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Subject: MC1 to MC224 upgrade guide

APPLICATION NOTE

www.triomotion.com

1. MC1 replacement guidelines.

As older systems come to the end of their life, there is an increasing need to be able to upgrade the Motion Coordinator by replacing the MC series 1 with a MC series 2xx controller. This document describes the areas that require attention when replacing a MC1 with the newer MC224.

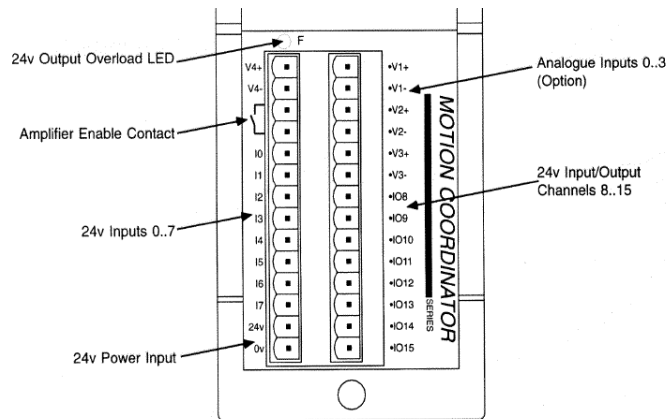
The MC224 has been chosen because this uses the same case style as the older controller.

2. Hardware differences.

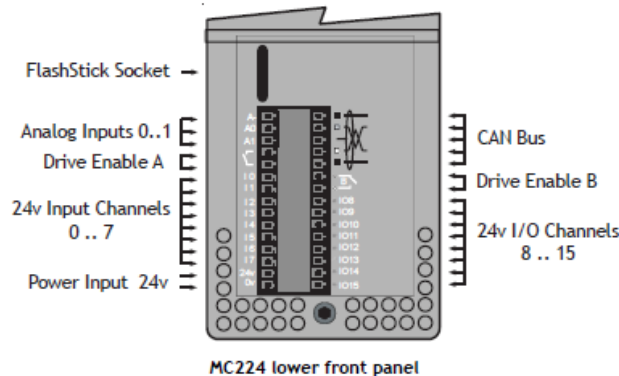
While the MC1 and MC224 have identical metal cases, there are some differences in the detail of connectors and options.

	MC1	MC224
Serial Skt A	Port 0 only	Port 0 and port 3
Serial Skt B	Port 1 (Rs232) Port 2 (Rs485 2 wire only)	Port 1 (Rs232) Port 2 (Rs422 4 wire – can be configured for 2 wire by user)
Analogue Inputs	Factory-fitted Option Up to 7 single ended or up to 4 differential P320 = +/-2V or 0-4V P322 = 0 to 10V P324 = +/- 10V	2 inputs built-in, 0 to 10V Up to 32 additional inputs via CANbus; +/-10V, P325. Up to 8 additional inputs via daughter board; 0 to 10V, P225.
Daughter Boards	All MC1 compatible daughter boards are supported by the MC224.	
Drive Enable	Reed relay, volt-free contact, 250mA at 24V.	2 x Solid-state relays, volt-free contact, 100mA at 24V.
Keypad	Optional built-in F/O port.	P435 F/O adapter.

	MC1	MC224
Digital inputs	8 built-in, 24V inputs.	8 built-in, 24V inputs.
Digital I/O	8 built-in, 24V PNP sourcing outputs/inputs. (bi-directional) Additional I/O via ribbon cable and P310 16IO expansion.	8 built-in, 24V PNP sourcing outputs/inputs. (bi-directional) Additional I/O via CANbus and P316 CAN 16IO expansion
IO Connector style	5.08 mm pitch 2-part screw terminals.	3.81 mm pitch 2-part screw terminals.



MC1 – Power and Digital IO connections



MC224 lower front panel

3. Software differences.

The MC1 and MC224 both run the motion control language; TrioBASIC. In the case of the MC1 this is a single-task version and in the MC224 it is a Multi-Tasking version. This table shows the main differences, but there will be differences due to timing of the run-time code execution as well. Finding out if these differences are important can only be done during commissioning by testing the various routines.

Note that almost all the motion functions run in the same way in both controllers, except that where CAM or CAMBOX is used, the MC1 has only integer values in the cam table, whereas the MC224 can store floating point numbers.

Command Checklist

	MC1	MC224
Logical and bitwise AND	&	AND
Logical and bitwise OR		OR
Logical and bitwise XOR	!	XOR
Change a parameter	CP()	Use parameter name
Read a parameter	RP()	Use parameter name

Soft PLC Operation

The MC1 system software includes a simple soft PLC that executes a ladder network operation every millisecond. If the PLC related commands are used in the MC1 program, the logic of the PLC operation must be decoded and re-written in BASIC to run as a separate task in the multi-tasking. The re-written code will not be guaranteed to execute every millisecond so care must be taken to prioritise the logic operations appropriately.

	MC1	MC224
Clear PLC rule table	CT	No equivalent
Define rung in PLC ladder	EC	No equivalent
Turn PLC ON/OFF	PLC=	No equivalent
Register Z	ZSET	No equivalent
Define statement for PLC event	PLCEVENT	No equivalent
Move WHEN condition	WHEN	No equivalent

Axis Parameters

The parameters P_GAIN, I_GAIN, D_GAIN, VFF_GAIN and OV_GAIN are stored as an integer number in the MC1, with a weighting of 1/256. Therefore all gains must be divided by 256 to work correctly in the MC224. e.g.

MC1: P_GAIN = 256 -----> MC224: P_GAIN = 1.0
 MC1: P_GAIN = 430 -----> MC224: P_GAIN = 1.68
 MC1: P_GAIN = 180 -----> MC224: P_GAIN = 0.70

This assumes that the MC224 is fitted with P200 servo daughter boards, the same as the MC1. If P201 enhanced servo daughter boards are used, the gains must be multiplied by 16 to arrive at the equivalent value.

TABLE

The table memory in the MC1 contains only signed integer numbers. In the MC224 the table memory is stored in floating point format. This may produce some rounding errors in the stored values, but in most cases the DSP floating point format correctly stores integer values up to 2²⁴. (16,777,215)

4. Advice to programmers

Save the program from the MC1 using the MCSETUP DOS utility which is available from the download archive on the Trio website; www.triomotion.com.

Using a text editor, search for the commands listed above and change them as suggested. If the EC command is present, you must assume there is a background PLC operation in use and you will need to decode the PLC function. Use the MC1 manual to decode the EC command list. MC1 manual chapter 8 page 29 has the details of this command. Once the PLC functions are understood, write a new program in BASIC to mimic the same functions but be aware that the BASIC timing will not be as precise as the PLC, so it will be important to prioritise the testing of inputs and setting of outputs. Some may be more time-critical than others.

Test the new programs thoroughly on the machine. It should be possible for a programmer familiar with Trio's series 2 Motion Coordinators to make the changes and test the software in one or two days.

5. Appendix

Serial port connections

Table 1: MC1

Serial Connector A:		Serial Connector B:	
Pin	Function	Pin	Function
1	-	1	RS485 D (Port 2)
2	-	2	RS485 /D (Port 2)
3	RS232 Transmit (Port 0)	3	RS232 Transmit (Port 1)
4	0V	4	0V
5	RS232 Receive (Port 0)	5	RS232 Receive (Port 1)
6	-	6	
7	-	7	
8	-	8	

Table 2: MC224

Serial Connector A:		Serial Connector B:	
Pin	Function	Pin	Function
1	Internal 5v - P435 supply	1	RS485 A Rx+ (Port 2)
2	Internal 0v - P435 supply	2	RS485 B Rx- (Port 2)
3	RS232 Transmit (Port 0)	3	RS232 Transmit (Port 1)
4	0V	4	0V
5	RS232 Receive (Port 0)	5	RS232 Receive (Port 1)
6	Internal 5v	6	+5V output
7	Output to P435	7	RS485 Z Tx- (Port 2)
8	Input from P435	8	RS485 Y Tx+ (Port 2)