL4 DURING THE PROGRAMMING PROCESS.</p> <p>The Status LEDs will flash in sequence to indicate programming is in progress.</p> <p>Note. If you have trouble upgrading the application with a large USB drive (e.g. 32 GB or more) try using a smaller USB 2.0 8GB drive or similar, formatted FAT32.</p> <p>NOTE. IT IS NORMAL AFTER REPROGRAMMING TO SEE THE ERROR LED FLASH A NUMBER OF TIMES</p>
12	Visually Check LED operation. The CPU OK LED will fade on /off MU led will be on. The ERR led will indicate any additional fault codes. NOTE. This is normal because for example, at this stage a DLP will not be loaded so this will be the most likely error code being shown. IMPORTANT. If the ERR led flashes rapidly this indicates that the RTU does not have a valid license. It does not mean that the device has failed to upgrade correctly. Contact QTech support to be issued a licence then using QTech workbench write the new licence to the RTU and repower the RTU to remove the error condition. (see below).	<p>If successfully flashed the Application should boot – the indication of this is that the CPU OK LED fades on and off (instead of blocking as per Q04 firmware). If there was a fault then the CPU LED will be off, with the ERR LED indicating an error code.</p> <p>The licencing system and features for Q04 differ in Q04 <i>Plus</i> so it will be normal for the license error code to be displayed. It does not indicate a hardware fault but does indicate an additional process to follow to update the RTU license.</p>
13	Remove the USB Drive.	<u>Do not leave it in</u> otherwise the next time the RTU reboots it will attempt to re-flash the firmware.
14	Note down the name of the XL4 usually in the form Q04-xxxx or XL4-xxxx (e.g. XL4-1008) (usually printed on a sticker on the processor board) Replace the XL4 case cover and screw together.	The name can be used for additional checks.

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15	From this point on you must install and operate Workbench 2.0.0. or later in order to configure the device.																																							
16	<p>Re-Connect the USB cable to the RTU and PC. Power on the RTU. Open Workbench.</p> <p>By default, it selects the XL4 <i>Plus</i> RTU device type to configure but if not then select “Datran XL4 <i>Plus</i> RTU” from the device type menu. The device type is displayed at the top of the window.</p> <p>Click Connect</p> <p>Select the Overview category from the category tree on the left side of the window. Verify the serial number of your RTU is displayed.</p> <p>If it is not displayed then the unit Serial number needs to be reprogrammed. Contact QTech for assistance.</p>	 <p>The screenshot shows the 'RTU Overview' window in QTech Workbench v2.4. The window title is 'RTU Overview' and the status is 'Offline'. The 'RTU Clock' is '01 Jan 0001 00:00:00'. The 'Overview' category is selected in the left-hand tree. The main area displays the following information:</p> <table border="1"> <thead> <tr> <th colspan="2">RTU Overview</th> </tr> </thead> <tbody> <tr> <td colspan="2">RTU Clock 01 Jan 0001 00:00:00</td> </tr> <tr> <td colspan="2">RTU Details</td> </tr> <tr> <td>Serial Number</td> <td></td> </tr> <tr> <td>Application Name</td> <td></td> </tr> <tr> <td>Application Issue Number</td> <td>0</td> </tr> <tr> <td>Application Build Date</td> <td></td> </tr> <tr> <td>Bootloader Version</td> <td></td> </tr> <tr> <td>MAC Address</td> <td></td> </tr> <tr> <td colspan="2">RTU Status</td> </tr> <tr> <td>Module Temperature</td> <td>0 °C</td> </tr> <tr> <td>Module Temperature (aux)</td> <td>0 °C</td> </tr> <tr> <td>Module Temperature (int)</td> <td>0 °C</td> </tr> <tr> <td>RTU Supply Voltage</td> <td>24.0 V</td> </tr> <tr> <td>RTU in Service Time</td> <td>(hours)</td> </tr> <tr> <td>System Resets</td> <td>0</td> </tr> <tr> <td colspan="2">Errors</td> </tr> <tr> <td>Supply Voltage</td> <td>OK</td> </tr> <tr> <td>Communications</td> <td>OK</td> </tr> </tbody> </table> <p>Buttons at the bottom include: Factory Default, Reboot, Clear Temps, Clear Resets, Sync Clock, Read from Device, Write to Device.</p>	RTU Overview		RTU Clock 01 Jan 0001 00:00:00		RTU Details		Serial Number		Application Name		Application Issue Number	0	Application Build Date		Bootloader Version		MAC Address		RTU Status		Module Temperature	0 °C	Module Temperature (aux)	0 °C	Module Temperature (int)	0 °C	RTU Supply Voltage	24.0 V	RTU in Service Time	(hours)	System Resets	0	Errors		Supply Voltage	OK	Communications	OK
RTU Overview																																								
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17	<p>If the RTU requires a new licence to enable features on the device contact QTech to be issued a licence.</p> <p>In Workbench click the licensing category and read the current licence from the device</p> <p>Enter the new licence code supplied by QTech and click write to device to update the licence in the device.</p>	For assistance please contact QTech																																						
18	The unit is now ready for further configuration. You can stop at this point if you wish.	Refer to the user manual or additional application notes for specific details on how to configure the RTU.																																						

Important: It is very important to remove the ISP jumpers during step 8 of this process before reassembling the XL4 Plus RTU.

Reverting to Q04 firmware

There is no special process to revert the Q04 processor back to Q04 firmware. It can be reprogrammed with the old firmware by using Workbench in the traditional way. The configuration settings that the Q04 had prior to being upgraded to Q04 Plus firmware will be retained, but following the downgrade, it would be prudent to use Workbench to give the Q04 its "Factory Defaults".

Upgrading Q04 Plus firmware

Once the XL4 RTU is running Q04 Plus firmware, further upgrades are easily performed via a USB drive. Please refer to the *XL4 Plus RTU* User Guide for further details.

Upgrading Q04 Plus bootloader

From time to time the bootloader will also need to be updated. This is done via Workbench connected to the RTU via USB. Please refer to the *XL4 Plus RTU* User Guide for further details.

For more information contact [QTech support@qtech.co.nz](mailto:QTech.support@qtech.co.nz)