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MC508

8 AXIS MOTION COORDINATOR

About this Manual

Purpose

This manual provides the information required for the Selection, Wiring, Connection, Setup, Operation and Functions of the MC508 Motion Coordinator.

Please read and understand this manual to ensure correct usage of the product.

Revision History

Date	Version	Revised Contents
18/10/24	1.00	Initial release - extracted from combined hardware document.

All goods supplied by Trio are subject to Trio's standard terms and conditions of sale.
This manual applies to systems based on the Motion Coordinator Flex-7.

The material in this manual is subject to change without notice. Despite every effort, in a manual of this scope errors and omissions may occur. Therefore, Trio Motion Technology Ltd. cannot be held responsible for any malfunctions or loss of data as a result.

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Safety Warning



During the installation or use of a control system, users of Trio products must ensure there is no possibility of injury to any person, or damage to machinery.

Control systems, especially during installation, can malfunction or behave unexpectedly.

Users must ensure that in all cases of normal operation, controller malfunction, or unexpected behaviour, the safety of operators, programmers or any other person is totally ensured.

If the Trio product is used in a manner not specified by **Trio Motion Technology LTD**, the protection provided by the product may be impaired.

Contents

Revision History	2
User Manual MC508	7
Overview	7
Programming.....	7
Display	7
ERROR DISPLAY CODES	8
I/O Capability.....	9
Communications.....	9
Removable storage.....	9
Axis positioning functions	9
LED indicators	10
Connections to the MC508	10
Registration	16
Dimensions	16
Specifications	17

User Manual MC508

Overview

The Motion Coordinator MC508 is based on Trio's high-performance ARM Coretex-A9 ® double-precision technology and provides 8 axes of servo, or 8 - 16 axes of pulse+direction control for stepper drives or pulse input servo drives.

Trio uses advanced FPGA techniques to reduce the size and fit the pulse output and servo circuitry in a compact DIN-rail mounted package.

The MC508 is housed in a rugged plastic case with integrated earth chassis and incorporates all the isolation circuitry necessary for direct connection to external equipment in an industrial environment.

Filtered power supplies are included so that it can be powered from a 24V d.c. logic supply present in most industrial cabinets.



Programming

The multi-tasking ability of the MC508 allows parts of a complex application to be developed, tested and run independently, although the tasks can share data and motion control hardware. The 22 available processes can be used for Motion-iX or IEC 61131-3 programs, or a combination of both can be run at the same time, thus allowing the programmer to select the best features of each.

Display

On power-up, the information display area shows bt during the boot process, then the MC508 version is displayed, showing P848 for the 8-axis pulse output version and P849 for the 8-axis servo + 8 axis pulse output version. The IP address and subnet mask is shown on power-up and whenever the Ethernet cable is first connected to the MC508.

During operation, this display shows run, OFF or Err to indicate the MC508 status. Below the main status display are the ERROR and ENABLE indicators.



ERROR:	An error has occurred (see Error Display Codes table below for details)
ENABLE:	When illuminated, WDOG is ON

A bank of 8 indicators at the left side shows the State of digital Inputs 0..7 and a similar bank on the right shows the state of inputs 8..15. The I/O displayed can be altered using the DISPLAY command.

ERROR DISPLAY CODES

Ann	Axis error on axis nn	
Caa	Configuration error on unit aa	Le: too many axes
Exx	System error	E00 - RAM error 8bit BB - RAM (VR) E01 - RAM error 16bit BB - RAM (TABLE) E03 - N/A E04 - VR/TABLE corrupt entry E05 - Invalid MC_CONFIG file E06 - Started in SAFE mode E07 - FPGA error E08 - Flash memory error E09 - Processor exception

I/O Capability

The MC508 has 16 built-in 24V inputs, selectable in banks of 8 between NPN and PNP operation and 16 output channels. These may be used for system interaction, or the inputs may be defined to be used by the controller for end-of-travel limits, registration, homing and feedhold functions if required. 16 programmable status indicators are provided for I/O monitoring. The MC508 can have up to 512 additional external Input and Output channels connected using DIN rail mounted CAN I/O modules. These units connect to the built-in CANbus port.

Communications

The 10/100 BASE-T Ethernet port is fitted as standard, and this is the primary communications connection to the MC508. Many protocols are supported include Telnet (Client and Server), Modbus TCP (Client and Server), Ethernet IP (Server) and the Trio Unified API.

Check the Trio website (www.triomotion.com) for a complete list.

The MC508 has one built-in RS232 port, and one built-in duplex RS485 channel for simple factory communication systems. Either the RS232 port or the RS485 port may be configured to run Modbus or Hostlink protocol for PLC or HMI interface.

If the built-in CAN channel is not used for connecting I/O modules, it may optionally be used for CAN communications. Eg DeviceNet, CanOpen etc.

Removable storage

The MC508 has a micro-SD Card slot which allows a simple means of transferring programs, firmware and data without a PC connection. Offering the OEM easy machine replication and servicing.



The memory slot is compatible with a wide range of micro-SD cards up to 32GB using the FAT32 compatible file system.

Axis positioning functions

The motion control generation software receives instructions to move an axis or axes from the Motion-iX or IEC 61131-3 language which is running concurrently on the same processor. The motion generation software provides control during operation to ensure smooth, coordinated movements with the velocity profiled as specified by the controlling program. Linear interpolation may be performed on groups of axes, and circular, helical or spherical interpolation in any two/three orthogonal axes. Each axis may run independently, or they may be linked using interpolation, CAM profile or the electronic gearbox facilities.

Consecutive movements may be merged to produce continuous path motion and the user may program the motion using programmable units of measurement (e.g. mm, inches, revs etc.). The module may also be programmed to control only the axis speed. The positioner checks the status of end of travel limit switches which can be used to cancel moves in progress and alter program execution.

LED indicators

Two LED's are provided to show processor (OK) and system status.

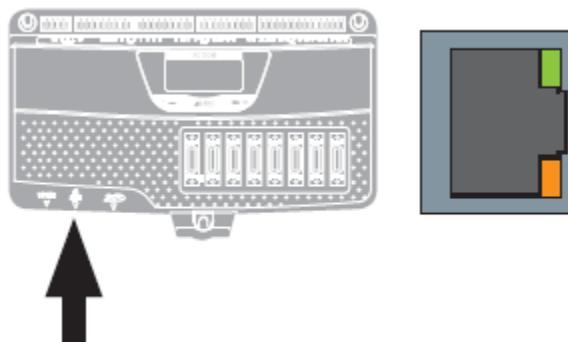
Connections to the MC508

ETHERNET port communications

Physical layer: 10/100 Base-T

CONNECTOR : RJ45

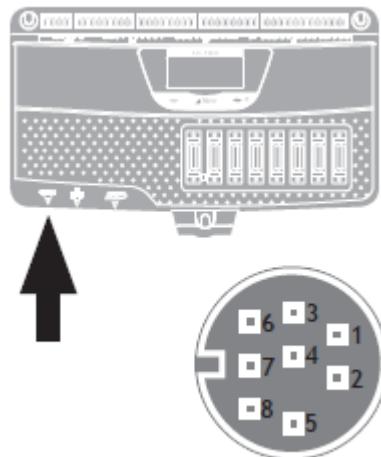
The Ethernet port is the default connection between the Motion Coordinator and the host PC running the Motion Perfect development application.



SERIAL port communications

The MC508 features two serial ports. Both ports are accessed through a single 8 pin connector.

Pin	Function	Note
1	RS485 Data In A Rx+	Serial Port #2
2	RS485 Data In B Rx-	
3	RS232 Transmit	Serial Port #1
4	0V Serial	
5	RS232 Receive	Serial Port #1
6	Internal 5V	5V supply is limited to 150mA, shared with encoder ports
7	RS485 Data Out Z Tx-	Serial Port #2
8	RS485 Data Out Y Tx+	Serial Port #2



Pulse+Direction Outputs / Encoder Inputs

The MC508 is designed to support any combination of servo and pulse driven motor drives on the standard controller hardware. There are 2 version of the MC508; the servo version and the pulse output only version. In the P848 pulse output version, only axes 0 to 7 can be configured. The P849 servo version makes axes 8 to 15 available as pulse and direction output.

Each of the first eight axes (0-7) can be enabled as servo (P849 version), pulse output or encoder according to the user's requirements by setting the axis ATYPE parameter. Axes 8 to 15 can be set as either pulse output or encoder on the P849 version.

The function of the 20-pin MDR connectors will be dependent on the specific axis configuration which has been defined. If the axis is setup as a servo, (P849 only) the connector will provide the analogue speed signal and encoder input. If the axis is configured as a pulse output, the connector provides differential outputs for step/direction or simulated encoder, and enable signals.

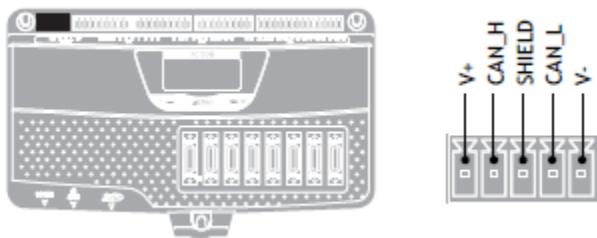
The flexible axis connector also provides 2 digital inputs (24V) and a current-limited 5V output capable of powering most encoders. This simplifies wiring and eliminates external power supplies.

Pin	Incremental Encoder Function	Pulse & Direction Function	Pulse & Direction Function (P849 ONLY)	Absolute Encoder Function
1	Enc A(n)	Pulse(n)	Pulse(n)	Clock(n)
2	Enc /A(n)	/Pulse(n)	/Pulse(n)	/Clock(n)
3	Enc B(n)	Dir(n)	Dir(n)	NC
4	Enc /B(n)	/Dir(n)	/Dir(n)	NC
5	+5V Enc (100mA max.)			
6	Do not connect			
7	WDOG(n)+			
8	WDOG(n)-			
9	Input A+ (16 + n*2)			
10	Input A/B Common			
11	Enc Z(n)	Enable(n)	Pulse(n+8)	Data(n)
12	Enc /Z(n)	/Enable(n)	/Pulse(n+8)	/Data(n)

13	NC	NC	Dir(n+8)	NC
14	NC	NC	/Dir(n+8)	NC
15	0V Enc			
16	Do not connect			
17	VOUT + (n)			
18	VOUT - (n)			
19	Do not connect			
20	Input B + (17 + n*2)			
Shell	Screen			

1. N=axis number
2. WDOG(n)+/- = normally open solid state relay, rated 24V@100mA (one per axis)
3. Input A/B Common, 0V_Enc & VOUT- are all isolated so must be connected with the correct signals.
4. +5V Output 400mA maximum current output is shared between all 8 axis connectors and the serial connector. 100mA maximum per axis connector.

5-WAY connector



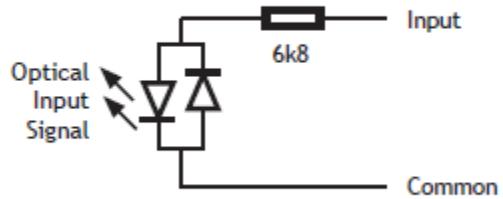
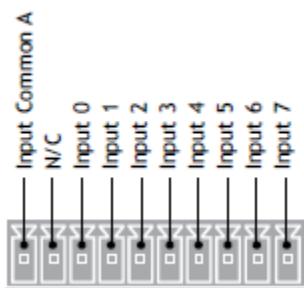
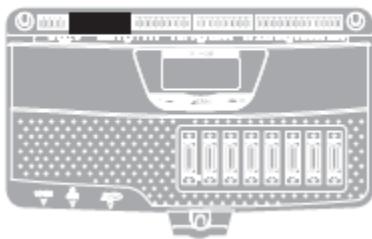
This is a 5 way 3.5mm pitch connector. The connector is used both to provide the 24Volt power to the MC508 and provide connections for I/O expansion via Trio's digital and analogue CAN I/O expanders.

24 Volts must be provided as this powers the unit. This 24Volt input is internally isolated from I/O 24 Volts and the +/-10V voltage outputs.

24Vd.c., Class 2 transformer or power source required for UL compliance. The MC508 is grounded via the metal chassis. It MUST be installed on an unpainted metal plate or DIN rail which is connected to earth. An earth screw is also provided on the rear of the chassis for bonding the MC508 to ground.

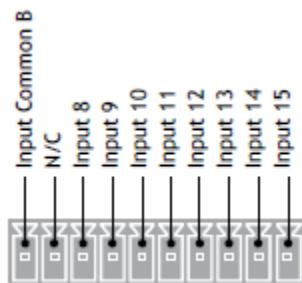
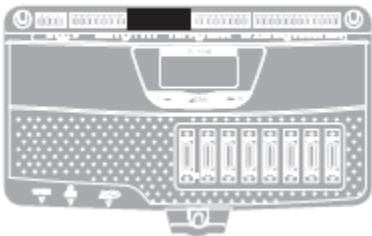
I/O Connector A

I/O CONNECTOR A



I/O Connector B

I/O CONNECTOR B



24V Input Channels

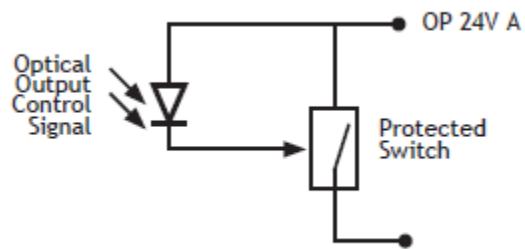
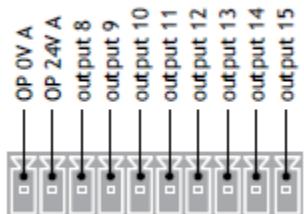
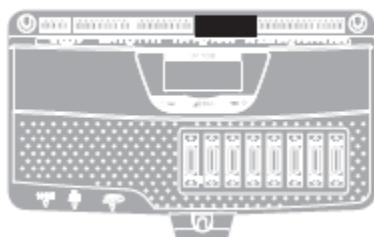
The MC508 has 32 dedicated 24V Input channels built into the master unit. A further 512 inputs can be provided by the addition of CAN I/O modules. The dedicated input channels are labelled channels 0..7, 8..15 and 2 per flexible axis connector (16..31). Two terminals marked XAC and XBC are provided for the input common connections. Connect XAC/XBC to 0V for PNP (source) input operation or connect to +24V for NPN (sink) operation. Input connectors A and B are independent so one can be PNP while the other is NPN.

Flexible axis connector inputs are fixed function PNP inputs.

Inputs 0 to 7 can be used as registration inputs for axes 0 to 7, using the `REGIST` command.

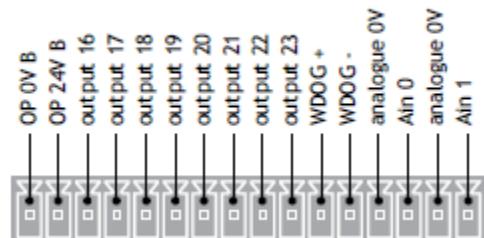
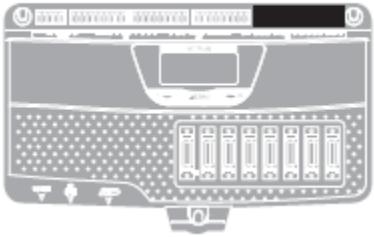
I/O Connector C

I/O CONNECTOR C



I/O Connector D

I/O CONNECTOR D



24V Output Power

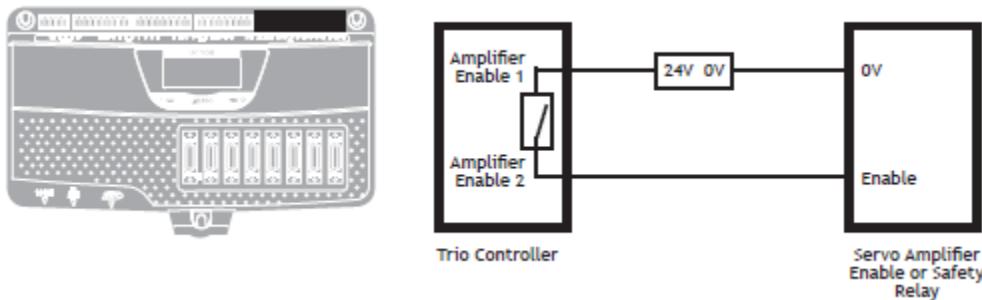
The XC-/XD-0 Volts and XC+/XD+24 Volts are used to power the 24 Volt digital outputs. XD-/XD+ also powers the analogue I/O, Including the servo DAC outputs.

24V Output Channels

Output channels 8..23 are output only of PNP type 24V source. The output circuit has electronic over-current protection and thermal protection which shuts the output down when the current exceeds 500mA.

Care should be taken to ensure that the 500mA limit for each output circuit is not exceeded, and that the total load for the group of 8 outputs does not exceed 4 Amps.

Amplifier Enable (WATCHDOG) Relay Outputs



An internal relay contact is available to enable external amplifiers when the controller has powered up correctly and the system and application software is ready. The amplifier enable is a solid-state relay with an ON resistance of 25Ω at 100mA. The enable relay will be open circuit if there is no power on the controller OR a motion error exists on the servo axis OR the user program sets it open with the WDOG=OFF command.

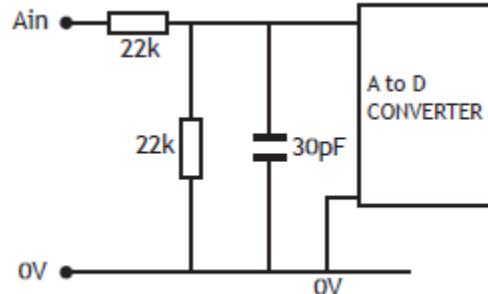
The amplifier enable relay may, for example, be incorporated within a hold-up circuit that must be intact before a 3-phase power input is made live.

 All stepper and servo amplifiers must be inhibited when the amplifier enable output is open circuit

Analogue Inputs

Two built-in 12bit analogue inputs are provided which are set up with a scale 0 to 10V. External connection to these inputs is via the 2-part terminal strip I/O connector D.

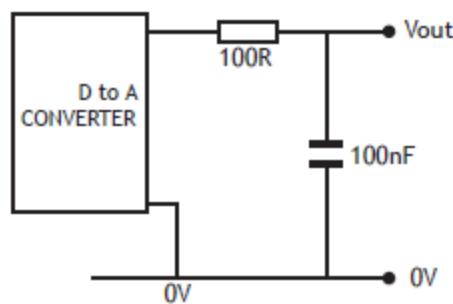
A 24V d.c. supply must be applied to I/O connector D (XD+/XD-) to provide power for the analogue input circuit.



Analogue Outputs

The MC508 has 8 12-bit analogue outputs, one per flexible axis connector, scaled at +/-10V. Each output is assigned to one servo axis, or in the case where the axis is not used, or is set as a pulse+direction/simulated encoder output, the analogue output may be set to a voltage directly in software.

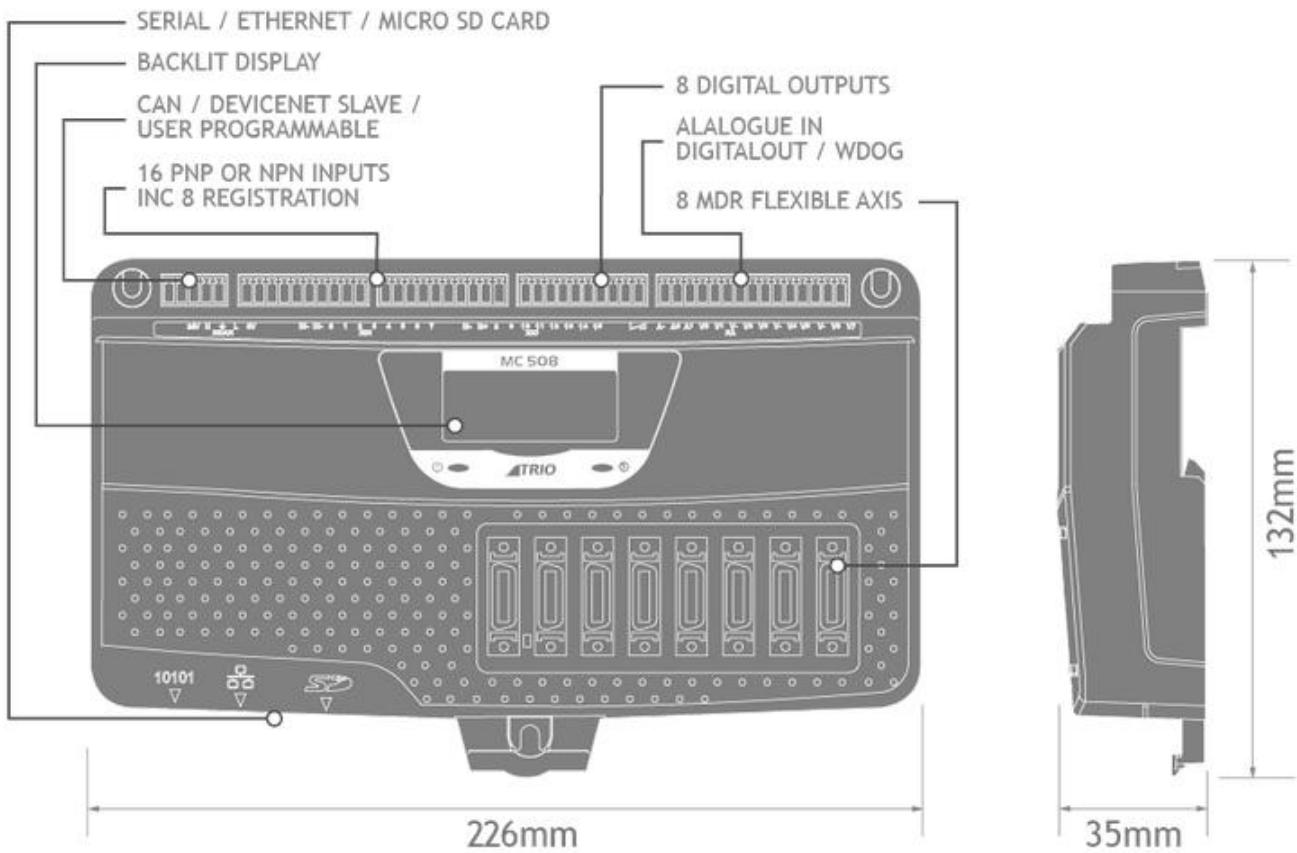
A 24V d.c. supply must be applied to I/O connector D to provide power for the analogue output circuit.



Registration

Axes 0 to 7 each have 2 available registration events. These are assigned in a flexible way to any of the first 8 digital inputs or can be used with the Z mark input on the encoder port.

Dimensions



Specifications

Specification table	
Size	132 mm x 226 mm x 35 mm (HxWxD)
Weight	640g
Operating Temp.	0 - 45 degrees C
Control Inputs Via I/O expansion	Forward Limit Reverse Limit Datum Input Feedhold Input
Communication Ports	Ethernet : 10/100BASE-T port connection. CAN bus : (DeviceNet and CANopen compatible) RS232 channel : up to 128k baud.
Position Resolution	64 bit internal position registers
Speed Resolution	32 bits. Speed may be changed at any time Moves may be merged
Servo Cycle	125µs minimum 1ms default 2ms maximum
Programming	Multi-tasking Motion iX system IEC 61131-3 programming system. Maximum 22 user processes.
Interpolation modes	Linear 1- 8 axis, circular, helical, spherical, CAM Profiles, speed control, software gearbox and linked motion.
Processor	ARM Cortex-A9.
Memory	8 Mbyte user program memory Automatic flash EPROM program and data storage
VR	16384 global VR data in FLASH memory (automatic-store)
TABLE	512000 x 64 bit TABLE memory. Option to auto-save 64,000 TABLE points
Real Time Clock	Capacitor support for 10 days of power off.

SD Card	micro-SD Card FAT 32, up to 32 GB Stores programs and data Can be used for firmware update, user program installation and system recovery
Power Input	24V d.c., Class 2 transformer or power source Processor/CANbus 18..29V d.c. at 225mA. Analogue I/O 18..29V d.c. at 50mA. Digital Outputs, 18..29V d.c. at up to 4 Amps per bank of 8.
Amplifier Enable Output	Normally open solid-state relay rated 24V ac/dc nominal. Maximum load 1000mA. Maximum Voltage 29V.
Analogue Inputs	2 isolated, 12 bit, 0 to 10v.
Serial / Encoder Power Output	5V at 150mA.
Digital Inputs	32 Opto-isolated 24V inputs. 16 are selectable PNP/NPN.
Digital Outputs	16 Opto-isolated 24V outputs. Current sourcing (PNP) 500mA. (max. 4A per bank of 8).
Product Code	P848 : MC508, 8 axis stepper
	P849 : MC508, 8 axis servo or stepper + 8 axis stepper or encoder.