

Release Notes for Microchip PIC24F Serial Bootloader

Version 1.04

May 17, 2010

1. Description

This application is intended to provide a robust Bootloader solution for PIC24F Microcontrollers. The communications protocol is based off the serial protocol described in Microchip Application Note *AN851, "A Flash Bootloader for PIC16 and PIC18 Devices"*. An example PC based host application and a serial communications DLL based off AN851 are provided. Modifications to the protocol and software have been made to optimize the bootloader for PIC24F architecture.

2. Version History

1/17/2008	1.00 – Initial release of PIC24F Serial Bootloader
4/09/2008	1.01 – Unreleased, initial support for AES encryption added
11/17/2008	1.02 – Added support for PIC24F 'K' devices and AES encryption officially released
7/7/2009	1.03 – Fixed a bug in P24QP.exe that could cause empty rows of data not to be removed from the hex file data when writing the PROGMEM text file.
5/17/2010	1.04 – Bug fix in config.h

3. Change Log

Version 1.04:

Changes to bootloader firmware

- Fixed an error in the PM_PAGE_SIZE define in config.h, which caused errors when erasing.

Version 1.03:

Changes to P24QP.exe

- Fixed a bug in P24QP.exe that could cause empty rows of data not to be removed from the hex file data when writing the PROGMEM text file.

Version 1.02:

Changes to bootloader firmware

- Added support for encryption using 128-bit AES encryption. Encryption enabled bootloader and hex file encryption tool can be obtained by contacting a local sales office.

- Added option for disabling autobaud feature with USE_AUTOBAUD macro. If autobaud is disabled the baud rate should be defined with using BAUDRATE.
- Added support for selecting a UART module using the UARTNUM macro.
- Fixed support for Configuration bit and Data EE memory sections, available on PIC24F 'K' devices.
- Added support for disabling analog pin functions on UART pins.
- Added support for saving the bootloader reset vector with boot protection disabled via the USE_RESET_SAVE macro.

Changes to P24QP.exe

- Improved .hex file parsing to allow use of either C30 compiled hex files in addition to hex files generated using MPLAB's export option.
- Added support for resizing of the P24QP window
- Removed USERID section, which does not exist on PIC24F parts
- Added checkboxes for easier selection of memory sections and removed prompt for erasing flash configuration on erase operations.
- Added support programming and verifying AES encrypted HEX files.
- Clarified error messages when unable to connect to a device.
- Added support for virtual COM ports and ports over COM4.

4. AN1157 Documentation Changes

- Add the following section between *Communication Protocol* and *Booting a Device* sections:

Security Concerns

It is important to note that using a bootloader may affect the security of an application. To allow for verification of programmed memory, the bootloader must implement a read command that will allow reading of the entire device memory, regardless of the setting of the code protection bits. This could allow the application to be read by an attacker.

For applications where security is a concern, an encryption-enabled version of the bootloader is available. With the encrypted bootloader, all data sent between the programmer and the PIC is encrypted, preventing the application code from being read without the encryption key. A utility is also provided that can be used to encrypt the HEX file before programming it, allowing it to be publicly released for user-side application updates without jeopardizing the security of the code. To obtain the AES enabled bootloader source code, or for more information, contact your Microchip sales office.

- The following note should be added to the *Remapped Vectors* section:

The bootloader uses a 16-bit address to vector to the user application. Therefore, the user reset vector should be located in the first 96K of device memory.

5. Known Issues

- This application makes use of the PIC24F UART Autobaud feature. Note that some PIC24F device revisions have errata regarding this feature. Workarounds for these errata are included in the bootloader code, but may not work for all applications. Please refer to the silicon errata for your device if you experience communication trouble.

- On PIC24F 'K' devices in order to place the bootloader in the hardware boot block using C30, the C30 attribute `__attribute__((boot))`, must be added to all bootloader variables and functions, otherwise the compiler will locate them outside of the boot section.

6. Compiler Version Used

This library was compiled using MPLAB C30 v.3.02 C compiler.

7. Memory Size

Program and data memory requirements are listed in Table 1 below. Expected requirements for optimized and unoptimized versions of a typical configuration of the bootloader are provided below the table. Please note that the following data is provided for guidance purposes only. Memory size will vary by compiler version, optimization settings, and device requirements.

Table 1: Memory Usage (Unoptimized)

Functions Included	Program Memory	Data Memory
Base Code	3,144 bytes	278 bytes
Device Specific Settings		
Non-word write capable device support	+108 bytes	+0 bytes
PPS Support	+75 bytes	+0 bytes
Configuration Bits Support	+132 bytes	+0 bytes
EEPROM Support	+318 bytes	+0 bytes
Bootloader Options		
Bootloader Protection	+291 bytes	+0 bytes
Runaway Code Protection	+486 bytes (additional +111 bytes required with Bootloader Protection enabled)	+8 bytes
Configuration Word Protection	+63 bytes	+0 bytes
Vector Protection	+63 bytes	+0 bytes
High Speed BRG support	+3 bytes (additional +63 bytes required with	

	Errata Workaround Support enabled)	
Errata Workaround support	+36 bytes	+0 bytes

Notes:

- Program memory usage includes space required for reset and interrupt vectors.
- Data memory values do not indicate space used by the software stack.

Memory usage

(Bootloader protection and Runaway code protection enabled, on a typical PIC24FJ device)

Unoptimized Program memory – 4068 bytes

Unoptimized Data memory – 286 bytes

Optimized Program memory – 2901 bytes

Optimized Data memory – 286 bytes

8. More Information

More detailed information about the operation of this code is available in Application Note AN1157, available from www.microchip.com.

Because of statutory export license restrictions on encryption software, the source code listings for the AES algorithm are not provided here. These applications may be ordered from Microchip Technology, Inc. through its sales offices.