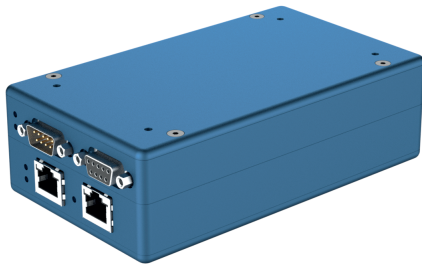
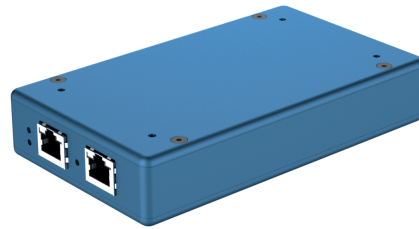


MMC-ETHERNET

Series



Modular Motion Control Ethernet System Reference Manual

MMC-ETHERNET

Reference Manual

Rev 1.03

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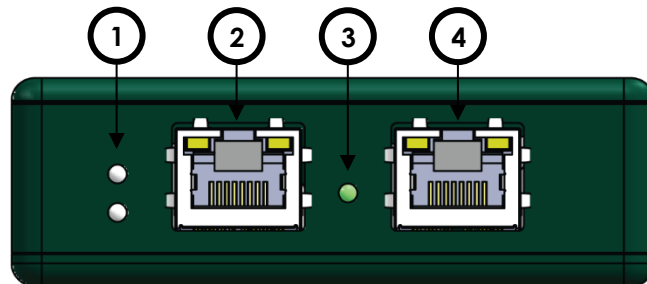
Command Index

Command	Description	Page
ANR	Set Axis Number	17
IPA	IP Address	18
MAC	MAC Address	19
SAV	Save Axis Settings	20
VER	Firmware Version	21

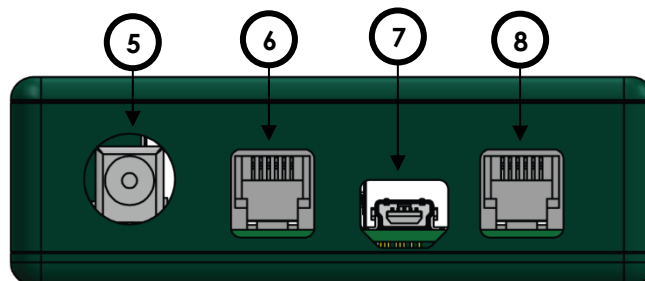
1. Introduction

1.1 Product Description

The MMC-ETHERNET is a module that provides Ethernet capabilities to all standard MMC controllers. The MMC-ETHERNET will facilitate all traffic received from any one of its communication ports or from an MMC controller within the connected stack. The module will use ASCII protocol for all communication networks. The MMC-ETHERNET is also a Power over Ethernet device compliant with PoE+ (IEEE 802.3at), allowing for both power and communication through a single connection.



1. +24V Power LED (Top) & Error LED Indicator (Bottom)
 - a. Red – An error has occurred.
2. Ethernet IN, RJ45
 - a. IEE 802.3at PoE+ compatible powered device
3. PoE+ LED Indicator
4. Ethernet OUT, RJ45



5. Power Supply, +24DC, Regulated
6. RS485 Connector, RJ11
7. USB Mini Connector
8. RS232 Connector, RJ11

1.2 Features

- +24 VDC through standard power jack
- IEE 802.3at PoE+ compatible powered device
- USB 2.0
- Ethernet, 10/100/1000 Mbps
- RS485
- RS232

1.3 Package Contents

If product is damaged or there are missing components, contact MICRONIX USA immediately. Do not discard product packaging in case of return shipment.

Package Contents:

- MMC-ETHERNET
- Quick Start Guide
- Supplemental CD
- USB Cable

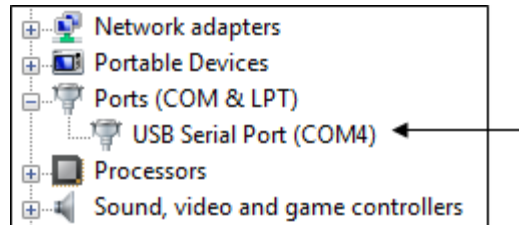
2. Quick Start Guide

2.1 Quick Start Guide Overview

The following Quick Start Guide is intended to provide a basic set-up of the MMC-ETHERNET in the least amount of time. The following paragraphs will provide a walkthrough of the steps needed to set-up the controller and verify that the system is working correctly.

1. Install Drivers
 - a. To ensure correct communication between the module and PC, install the proper drivers onto the communicating computer prior to connecting the MMC-ETHERNET.
 - b. The drivers may be found on the supplemental installation CD or can be downloaded from: <http://www.ftdichip.com/Drivers/VCP.htm>
2. Connect Module to PC
 - a. Use an CAT5e/6 cable to connect the MMC-ETHERNET controller to the communicating PC/Server
 - b. Use the supplied Mini USB to USB cable to connect the MMC-ETHERNET controller to the communicating PC. Only one USB cable is required per module/stack.
3. Power Up Controller
 - a. Connect the controller with a 24V, regulated power supply with the correct amperage rating through the 5.5mm barrel jack connector.
 - b. Alternatively, connect the controller through the RJ45 Ethernet IN connector using the IEE802.3at rating
4. Check COM Port
 - a. It is necessary to note the COM Port assigned to the MMC-ETHERNET when connecting to a PC.
 - i. In Windows Vista Open the Device Manager:
 - 1 Windows Logo (in the bottom left corner by default)
 - 2 Control Panel
 - 3 Device Manager
 - ii. In Window XP Open Device Manager:
 - 1 Start (in the bottom left corner by default)
 - 2 Control Panel
 - 3 System

- 4 select the Hardware tab
- 5 Click the device manager button
- iii. In Windows 7 Open the Device Manager:
 - b. After powering up the controller (Step 4), note the USB Serial Port assigned. See the figure below showing a snapshot of the Device Manager window:



5. Continue to Quick Start MMC-ETHERNET Motion Controller Platform
 - a. The following section will help you get running with the MMC-ETHERNET Motion Controller Platform program.

2.2 Quick Start MMC-ETHERNET Motion Controller Platform

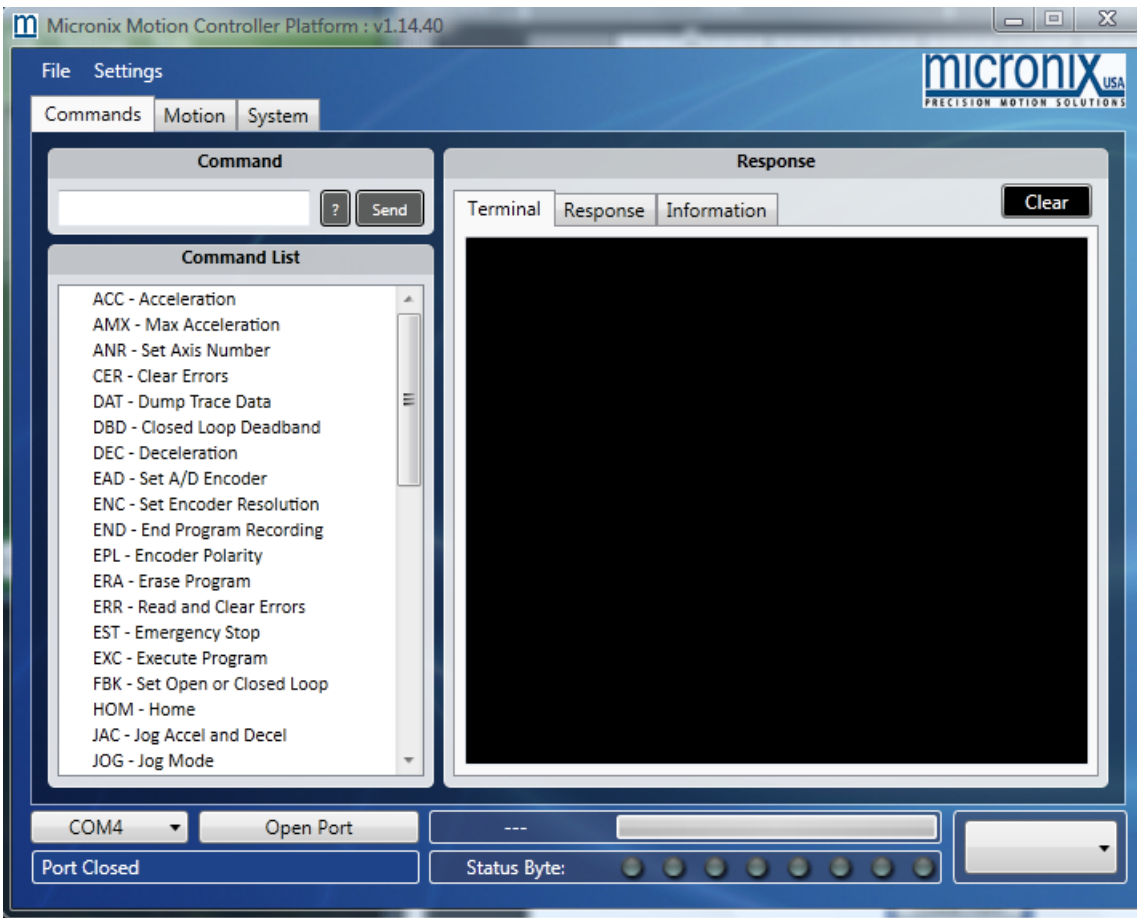
The following Quick Start Guide is intended to provide a basic set-up of the MMC-ETHERNET MCP program. The following paragraphs will provide a walkthrough of the steps needed to install the program and verify that the system is working correctly.

1. Pre-Installation
 - a. This guide assumes you have already run through the previous Quick Start guide and that the controller is on and connected to a Com port on your computer. Please verify that this is true.
 - b. You will need the .NET Framework 4.0. If you are unsure if you have the .NET Framework 4.0 follow these steps.
 - i. Open the start menu (windows icon if using Vista).
 - ii. Open the Control Panel
 - iii. Open "Add or Remove Programs" ("Programs and Features" if using Vista)
 - iv. Scroll through the list and find "Microsoft .NET Framework" If it is 4.0 skip to step-2. Otherwise continue with step c.
 - c. To install the .NET Framework 4.0 you will need a connection to the internet.
 - i. Navigate to this site:
<http://www.microsoft.com/downloads/details.aspx?FamilyID=9cfb2d51-5ff4-4491-b0e5-b386f32c0992&displaylang=en>
 - ii. Download and run the web installer
 - iii. At the conclusion of this install you will be asked to restart your computer. Do this now.
2. Install
 - a. To install the MMC-ETHERNET motion controller platform, double click the setup.exe file on the supplied CD and follow the on screen instructions.
3. Run
 - a. The installer placed a start menu short-cut to the MMC-ETHERNET MCP program. Make sure that your MMC-ETHERNET is connected to your computer, powered on, and connected to a valid COM port as discussed in section 2.1
 - b. Open the start menu (or windows icon for Vista)

- c. Open the 'All programs' tab
- d. Open the MICRONIX USA folder
- e. Run the MMC-ETHERNET MCP program

Using the MMC-ETHERNET Motion Controller Platform

In the Quick Start Guide Overview you connected your MMC-ETHERNET to your computer. In the Quick Start MMC-ETHERNET Motion Controller Platform you installed and ran the MMC-ETHERNET MCP software. This section will describe the capabilities of the MMC-ETHERNET MCP program and give you a brief understanding of how to use it.

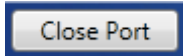


1. Port Control – The picture below depicts the program when the Port has been opened

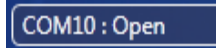


- a. Select the COM port associated with your MMC-ETHERNET COM10 as discussed in section 2.1, step 5.
- b. Click the Open Port button to connect to the MMC-ETHERNET Open Port

- i. This button should change giving you the option to close the port



- c. The Port field should change to indicate the Port is Open



and the terminal should populate with some information about the system and then turn blank. You are now ready to start moving a stage with your MMC-ETHERNET. For more information about this program see the MMC-ETHERNET MCP program guide.

- 2. More information – more information about the MMC-ETHERNET MCP can be found in the MMC-ETHERNET MCP program guide.

3. Technical Information

3.1 MMC-ETHERNET Specifications

Parameter	Description
Control Interface	USB 2.0 compliant Ethernet 10/100/1000 Mbps RS232 / RS485
Commands	ASCII Commands
Power Supply	Regulated 24V DC (1A per module/axis*) PoE+ (IEE 802.3at Compatible)
Software Interface	MMC MCP GUI, LabVIEW VI's

3.2 Serial Port Setup

If the MMC-ETHERNET is not automatically recognized by your computer, you will have to first install the FTDI interface drivers before communicating with the controller. The drivers are supplied on the supplemental CD under the folder *MMC-ETHERNET Drivers* or can be downloaded from:

<http://www.ftdichip.com/Drivers/VCP.htm>

Below are the virtual RS-232 configuration settings necessary for correct communication setup:

Software Parameter	Setting
Data Bits	8
Stop Bits	1
Parity	No
Handshake	No
Baud rate	38400

3.3 Ethernet Port Setup

The RJ45 connector can be used to communicate via Ethernet using ACSII over TCP/IP. The MMC-ETHERNET will auto negotiate 10/100/1000Mbps with an Ethernet client. Two TCP/IP ports with an integrated switch will be available for more flexible connections to an existing Ethernet network.

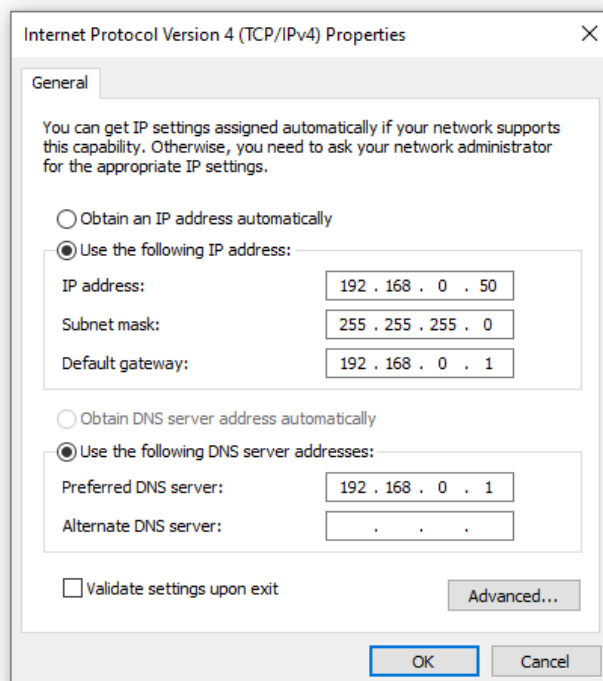
Static IP address assignment will be used with the default IP/sockets settings below

IP Address: 192.168.0.20
 Port: 5000

To change the IP address, the (nIPA) command should be used. See the nIPA command section for details. Once the IP address is changed and settings are saved, the new IP address will be used on the next power up.

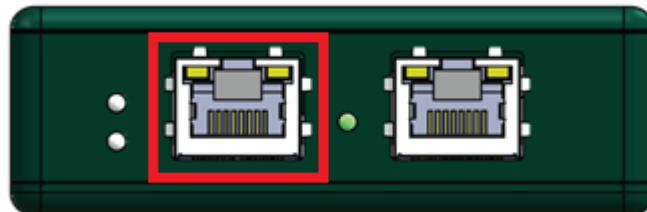
If using a PC, the adapter options for the Ethernet port will likely need to be updated in order to establish communication. This can be done using the steps below.

1. Open Network and Internet Settings window
2. Navigate to "Change adapter options"
3. Right click the correct Ethernet port and select Properties
4. Select Internet Protocol Version 4 (TCP/IPv4) and click Properties
5. Select the option to "Use the following IP address" and enter in the IP address, subnet mask, and default gateway. These setting will vary depending on the configured IP address of the MMC-ETHERNET. See an example of settings below for the default IP address.



3.4 Power Over Ethernet (PoE+)

The MMC-ETHERNET is a powered device (PD) that implements IEEE 802.3at Type-2 Hardware Classification (PoE+). The power sourcing equipment (PSE), such as a PoE+ compatible switch, can connect to the Ethernet IN connector on the MMC-ETHERNET. The PSE will need to be IEEE 802.3at compliant.

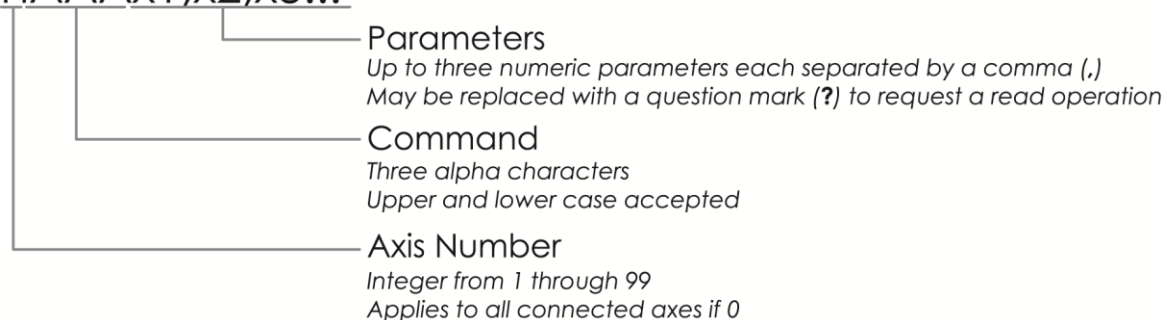


The PSE will provide enough power to operate the MMC-ETHERNET and a single axis controller, such as the MMC-200 or MMC-110. Contact Micronix, USA for additional configurations or axis.

4. Commands

4.1 Command Line Syntax

nAAx1,x2,x3...



There are three components to every command prompt. The first is the "Axis Number" which designates which controller, or axis, will receive the command. If the "Axis Number" is 0, then the command will be sent globally to all connected controllers. It is possible to connect up to 99 controllers; therefore the "Axis Number" will be an integer value from 0 through 99.

The second component is the "Command", which is always comprised of three letters. Each command is outlined, along with its corresponding parameters, in the *Command Description* section 5.9 of this manual.

The third and final component is the "Parameter". This portion is command dependent, meaning that the parameter value will change depending on the specific requirements of the "Command". Where applicable, a question mark (?) may be substituted to initiate a read operation which will return information regarding the particular command. There may be up to three separate parameters for a particular command, each parameter value is separated by a comma (,).

All white space (blank spaces) are ignored in the command format. The following are examples of equivalent commands:

4TRM13, 45
4 TRM 13 , 45

4.2 Command Line Format

Commands are first executed in the order that they are input, then line by line. This means that two commands on the same line are executed significantly closer to each other than if they were on two separate lines. Each command is separated by a semicolon (;) and every command line ends in a terminator (EX: carriage return). The following is an example of a command line entry:

1MVR16; 3MVR12 | Axis 1, Move 16 mm [16 degrees]; Axis 3, Move 12 mm [12 degrees]

Using multiple commands on the same command line allows for synchronization of different commands to different axes. Up to 8 commands are allowed per command line.

Only one read operation is allowed per line. The controller will not send information unless requested to do so by a read operation.

4.3 Global Commands

Some commands have the option of being called globally. This means that you can send the same command to all available axes. To do this, replace the axis number of a global command with a '0'. For example; 0ACC 50 will set the acceleration of all available axes to 50 mm/s² [degrees/s²].

4.4 Multiple Parameters

When dealing with a command that has multiple parameters, it is possible to change a single parameter by omitting numbers for the parameters that will remain unchanged. For example; 4PID, , 3 will only change the third parameter to a new value, "3".

4.5 Synchronous Move

It is possible to execute multiple motions at the same time by setting up and executing a synchronous move. To set up a synchronous move, use the MSA and MSR commands. These commands can be written on the same command line (up to 8 allowed) or on separate lines followed by a line terminator. To execute the move, use the RUN command on the proceeding command line followed by a line terminator. For example;

1MSA4; 2MSA4; 3MSA4 | Axis 1, Move 4mm; Axis 2, Move 4mm; Axis 3 Move 4mm
0RUN | Run Synchronous Move

Or

1MSA4 | Axis 1, Move 4mm
2MSA4 | Axis 2, Move 4mm
3MSA4 | Axis 3 Move 4mm
0RUN | Run Synchronous Move

4.6 Terminating Characters

When communicating with the controller via USB, it is necessary to note the terminating characters involved in transmitting and receiving data. Note that the terminating characters will be different when communicating through Ethernet or USB.

To send data to the controller via USB, enter the desired commands in the command line followed by the new line and carriage return terminating characters [$\backslash n \backslash r$], or just the carriage return terminating character [$\backslash r$]. When receiving, each line of data will be followed by the new line terminating character [$\backslash n$] and the final line will end in the new line and carriage return terminating characters [$\backslash n \backslash r$]. The ASCII value for new line [$\backslash n$] is 0X0A and for carriage return [$\backslash r$] is 0X0D. The following is an example of data transmission:

```
1VEL0.005 \n\r      | Axis 1, Set velocity to .005 mm/s [degrees/s2] [New line, Carriage Return]
```

These terminating resistors will be required for both USB and Ethernet communication.

4.7 Summary of Commands

Command	Description	During Motion		Real-time		Program		Global		Page
		Set	Read	Set	Read	Set	Read	Set	Read	
ANR	Set Axis Number		✓	✓	✓			✓		17
IPA	IP Address		✓	✓						18
MAC	MAC Address		✓		✓					19
SAV	Save Axis Settings			✓				✓		20
VER	Firmware Version		✓		✓					21

*If paired with another MMC controller, then please see the corresponding reference manual for their respective commands.

4.8 Command Descriptions

ANR

Set Axis Number

During Motion		Real-time		Program		Global	
Set	Read	Set	Read	Set	Read	Set	Read
	✓	✓	✓			✓*	
Command Description:		<p>This command is used to override Auto Addressing by manually assigning an axis number to a controller. Auto Addressing is the default method of assigning axis numbers on power up and may be reassigned to an axis by substituting a "0" for the parameter value. Simultaneous axis swapping is possible by using multiple ANR commands on the same command line.</p> <p>*This command can be called globally by specifying a '0' for the axis number; however it will only work if the new axis number parameter is set to '0' for auto-addressing.</p>					
Returns:		<p>A read operation returns the following axis number values for the specified axis:</p> <p>0 – Auto Addressing assigned (default) 1-99 – Manually assigned, axis number displayed</p>					
Syntax:		<p>nANRx – Standard syntax nANR? – Read axis number value</p> <p>Error [#]: ANR? – Read operation with missing axis number [27] nANR – Missing new axis number parameter [28] ANRx – Missing axis number [30]</p>					
Parameter Description:		<p>n[int] – Axis number x[int] – New axis number, 0 for Auto Addressing ? – Read axis number value</p>					
Parameter Range:		<p>n – 0 to 99 x – 0 to 99</p>					
Related Commands:		None					
Example:		<p>5ANR1 ; 1ANR5 Simultaneous axis swapping: Axis 5, Set to axis 1; 1; Axis 1, Set to axis 5 - 4ANR0 Axis 4 Set to Auto Addressing. However it will remain axis 4 until the MMC-100 is reset</p>					

IPA

Set IP Address

During Motion		Real-time		Program		Global	
Set	Read	Set	Read	Set	Read	Set	Read
	✓	✓					
Command Description:		This command is used to set the desired IP address of the controller. The controller will use an IPv4 format address. Each 8-bit segment of the IP address are defined separately.					
Returns:		A read operation returns the full IP address.					
Syntax:		nIPAx1 – Standard syntax nIPA? – Read acceleration value Error [#]: IPA? – Read operation with missing axis number [27] nIPA – Missing parameter [28]					
Parameter Description:		n[int] – Axis number x1[int] – IP address ? – Read IP address value					
Parameter Range:		n – 0 to 99 x1 – Format: nnn.nnn.nnn.nnn nnn must be less than 255					
Related Commands:							
Example:		1IPA192.168.0.21 Axis 1, Set IP to 192.186.0.21 1SAV Axis 1, Save IP address to flash					

MAC

MAC Address

During Motion		Real-time		Program		Global	
Set	Read	Set	Read	Set	Read	Set	Read
	✓		✓				
Command Description:		This command is used to return media access control (MAC) address of the MMC-ETHERNET. This is a 6 byte manufacturer assigned number.					
Returns:		A read operation returns the MAC address for the specified axis.					
Syntax:		nMAC? – Read MAC address Error [#]: MAC? – Read operation with missing axis number [27] nMAC – Missing acceleration parameter [28]					
Parameter Description:		n[int] – Axis number ? – Read MAC address					
Parameter Range:		n – 0 to 99					
Related Commands:							
Example:		4MAC?		Axis 4, Read MAC address]			

SAV

Save Axis Settings

During Motion		Real-time		Program		Global	
Set	Read	Set	Read	Set	Read	Set	Read
		✓				✓	
Command Description:		This command is used to save all settings for the specified axis. This allows an axis to be configured on power up.					
Returns:		A read operation cannot be used with this command.					
Syntax:		nSAV – Standard syntax 0SAV – All axes save settings					
Parameter Description:		n[int] – Axis number					
Parameter Range:		n – 0 to 99					
Related Commands:		None					
Example:		16SAV		Axis 16, save settings			

VER

Firmware Version

During Motion		Real-time		Program		Global	
Set	Read	Set	Read	Set	Read	Set	Read
	✓		✓				
Command Description:		This command is used to check the firmware version for the specified axis.					
Returns:		A read operation returns the firmware version for the specified axis.					
Syntax:		nVER? – Standard syntax Error(s): VER? – Read operation with missing axis number [27] nVER – Missing read operation parameter [28]					
Parameter Description:		n[int] – Axis number ? – Read firmware version					
Parameter Range:		n – 1 to 99					
Related Commands:		None					
Example:		11VER?		Axis 11, Read firmware version			

4.9 *Error Messages*

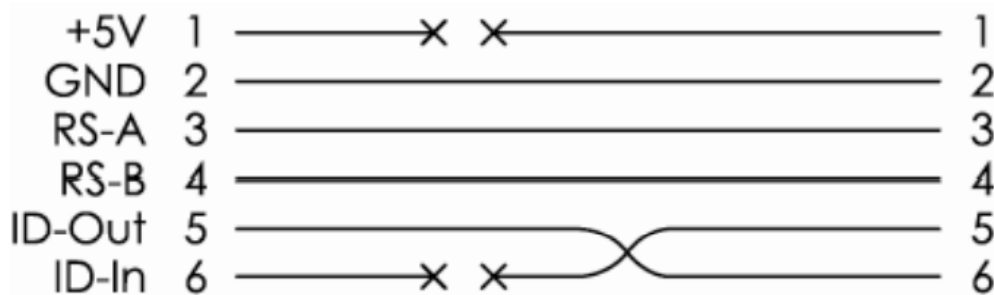
Error Number	Name	Description
26	Invalid Command	The 3-letter instruction entered is not a valid command. Ensure that the 3-letter instruction is a recognizable command.
28	Invalid Parameter Type	<p>1. The parameter entered does not correspond to the type of number that the instruction requires. For example, the command may expect an integer value, therefore sending a floating point value will trigger this error.</p> <p>2. The allowable precision for a parameter has been exceeded. For example, velocity can be specified with a precision of 0.001 mm/sec. If a more precise velocity value of 0.0001 mm/sec is entered, this error will be triggered. Refer to the command pages for the type of parameter that each command expects.</p>

5. Connector Pin-outs

5.1 RS-485 Intermodular Connector Cable Pin-out

The RS-485 Intermodular Connector Cable is used to daisy chain two MMC modules together, allowing for alternative module configurations. The cable is directional, and its orientation should be noted when configuring axis numbers, for the direction of the cable will determine axis order. This connector can also be used to communicate with the controller in place of the USB connection by connecting your RS-485 Bus to pins 2, 3 and 4 as they appear below.

RS-485 Intermodular Connector Cable Pin-out:



5.2 RS-232 RJ-11 Pin-out

Pin	Description
1	N.C.
2	GND
3	RX
4	TX
5	ID-Out (Not Used)
6	ID-In (Not Used)