M16C/62

Programming the M16C/62 in Flash Parallel Mode

1.0 Abstract

The following article describes using the ATC (Advanced Transdata) PGM1000 programmer to parallel program the flash memory of the M16C/62 series of microcontrollers. The MCU mode of parallel flash programming is referred to in the M16C/62 data sheets as “Parallel I/O Mode”.

2.0 Introduction

The Renesas M16C/62 series of microcontrollers is a 16-bit family of MCUs, based on Renesas’ popular M16C CPU core. These parts provide high memory efficiency, power-saving ability, low noise emission, and improved noise immunity. The flash versions of the device contain flash memory that can be rewritten with a single voltage. The M16C/62 flash can be programmed using one of three methods: Parallel I/O Mode, Standard Serial I/O Mode, and CPU Rewrite Mode. It is the Parallel I/O Mode that is detailed in this article.

The flash memory is divided into two major blocks, a user program area and a boot ROM area. The user program area is for the normal application program and data. Any program in the boot ROM area is accessed only when a special hardware reset sequence is initiated. This boot ROM area has a control program stored in it when shipped from the factory. The program allows asynchronous or synchronous serial programming of the user area of the flash. Changes to the boot area of the flash can only be made using Parallel I/O Mode.

3.0 Setting Up the PGM1000 Programmer

Select the appropriate program adapter for the M16C device package that will be used. There are currently two adapters for the M16C/62 parts, as shown in Table 1.

Table 1 Adapters for M16C Device

Adapter Name	Number	Supported Devices
APT-MCP6S	M306XXXX-100P6S	M30620/M30624FP (100-pin SPFQ)
APT-MCP6Q	M306XXXX-100P6Q	M30620/M30624GP (100-pin QFP)

The adapters are marked to indicate J1 and J2.

To install the adapter onto the PGM1000 programmer, follow these steps:

1. Connect the DC power supply. The ACTIVE LED will blink several times and then stay on when the programmer is ready.
2. Connect the programmer to the parallel port of the host computer using the DB25 cable.

3. Install the software on the host computer if it is not already installed.

The PGM1000 has the following four windows that are used to display programming information:

- Boot ROM Memory
- Program Memory
- Device Configuration
- Verify Errors

A view of the screen with these four windows open is shown in Figure 1.

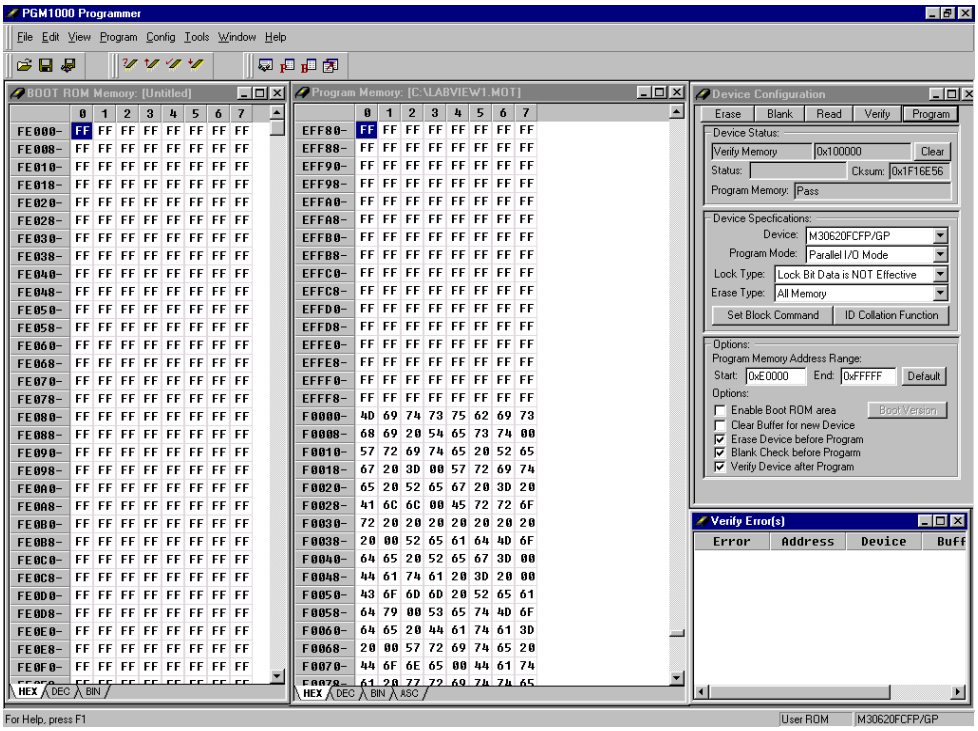

Figure 1 Screen View of Four Open Windows

Use the Device Specification window to select the M16/62 (M30624). Also use this window to select Parallel I/O Mode as the Program Mode.

Install the device to be programmed into the socket. Ensure that pin 1 is lined up with the triangle on the programming adapter that indicates pin 1.

4.0 Programming the Boot ROM Area

Note: The boot ROM area contains a factory-programmed boot ROM code used for “Serial I/O Mode” programming of the user flash area. If the boot ROM area is reprogrammed, the factory Serial I/O Mode programming modes can no longer be used.

To enable access to the boot ROM area, click the “Enable Boot ROM area” filed under Options in the Device Configuration. If this block is not checked, the Boot ROM area of the device cannot be accessed.

To select the file to be loaded to the boot ROM area, go to the File menu and select “Open File”. This will open a dialog box. Clicking on the down arrow next to “Files of type” will result in a dialog box as shown in Figure 2.

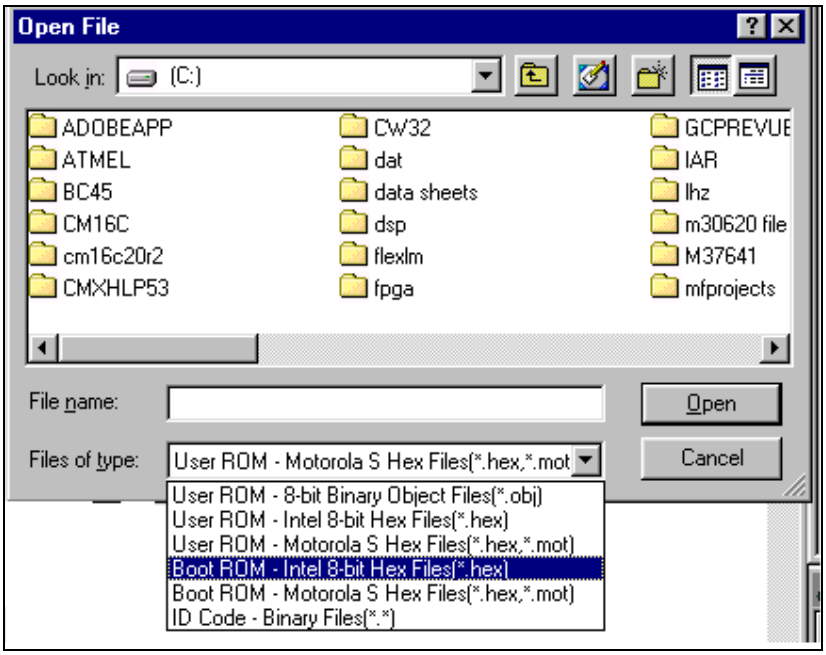

Figure 2 Open File Dialog Box

Select either “Boot ROM - Intel 8-bit Hex files (*.hex)” or the “Boot ROM - Motorola S Hex Files (*.hex,*.mot)” for the type of file to be opened. If one of the User ROM file types is used as a file type. the program selected will be loaded into the program ROM area buffer, not the boot ROM area buffer. This will result in errors when programming is attempted.

Once the file has been selected, a complete program cycle can be selected by choosing the program button with the “Erase Device before Program”, “Blank Check before Program”, and “Verify Device after Program” boxes checked in the Programmer Device Configuration window.

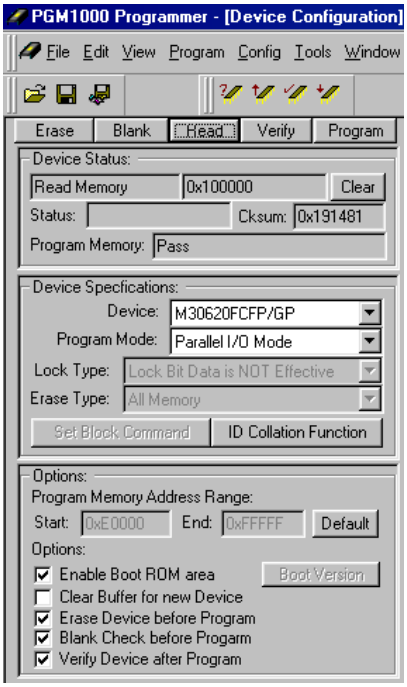

Figure 3 Device Configuration Window

The Programmer will then erase the flash area, check that the area is blank, program the device with the data from the file selected, and then read the flash memory area and verify it against the information stored in the buffer. If there are errors during the verify, they will be indicated in the Verify Error(s) window.

5.0 Programming the User Flash Area

To program the user flash area, ensure that the “Enable Boot ROM area” check box in the options section of the Device Configuration window is not checked. To allow programming of all areas of user memory, the following Device Specifications should also be selected in the Device Configuration window.

Program mode: Set to “Parallel I/O”
Lock Type: Set to “Lock Bit Data is NOT Effective”
Erase Type: Set to “All Memory”

Under the options section of the Device Configuration window, select the following boxes:

- “Erase Device before Programming”
- “Blank Check before Programming”
- “Verify Device after Programming”

Once the setup of those options is complete, the program file needs to be selected. To select the file go to the File menu and select “Open File”. A dialog box will open similar to the one shown in Figure 4. It is important to

select the correct file type in the “Files of type:” section of the window. One of the three “User ROM” selections must be selected. Do not use the “Boot ROM” selections. If ID codes are to be programmed, refer to section 6.0 Using ID Codes.

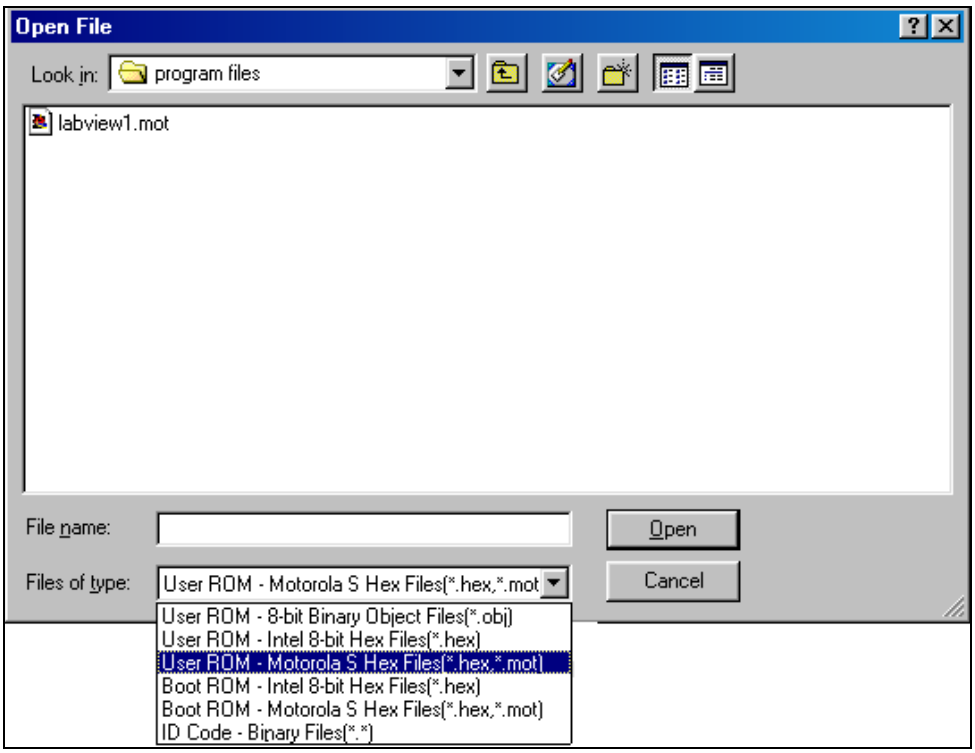

Figure 4 Open File Dialog Box

Once the file has been selected, a complete program cycle can be selected by choosing the program button with the “Erase Device before Program”, “Blank Check before Program”, and “Verify Device after Program” boxes checked in the Programmer Device Configuration window.

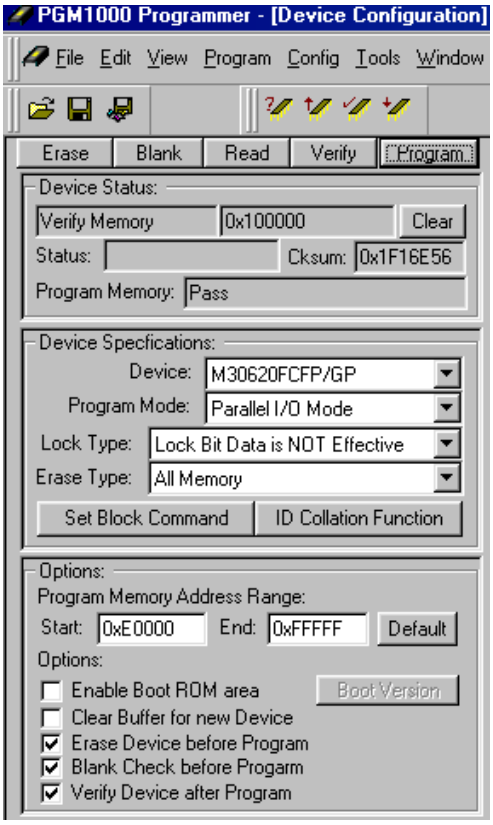

Figure 5 Device Configuration Window

The Programmer will then erase the flash area, check that the area is blank, program the device with the data from the file selected, and then read the flash memory area and verify it against the information stored in the buffer. If there are errors during the read and verify, they will be indicated in the Verify Error(s) window.

6.0 Using ID Codes

The M16C/62 devices have 7 bytes of flash memory mapped to be used as ID codes. These ID codes are checked as part of the initialization of the “Standard Serial I/O Mode” of programming. The ID codes provide protection against reading or modifying the flash memory. The data to be written to these locations can be written as fixed data in the program file or added to the buffer prior to programming the device. To add the ID code as part of the programming, load the original program file as outlined in section 5.0 Programming the User Flash Area. After the program has been loaded to the memory buffer, select the ID Collation Function from the Device Specifications section of the Device Configuration window. Clicking on this button will open the dialog box shown in Figure 6.

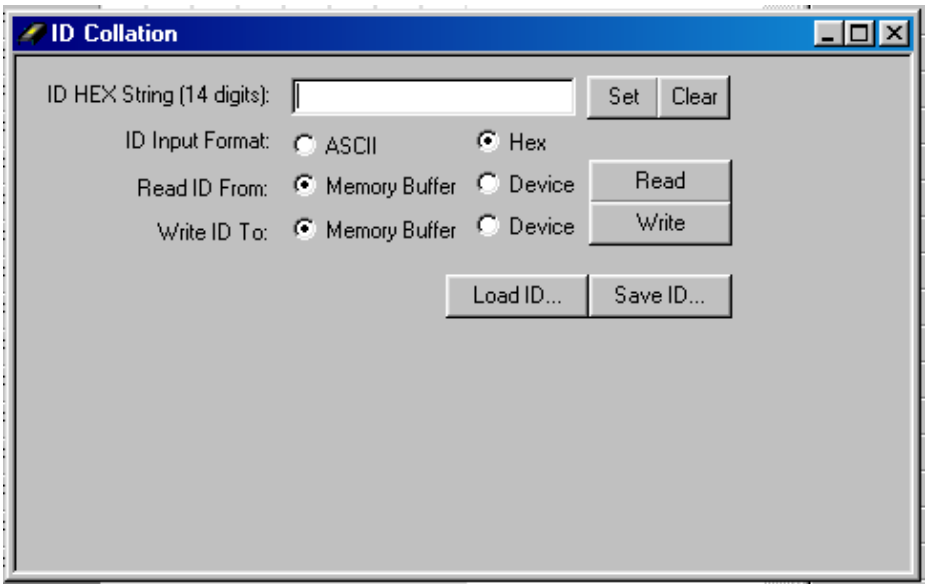

Figure 6 ID Collation Dialog Box

A 14-character hex string or 7-character ASCII string can be input into the dialog box. If a standard ID file has been created, it can be loaded using the "Load ID…" button. After the ID string is entered select the Memory Buffer option in the "Write ID To" section of the dialog box. Then clicking the Write button will place the ID string into the appropriate locations in the memory buffer. Programming the device at this point will transfer the original program with the ID bytes added. The contents of the memory buffer can be saved as a *.hex of *.obj file using the Save option under the File menu. This allows subsequent programming with the ID bytes to be accomplished by simply loading the file that was saved.

7.0 Reference

Renesas Technology Corporation Semiconductor Home Page

http://www.renesas.com

E-mail Support

support_apl@renesas.com

Data Sheets

- M16C/62 datasheets, 62aeds.pdf

User's Manual

- ATC (Advanced Transdata) PGM1000 Manual

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