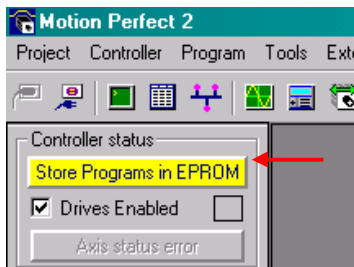


TECHNICAL NOTE

Doc No.: TN30-09
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Subject: Non-Volatile memory in the MC202 (FLASHVR)

All Trio controllers have battery-backed non-volatile user memory for programs and variables. The exception to this is the MC202 controller.

The MC202 uses flash memory (EPROM) to accommodate program and variable storage for power-down/power-up recovery.



Non-volatile program storage in the MC202 is accomplished in Motion *Perfect2*TM using the option on the left control panel. A "Store Programs in EPROM" button will highlight when a program is changed and needs to be saved before power down. The button is only present when Motion *Perfect2*TM connects to an



MC202, and is not used for MC204, MC205, and MC216.

In addition to the 251 VR variables, each program (task) in the controller can have up to 256 user-defined variables. All variables will be *volatile* in the MC202 controller, and *non-volatile* in the MC204, 205, and 216 controllers.

FLASHVR

On the MC202 a command **FLASHVR(x)** is available to enable you to store the VR(x) variable or TABLE memory into the flash EPROM memory. The description from the new manual is as follows:

Syntax: **FLASHVR([variable number])**

Stores a single VR(x) global variable into permanent flash memory. VR variables stored in this way will have their value restored to the current value when the unit is powered up again. This feature is provided on controllers which do not feature battery backed ram VR(x) storage.

Each FLASHVR command generates a write to a block of flash EPROM. There are two 1024-byte blocks. Each FLASHVR(x) command uses 5 bytes. This results in 204 FLASHVR(x) writes per block. When writing to flash memory, the first block is filled then transferred completely to the second block. After the first block is written and transferred it is erased. This constitutes one cycle and there are 100,000 cycles possible. Flash memory does, however, have a finite life and cannot be replaced. Programmers should allow for this fact by limiting continuous writes to the flash memory.

The example below demonstrates how to calculate the life of flash memory in a particular application.

A program used VR(0) to VR(49) global variables. The 50 VR variables are written 10 times per day during normal operation. Calculate the maximum number of write (i.e. life) of the flash memory:

```
204 (FLASHVR write per 1024 block - constant)
-50 (Actively flashed variables: VR(0) to VR(49) user variables)
154 (Active size for FLASHVR command)

2 x 154 = 308 (repeat write "cycles" available)
100,000 x 308 = 30,800,000 (total number of repeat write available)
30,800,000 / (50x10) = 61,600 (Maximum days to write to flash)
```

Therefore, life of flash is:

```
61,600 / 365 = 169 years
```

Additional features:

The FLASHVR command can also be used to store the TABLE memory. By using the command **FLASHVR(-1)**, the entire contents of the TABLE memory will be written to the flash memory. Since the entire TABLE is flashed using (-1), you must re-allocate the table memory for readback. This is done by simply writing to one locate "above" your table memory. For example,

```
TABLE(0,1,2,3,4,5,6,7,8,9,10) `Save 1..10 starting at location 0.
FLASHVR(-1)           `Flash entire TABLE
TABLE(11,1)           `Write to location 11 to re-allocate lower table memory.
```

To revert to the standard power-up mode, i.e. not reading the values from the EPROM, you should use the command **FLASHVR(-2)**

Saving Global VR variable in the MC202

Global VR variables can be saved to flash EPROM by using the FLASHVR(x) command. A loop can be written to flash a group of VR variables. **Be sure the NOT to make a continuously looping routine for flashing VR variables as this can diminish the life of the flash EPROM.**

```
VR(1)=1234.5 `Assign a value to VR(1)
FLASHVR(1) `Store VR(1) to flash memory
.
.
MOVE(VR(1)) `Use last VR(1) value
WAIT IDLE `Wait for move to complete
.
.
VR(100)=345.6
VR(101)=444.4
VR(102)=555.6
VR(103)=666.5
VR(104)=777.7
VR(105)=888.6
VR(106)=999.8
VR(107)=778.9

FOR x=100 TO 107
    FLASHVR(x) `Store multiple VR(x) to flash memory
NEXT x
```

Saving TABLE memory in the MC202 to Flash

To save the entire 8000 (0 to 7999) locations of TABLE memory in the MC202 to flash EPROM, use FLASHVR(-1).

```
TABLE(0,12,22,33,44,55,66,77,88,99,100) `Write values to TABLE memory  
FLASHVR(-1) `Save all TABLE values to flash EPROM  
.  
.
```