RMU Upgrade Manual Rev 0

Overview

There are 3 programmable elements in a RMU.

These are

1. The bootloader. This is a small program that resides at the top of the dsPIC memory map and allows the main firmware in the dsPIC to be updated without the use of a programming device such as the PICKIT 3.
It can be invoked by selecting the B position on the Rotary Switch, but will automatically start if the main firmware is either missing or corrupted.
2. The main firmware is the program that perform all of the operating functions of the RMU
3. The I/O firmware is the combination of the hardware design and the soft-core processor firmware that is used by the Altera (now Intel) Field Programmable gate array.

The current version of these three programmable elements is:

1. The bootloader is 3v1 (File is called: P572_Bootloader_3v1.hex)
2. The main firmware is 4v0r1 (File is called: P572_RTU_lcd_4v0r1(9ef48c1b).hex
3. The I/O firmware is HW2.04 SW 2.09 (File is called: IO_2v04_2v09.rbf)

Any units prior to serial number R115 (so R100 to R114 and any N-xxx serial numbers) would benefit from being update to have the latest boot loader, the latest I/O firmware and the latest main I/O firmware.

The 20 units received in early November (R115 to R134) already have the latest boot loader and the latest I/O firmware, but we now have a slightly later version of the main firmware, which will tell the user if the wrong password has been entered. This process does NOT need the lid removing, it is updated using MicroConf, see below for details.

All other units would need all three elements upgrading.

As well as the three programmable elements listed above, two PC programs are also needed.

1. The Microchip MPLAB-X program together with PICKIT programmer and
2. The Microchip_PC_Loader.exe

All five files are contained in the zip file called:

    2021-11-08 RMU IO and main firmware upgrade - for Galen

The process is as follows.

Stage 1 - Installing or Upgrading the bootloader

Remove the Lid from the RMU.
Connect the PICKit 3 hardware to your PC and power the RMU
Fire up your PC/Laptop, note the location of the P572_Bootloader_3v1.hex programming file and start the Microchip mpplab-x
In the device box - type dsPIC33EP512MC806
Select PICkit3 as the tool selection, and click connect
Then select the P572_Bootloader_3v1.hex programming file using the browse button, and click the program button.
Power Cycle the RMU and the three LED stack will all be illuminated and the Ident Light will flash red and green alternately.

The bootloader is now installed and any previous main firmware will have been erased. The main firmware will now need to be loaded using the serial communications method.

Stage 2 - Load Main F/W using the Serial Bootloader

Close the Microchip MPLAB-X program and launch the Microchip_PC_Loader.exe file. It does not need installing, it runs in place. The program when launched will be named dsPIC33E/PIC24E Loader Application V1.0. Note the location of the main firmware file which will be called: P572-RTU-lcd-4v0r1(csum).hex.

The PC needs to be connected to the RS232 port (COM1) TB2 Pins 1,2 &3 only.

Select the PC Com port that is connected to the RMU and click the bottom right **Connect** button.

If the serial connection has been made correctly, the PC loader application will report the version number of the PIC bootloader, 3.1 in this case, as shown below.
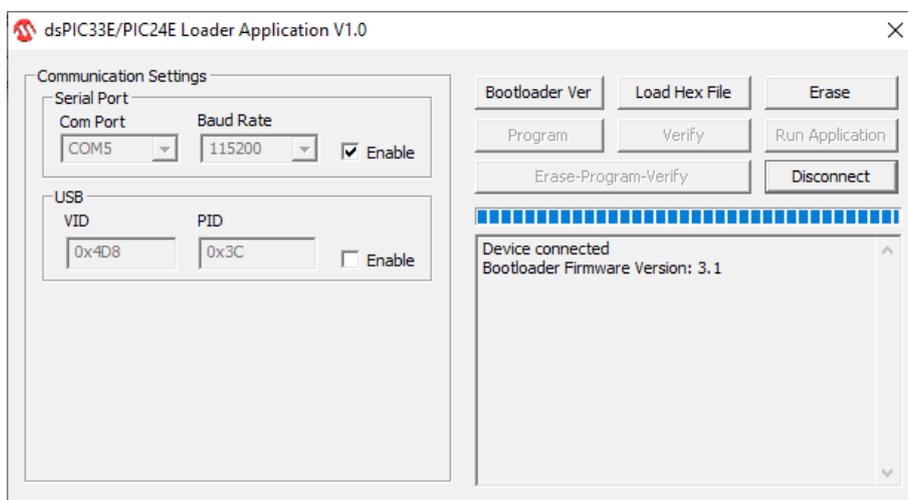
Then click the **Load Hex File** button and browse to where the P572-RTU-lcd-4v0r1(csum).hex is stored
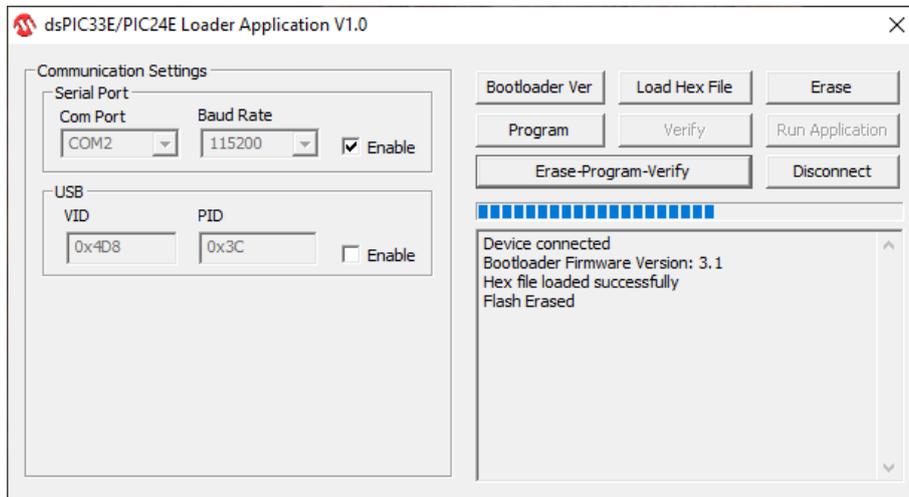
One the file has been loaded, click the **Erase-Program-Verify** button. The process takes around a minute and a progress bar indicates that it is working, as in the screenshot above. Once the programming has completed, the RMU can be power-cycled.

Stage 3 - Updating the I/O Firmware

Following the power cycle, the RMU will now be running the latest main firmware.

The I/O firmware can now be update using MicroConf, and any future main firmware can also be update using Microconf. The Serial bootloader will not be required again (except as a recovery mechanism should something go horribly wrong)

To program the RMU I/O Firmware version use 4v5r5 or later version of Microconf.

Launch Microconf and select the line with the unit to upgraded. Right click and select the Install/Retrieve Files then select the Update I/O Firmware sub-option.

Browse to the HW2.04 SW 2.09 file, and type in the password (p572)

The file is sent to the external (spi) memory in the RMU, and when complete, the RMU moves the data to to the Altera/Intel Gate Array and a percentage progress is shown on the main Microconf window. Once all the I/O firmware has been moved in to the Altera/Intel Gate Array, the percentage progress will be replaced by the version number.

UPGRADE COMPLETE

The following pages are just for additional information, if required.

Microchip MPLAB reminder

This link will get you to the right Microchip page

https://www.microchip.com/mplab/mplab-x-ide

Now Scroll down to this table

Choose the Windows x86/x64 option - MPLAB® X IDE v5.10
Down load it and run it. It will open this dialog box
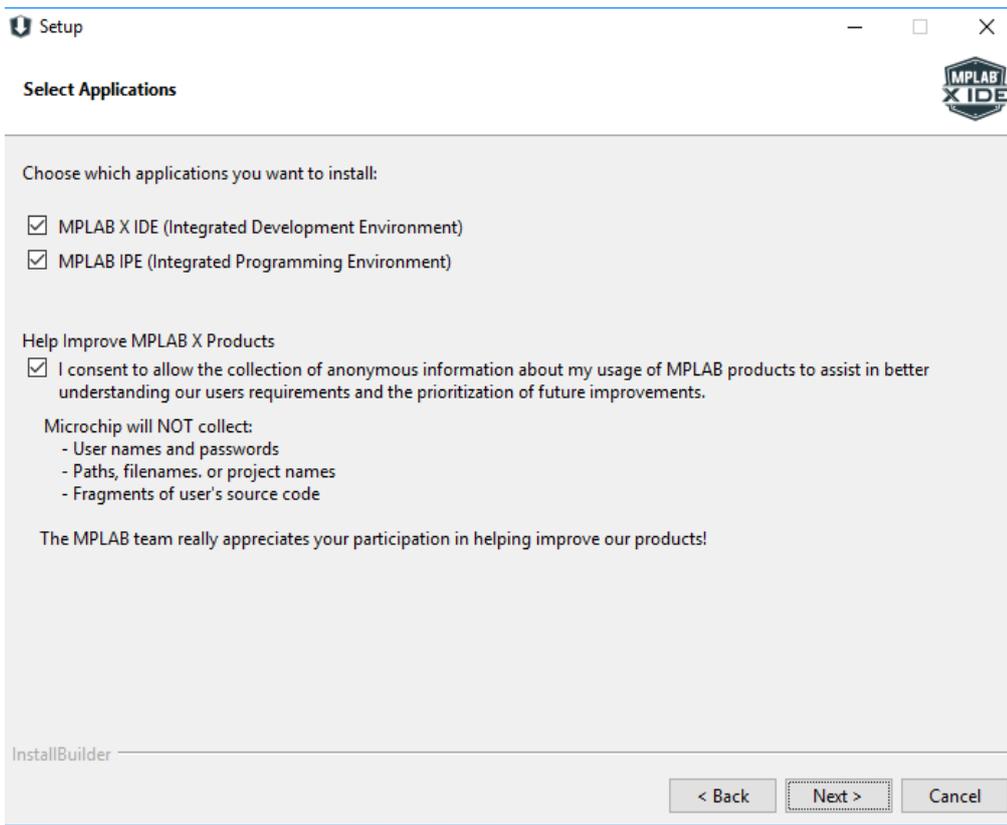
Deselect the Top Row (the IDE) and the help improve MPLAB
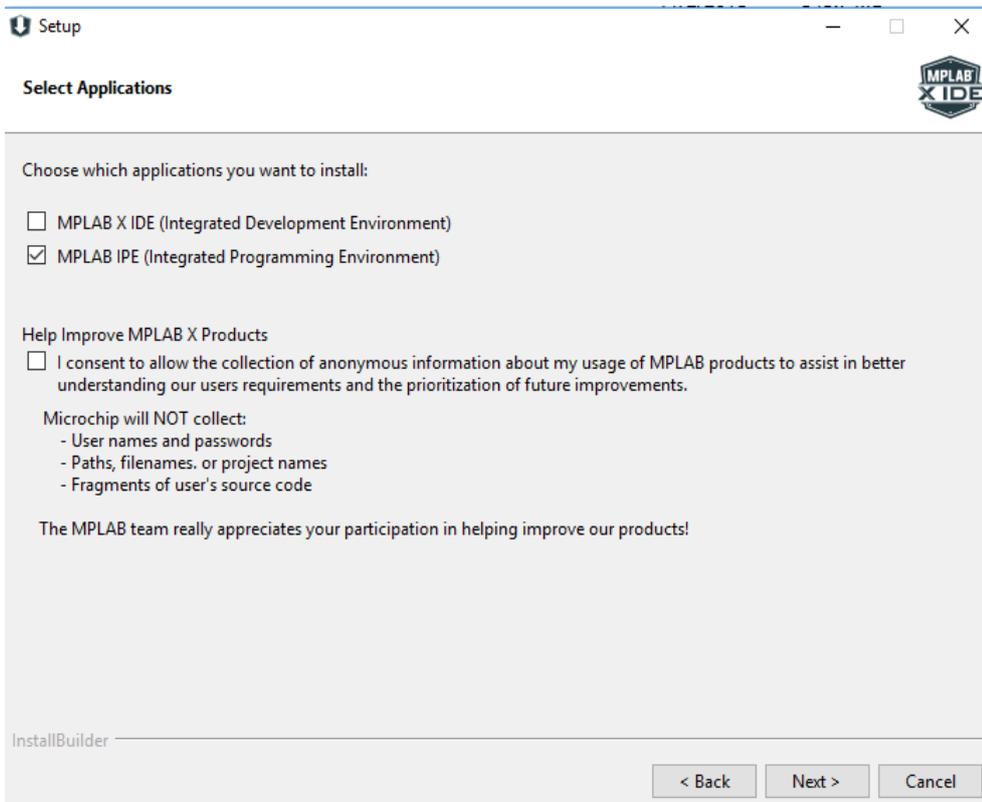
Then click next, Windows security will help as usual ...

When it is installed, you need to launch the MPLAB X IPE (The IPE is the Integrated Programming Environment)
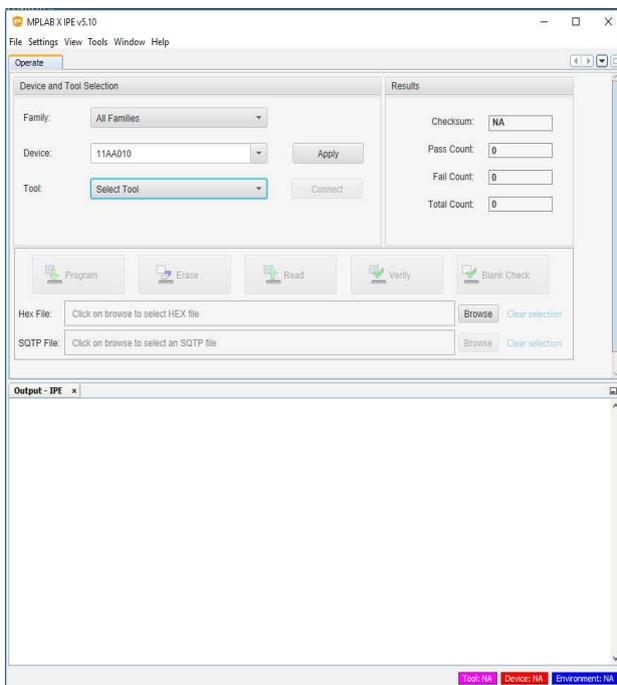
Connect the PICKit 3 hardware to your PC

In the device box - type dsPIC33EP512MC806

Select PICkit3 as the tool selection, and click connect
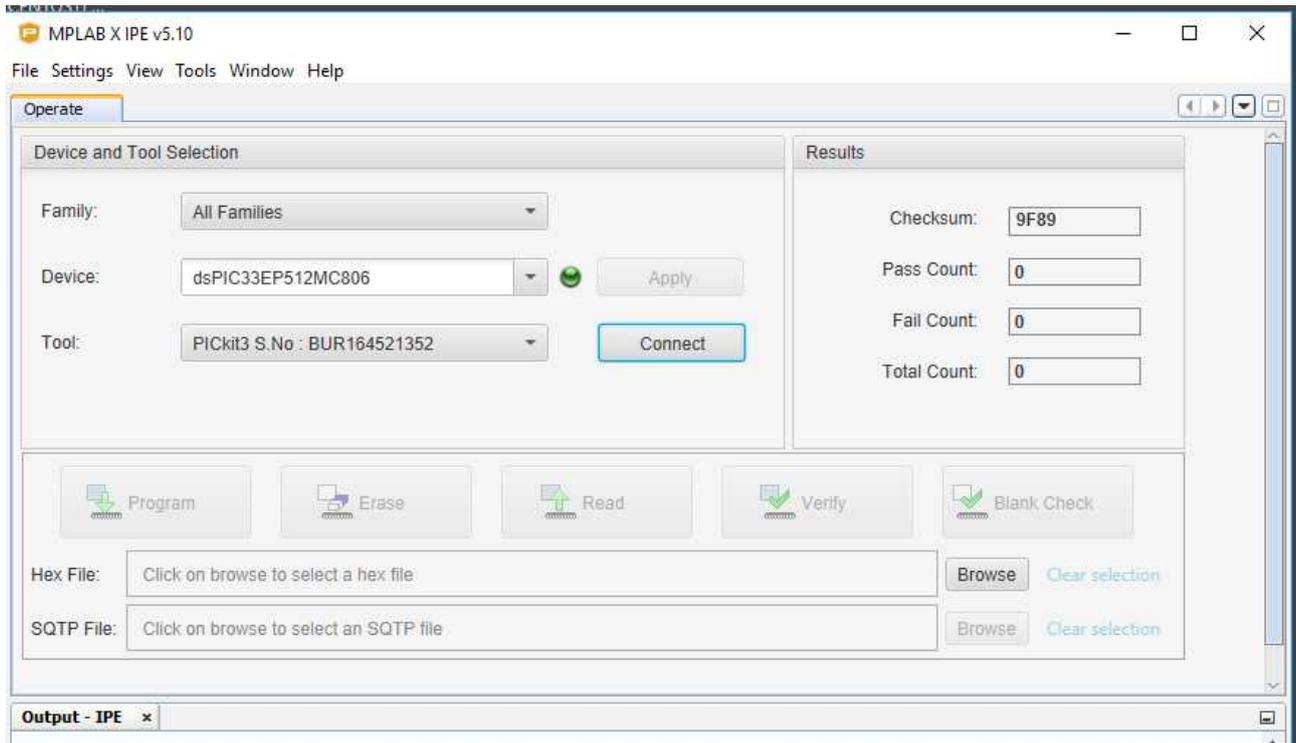
Then browse for the relevant hex file

The P572 Bootloader Description

Bootloader functionality is now supported. The bootloader resides in the dsPIC auxiliary flash region, separate to the main program flash. On power up the auxiliary boot code is executed first.

On entering the bootloader, its first task is to check the on-board SPI Flash memory for a valid dsPIC application image. If found, it will erase the dsPIC application and transfer the new application to the dsPIC. During programming of the dsPIC, the vertical led stack will display the progress of the operation, illuminating the top led first, followed by the middle then bottom led when almost complete. On completion, it clears the application from the SPI Flash and then enters the standard bootloader checks.

The standard bootloader implements a serial bootloader mechanism on the P572's RS232 port. Data rate is 115200 baud.

The standard bootloader is activated if either no current application is detected, or if the rotary selector switch is in position 'B'. Activation of the standard bootloader is indicated by all three green leds on the vertical stack being illuminated, and the status indicator alternating green/red.

Communication with the P572 bootloader is via Microchips Loader Application software. This allows connection to the device and the ability to load new application firmware, regardless of the current application code version.

If the bootloader is not required (valid code detected and rotary switch not in position 'B') then control is passed to the application firmware.

The standard (serial) bootloader can be used to load any current version of the P572 application firmware to date. The SPI Flash based update mechanism however (required for updates via NANOconf over Ethernet) is only available from application firmware versions 3v7r0 and above.

Note: In addition to SPI Flash based application updates, firmware version 3v7r0 onward supports the remote update of the FPGA I/O firmware via NANOconf (NANOconf v4.5r4 or later required to support this new P572 functionality). During the update, NANOconf transfers the FPGA image to the P572, and then the FPGA update initiated, indicated by a flashing red status led, with the green led stack indicating update progress. Normal machine operation should resume once the update is complete.

Rev 0 - MOB - 08 Nov 2021

/home/mob/nfs_secure/engineering/Projects/P572 - Nano RTU Interface/Upgrading/RMU Upgrade Manual.odt