

To our customers,

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Renesas Electronics Corporation

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### M16C/26

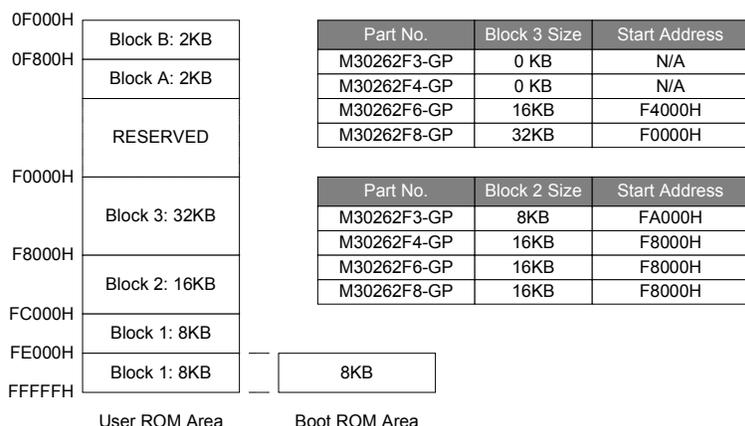
### Programming Flash Memory via Flash-Over-USB™

#### 1.0 Abstract

The following article describes using a synchronous serial port and the FoUSB (Flash-over-USB™) Programmer application to program the user flash memory of the M16C/26 series of microcontrollers. This is referred to in the M16C/26 datasheet as the “Standard Serial I/O Mode 1” method of flash programming.

#### 2.0 Introduction

The Renesas M16C/26 is a 16-bit MCU based on the M16C/60 series CPU core. The peripheral set includes 10-bit A/D, UARTs, Timers, DMA, and GPIO. The MCU features include up to 64K bytes of Flash ROM, 2K bytes of RAM, and 4K bytes of virtual EEPROM. The flash memory is divided into several blocks as shown in Figure 1, and so, allows memory to be erased one block at a time.



**Figure 1 M16C/26 Flash Memory Map**

The M16C/26 flash memory can be programmed with a single voltage. Three flash memory modes are available in which to read, program and erase: (1) parallel I/O and (2) serial I/O modes in which the flash memory can be manipulated using a programmer and (3) CPU rewrite mode in which the flash memory can be manipulated by the Central Processing Unit (CPU). The Standard Serial I/O Mode can be further divided into a synchronous mode (Standard Serial I/O Mode 1) and an asynchronous mode (Standard Serial I/O Mode 2). The standard serial I/O mode inputs and outputs the software commands, addresses and data needed to operate (read, program, erase, etc.) the internal flash memory using the serial I/O port UART1.

The flash memory is divided into two major blocks, a user program area and a boot ROM area. The user program area is used for user application program and data. The boot ROM area has a control program stored in it when shipped from the factory and can only be accessed when a special hardware reset sequence is initiated. This

program allows asynchronous or synchronous serial programming of the user area of the flash and can only be changed by using Parallel I/O Mode.

Renesas provides a Windows® based program, Flash-Over-USB™ (FoUSB), to download code to M16C/26 MCUs. FoUSB Programmer is used along with the USB-Monitor (see Figure 3) for reprogramming the flash memory of a M16C/26 microcontroller over USB (Universal Serial Bus).



Figure 2 M16C/26 Flash Memory Map



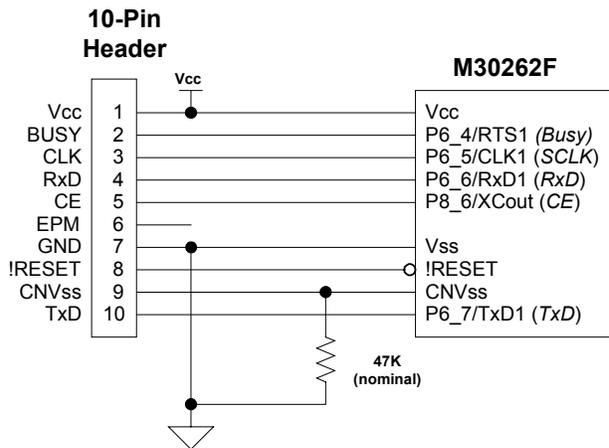
Figure 3 M16C System Connectivity for FoUSB Programmer

### 3.0 Hardware Requirements for Synchronous Serial Programming

The CNVSS pin on the M16C MCU is the primary control line that determines whether the user area or the boot area of the flash memory is accessed after reset is released. If the CNVSS pin is low the device will always access the user flash area and will start in single chip mode. To execute the synchronous serial rewrite program in the boot area of the flash, the CNVSS pin has to be held high. The operation uses the four UART1 pins of the MCU: CLK1 (P6<sub>5</sub>), RxD1 (P6<sub>6</sub>), TxD1 (P6<sub>7</sub>) and RTS1 (P6<sub>4</sub>). The CLK1 pin is the transfer clock input pin through which a 1MHz clock is fed to the MCU from the USB monitor for synchronous data input to the RxD1 pin. The

TxD1 pin is for CMOS output from the MCU. The RTS1 (BUSY) pin outputs a low level when ready for data reception and a high level when reception starts.

Since the USB-Monitor uses the Renesas factory boot code to communicate with the target MCU, the proper pin connections should be considered on your target board design. An example connection for the M16C/26 is shown in Figure 4.



**Figure 4** A typical M16C/26 target board hardware connection for FoUSB Connectivity

When the USB-Monitor is connected to a computer for the first time, Windows will recognize the new hardware and will request for the drivers. The drivers were already installed during the install, for example, if the installation directory is 'C:\MTOOL\FOUSB', then the required device driver will be located in 'C:\MTOOL\FOUSB\Device Drivers' and needs to be pointed to if asked by Windows. For Windows XP, a dialog box is displayed warning that the driver has not been tested for Windows XP compatibility. This warning message should be disregarded and continue driver installation.

### 4.0 Using the FoUSB Programmer

The main steps that need to be followed for programming the flash memory of an M16C/26 MCU chip using FoUSB are described below. The name of a button or option that has to be clicked or selected is written in bold italics. All other items extracted from the programmer software GUI (Graphical User Interface) appears in normal italics. Sections 4.1 to 4.4 covers buttons and options that are absolutely essential for flash programming of an MCU. Description of all buttons or options that are available in the various windows of FoUSB can be found in the *Help* section that can be invoked by clicking on HELP on the FoUSB main GUI shown in **Figure 5**.

## 4.1 Starting FoUSB

Connect a USB-Monitor to the M16C/26 target board and then connect the USB cable to the PC as shown in Figure 4. To start FoUSB, double-click on 'fousb' icon on your desktop or select Flash-over-USB from the Start menu (Start > Programs > Renesas-Tools > Flash-over-USB ver. 1.xx > Flash-over-USB). A connection dialog box will appear as shown in **Figure 5**. Click **OK** and the main GUI of the FoUSB program will appear as shown in Figure 6. *USB Monitor Device* appears on the FoUSB main GUI indicating that the USB monitor has been properly connected.

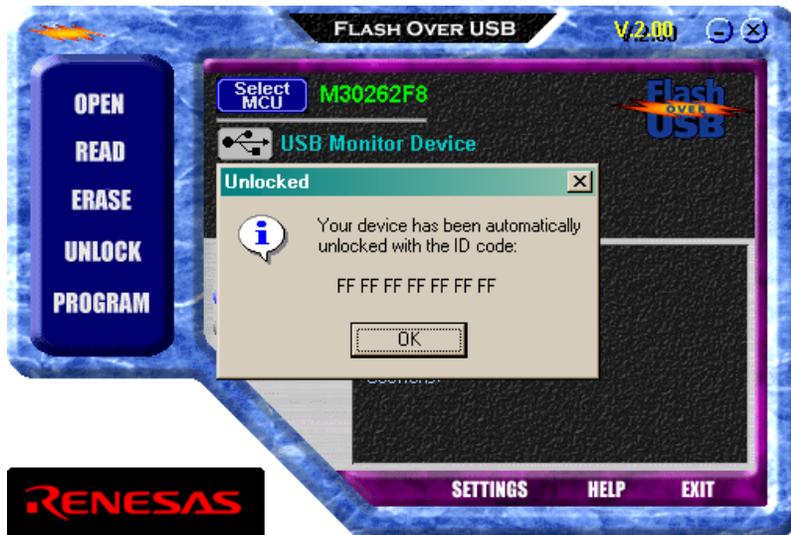


Figure 5 USB Monitor connection dialog box



Figure 6 FoUSB main GUI

## 4.2 Selecting Target MCU

To select the firefly as target MCU, perform the following steps.

1. Click on **Select MCU** on the FoUSB main GUI. A *Chip Selection* GUI appears as shown in Figure 7.
2. Click on **M16C/26** from the *Select MCU Family* option. M30262F8\_DBC appears as a part number in the *Select MCU Part Number* option.
3. Click on **M30262F8\_DBC** under *Select MCU Part Number* to highlight it. Then press **OK**. This selects the target firefly MCU chip and the *Chip Selection* GUI disappears. The selected MCU (*M30262F8\_DBC*) appears on the start-up GUI besides *Select MCU* as shown in Figure 6.

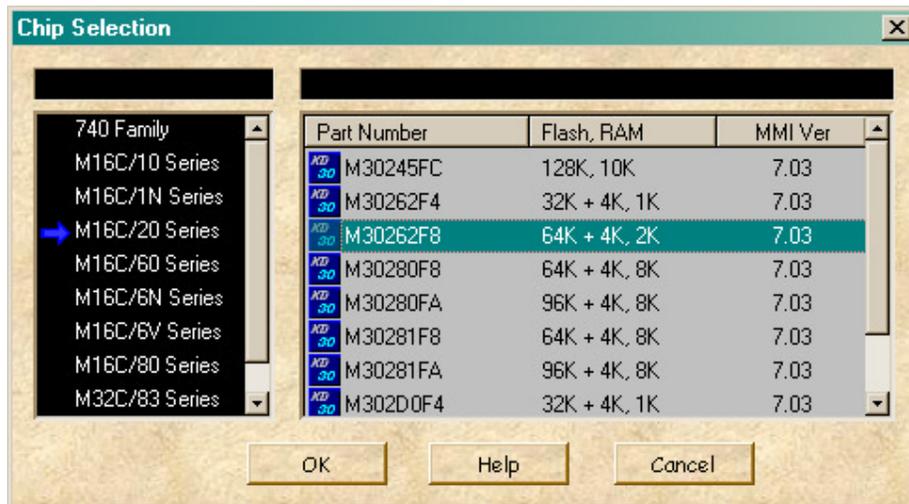


Figure 7 Chip Selection GUI

## 4.3 Selecting Target Program

To select a target program, perform following steps:

1. Click on **OPEN** on FoUSB main GUI. Windows file selection menu appears as shown in Figure 8.
2. Find the target file (e.g., xxxx.mot) for loading into MCU flash, highlight the file, and then click on **Open** of Windows file selection menu. The target file is thereby selected and the file selection menu disappears. The selected target file appears on FoUSB main GUI beside *FILE* as shown in figure 9.

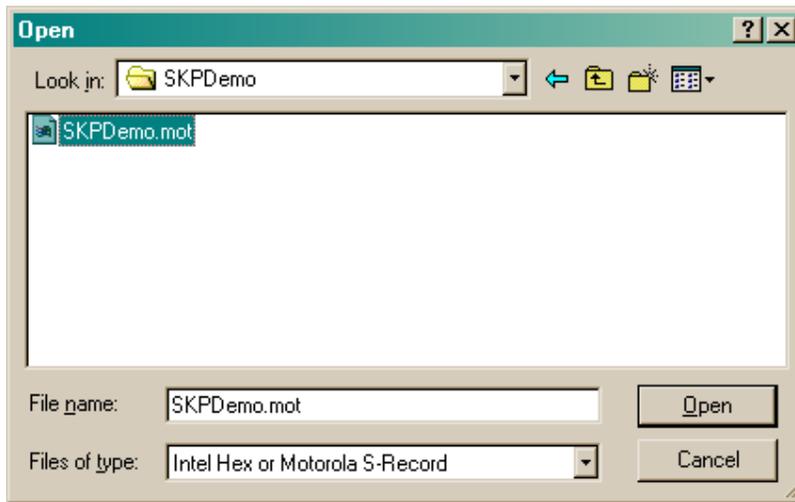


Figure 8 Dialog box for file selection



Figure 9 FoUSB main GUI after file selection

## 4.4 Loading Target Program

To load the selected target program into the MCU flash, perform the following steps:

1. Click on **PROGRAM** on FoUSB main GUI. The *Program Flash* dialog box appears as shown in Figure 10.
2. Select **Erase->Program->Verify** option (the default option) from *Choose an Operation*.
3. Select **Erase All Block** option from *Erasing Options*.

4. Click on **Program** of the Program Flash GUI. The loading of target program into MCU flash will start at this point and the progress of flash programming will be shown dynamically by a moving bar located at the lower part of this dialog box. After a successful programming of the flash, a *Program Completed Successfully* dialog box will appear as shown in Figure 11.
5. Click on **OK** button and the dialog box disappear (and back to the FoUSB main GUI).

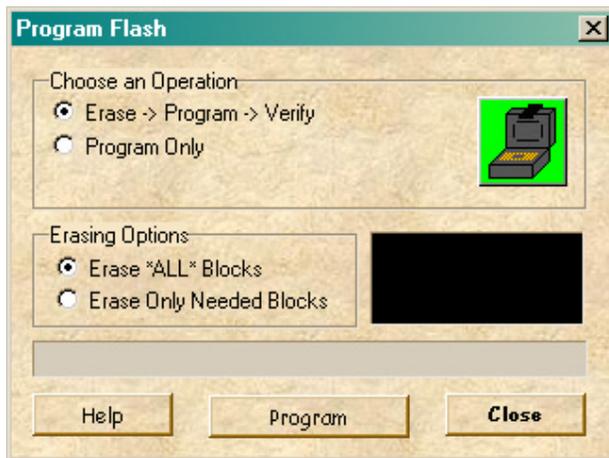


Figure 10 Menu options for programming flash



Figure 11 Dialog box after a successful flash programming

#### **4.5 Exiting FoUSB Programmer**

To exit from FoUSB, click on EXIT or the X button on the upper right corner of the main GUI.

#### **5.0 Reference**

##### **Renesas Technology Corporation Semiconductor Home Page**

<http://www.renesas.com>

##### **E-mail Support**

[support\\_apl@renesas.com](mailto:support_apl@renesas.com)

##### **Data Sheets**

- M16C/26 datasheet, M30262eds.pdf

##### **User's Manual**

- MSV30262-SKP Users Manual, Users\_Manual\_MSV30262.pdf
- MSV30262-SKP Quick start guide, Quick\_Start\_guide\_MSV30262.pdf
- Flash-Over-USB Help menu

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