Overview

The MC433 can be programmed one of two ways:

- Re-Program Motor Controller Flash using **`MC433Prog.exe`**.
- Update EEPROM parameters using **`MC433Setup.exe`**.

Programming Motor Controller Flash overwrites the contents of the current Motor Controller Flash with a new program. A new program may add new features, fix bugs or update the main PWM control algorithm. Flash contents can only be changed by enabling Flash Programming Mode by installing a shorting jumper on connector J30 and downloading a new program using utility **`MC433Prog.exe`**. Changing Motor Controller contents must be done carefully to avoid damaging the AVR processors. Flashing the Motor Controller erases the content of EEPROM.

> **CAUTION: Once programming is complete the programming enable jumper must be removed. If the jumper is left in place and step/dir commands are sent to the controller the motor controllers will be reprogrammed with incorrect information and possibly damaged.**

Updating EEPROM parameters such as chop rate, chop frequency, automatic shut off, etc is done by modifying the contents of Motor Controller EEPROM. Changing EEPROM contents does not require installation of the Flash Programming Mode shorting jumper. This mode is entered by installing both Step Mode Shorting Jumpers on each Motor Controller. **MC433Setup.exe** can be to used to converse with each Motor Controller to change system settings on an individual Motor Controller basis.

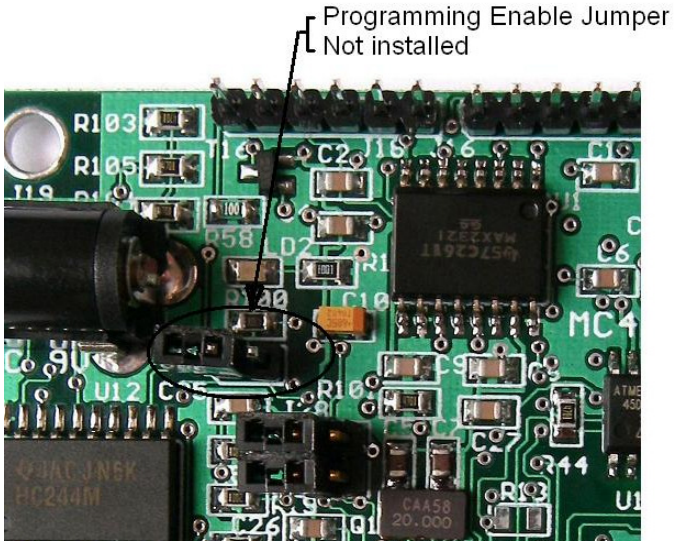
Before attempting to Re-Flash the controllers or change EEPROM content turn motor power off. The programming procedure may turn on all Power MOSFETs - drawing significant power from the motor power supply.

New Motor Controller code releases are not available for download from our web site but are sent by email request only. Check the MC433 Product page for the latest release.

Programming Motor Controller Flash

The MC433 Rev 1.1 and Rev 1.1b PCB's have a programming interface on the board. The Flash contents of the motor control processors and G Code processor can be re-programmed through the parallel port interface. Rev 1.1 and 1.1b are programmed the same way - there is no functional difference between Rev 1.1 and 1.1b PCBs except for the G Version – Rev 1.1b has an additional SPI Serial Flash device for on board G Code storage.

To enable Programming Mode the supplied shorting jumper must be installed on connector J30. J30 is located next to the DC Logic Power connector (see picture below). To download a new control program to the processors use programming utility **`MC433Prog.exe`** only – do not use any other programming utility. **MC433Prog.exe** is available on the SOC Machines web site on the MC433 product page. As soon programming mode is enabled all commands sent to the parallel port are interpreted as programming commands – sending any other command such as step/dir sequences will probably damage the control processors. Utility **`MC433prog.exe`** implements the AVR ISP programming protocol. Use of any other program or programming utility may damage or lock the processors from further programming. Remove the program enable jumper immediately after programming is complete. Do not remove or attach the parallel port cable with the programming enable jumper installed.



`MC433Prog.exe` is a command line program running under Windows98, 2000 and XP. The program emulates the operation of **ISProg.exe** (an AVR ISP programming utility) and is used to download new Flash and/or EEPROM files to the Motor Controllers and G Code Processor. **`MC433Prog.exe`** can be used to program each of the four processors individually or (using a command file) perform a sequence of programming functions on all four motor controllers in one pass.

New motor control programs and G Code programs are provided as Intel Hex files. New code releases will always include a master program configuration text file. **`MC433Prog.exe`** has been tailored to program the MC433 and MC433G only – do not use this utility to program AVR processors with the ISP10 programming adapter – use **`ISProg.exe`** instead.

An MC433 has four AVR processors identified as X2, X3, X4 and X5. Each of these processors is either an ATmega168 or ATmega88. The key difference between an ATmega168 and ATmega88 is the amount of Flash, EEPROM and SRAM – the performance of each processor is the same. The correct code must be loaded into each processor. The relationship between X number and motor axis is as follows:

Processor ID	Motor Axis
X2	Z
X3	A
X4	Y
X5	X

To select a specific processor enter it's identifier at the command prompt –X2, X3, X4 or X5 – subsequent programming commands are then sent to the selected processor. Note these identification numbers do not correspond to the motor drive connector numbers.

If the MC433G is to be re-programmed CONTROL MODE must be disabled first using the "**cm**" command – this forces the ATmega644 to release control of the Step/Dir parallel port controls lines so **MC433Prog.exe** can control them. MC433G motor controllers can only be programmed correctly if the "**cm**" command is first sent via the RS-232 port – CONTROL MODE is re-enabled by sending the "**cc**" command.

Remove power from the MC433 (or MC433G) DC Logic and Motor Power. Remove the Flash Programming Enable jumper (J30). Attach a parallel port cable to the controller and apply power. Now install the Flash Programming Enable jumper.

Start **`MC433Prog.exe`** by double clicking or starting it a cmd window – the first command to use is the "**`xa`**" command – this interrogates each processor to verify it's type and fuse settings. Type "**h**" to show all commands – note that it is possible to send commands to the MC433 with **`MC433Prog.exe`** that will lock the board from further programming so please use the commands carefully. Contact the company if in doubt about how to proceed.

```
>MC433prog <CR>
MC433 Programming Utility V0.99
© Copyright 2006, SOC Robotics, Inc.
Type 'e' to exit or 'h' for help

-xa
Reset 1:  Target not responding
Reset 2:  Target ATmega168 responding  - default fuses set
Reset 3:  Target ATmega168 responding  - default fuses set
Reset 4:  Target ATmega168 responding  - default fuses set
Reset 5:  Target ATmega168 responding  - default fuses set
-
```

Having confirmed all the processors are alive and talking new motor controller software can be downloaded to each motor controller by typing "**f**" followed by the name of the Program Configuration file.

```
-fMC433config_R87.txt<CR>

  < contents of MC433config_R87.txt is executed >
```

The program will now program all four processors in turn loading the correct hex file from the MC433config_R87.txt text file.

Below is an example of the contents of Program Configuration file **`mc433config_R87.txt`**:

```
x2
dfmc433_motor_controller_R87z.hex
x3
dfmc433_motor_controller_R87.hex
x4
dfmc433_motor_controller_R87.hex
x5
dfmc433_motor_controller_R87.hex
xa
```

Exit MC433Prog.exe by entering the "**`e`**" command.
Note processor X2 – Z Axis is loaded with a different program than the other three processors. X2 is unable to monitor ESTOP so must get this information from the other processors.

All Program Configuration files supplied by the company end with a Version Identification Number. In the example file above the VIN is R87 – Version 0.87.

After programming is complete **REMOVE** the programming enable jumper – the board does not need be powered down to remove the jumper. You are now ready to send new step/dir commands to the controller.

Updating EEPROM Contents

Update Motor Controller EEPROM contents using **MC433Setup.exe.** In order to use **MC433Setup.exe** Motor Controller Version 0.95 or later must be installed in motor controller Flash. To check the current motor controller Flash version run **MC433Setup.exe** with the EEPROM update jumpers installed – **MC433Setup.exe** interrogates all four motor controllers retrieving all setup information.

`MC433Setup.exe` and Motor Controller Rev 0.95 will be available after September 15th, 2006.

Post Programming Procedure

After completing the programming procedure it's good practice to interrogate the processors one more time with the "**xa**" command to ensure all Motor Controllers are responding. Motor controllers will only respond to MC433Prog.exe if the Flash Programming Enable jumper is installed.

One last thing:

DO NOT FORGET TO REMOVE THE FLASH PROGRAMMING ENABLE JUMPER BEFORE SENDING STEP COMMANDS TO THE MC433.