AN1010

PIC16CR ROM Code Submission

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INTRODUCTION

Microchip Technology is now offering a number of established Flash devices in a ROM version for high volume customers.

This application note details some of the differences between the Flash and the ROM devices, and also outlines any requirements placed on the customer code.

Development Tools Support

The ROM family of devices are designed to be electrically and code compatible with the equivalent Flash device. The PIC16CR family of devices will use the same development tools as the PIC16F/PIC16C equivalent. A summary of each development platform is given below.

MPLAB® ICE 2000 – MPLAB ICE 2000 support is through the use of the equivalent Flash or OTP processor module and the device adapter and transition socket for the device package.

MPLAB® ICD 2 – The MPLAB ICD is not supported by the ROM family of devices. The Flash equivalent part can be used for debugging in the application and the code can be transferred to the ROM.

PRO MATE® – Programming support is not offered, this is a ROM product. Future support may be made available to read non code-protected parts.

PICSTART® Plus – No support is offered.

MPLAB® IDE – The ROM family of devices are available in the device selection.

Other Compilers – The PIC16CR is code compatible with the equivalent Flash devices, however, Microchip cannot guarantee that code generated by third party compilers will operate with the ROM devices. Please contact your third party vendor.

Special Code Requirements

When Coding for the PIC16CR ROM family of micro-controllers, it is important that there are no undefined areas in your code. Remember the hex file will only contain the code that you compile or assemble. Any unused portions of the memory should be specified or filled with a known value or opcode.

On submission of the code to Microchip Technology Inc., the code will be checked to ensure that the hex file contains the following information:

- User Code with no undefined locations
- Configuration Word
- User ID (0x2000-0x2002)

If the code is found not to contain any of the above, it will be returned. Software is available to check the validity of the code. Please contact your local Microchip Representative for details on how to obtain this software.

The Configuration Word can be embedded into the hex file by specifying the configuration at the time of assembling your code. Please consult the MPASM™ assembler reference guide if you are unsure how to do this. For other development tools please contact your vendor or consult the user guide.

The User ID bytes can also be specified from within the MPLAB IDE. Please remember that location, 0x2003, will be overwritten as this value is specified by Microchip.

User Code Generation

When generating the user code, care must be taken to ensure that there are no undefined memory locations. The code below shows how undefined areas can occur.

EXAMPLE 1:

```
ORG     0x0000
GOTO    Program_Start

ORG     0x0004
;Process ISR
;
;
RETFIE
```

In the above example, the hex file will be generated and will contain code for location 0x0000 and 0x0004 onwards. The locations, 0x0001 through 0x0003, will not be specified within the hex file. This would generate an error when running through the code checking program.

One possible solution is presented below.

EXAMPLE 2:

```
    ORG     0x0000
    GOTO    Program_Start
    NOP
    NOP
    NOP
              ;we are now at 0x0004 the ISR
    ;ISR Code
     RETFIE
```

The code example above will generate the hex file and the undefined areas in Example 1 are now defined and included. This method is suitable for small areas of code. For larger areas of memory or to fill from the end of your code to the top of memory, the MPASM assembler fill directive can be used. This is shown in Example 3.

EXAMPLE 3:

```
    ORG     0x0000          ;reset vector
    GOTO    Program_Start
    NOP
    NOP
    NOP
    RETFIE                  ;0x0004 ISR

Program_Start
    CALL    function        ;call function
    GOTO    Program_Start   ;loop back

function
    BSF     PORTB, 0        ;set RB0
    NOP
    BCF     PORTB, 0        ;clr RB0
    RETURN

fill    0x3fff, 0x2000-$    ;fill directive

end                         ;program end
```

Adding the `fill 0x3fff, 0x2000-$` directive before the end of the code marker will cause the assembler to fill the remaining contents of the ROM from the last instruction to top of memory with 0x3fff, thus making the code suitable for ROM submission. The fill directive also allows the use of other opcodes such as `NOP` or `GOTO $`.

Some Limitations

As this is a ROM device, there are some limitations that exist with this family that are different to the Flash products.

- Serialization – As this family contains no programmable memory, serialization of individual parts is not possible.

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

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