MMC-10
Series

Modular Motion Control System

Quick Start Guide

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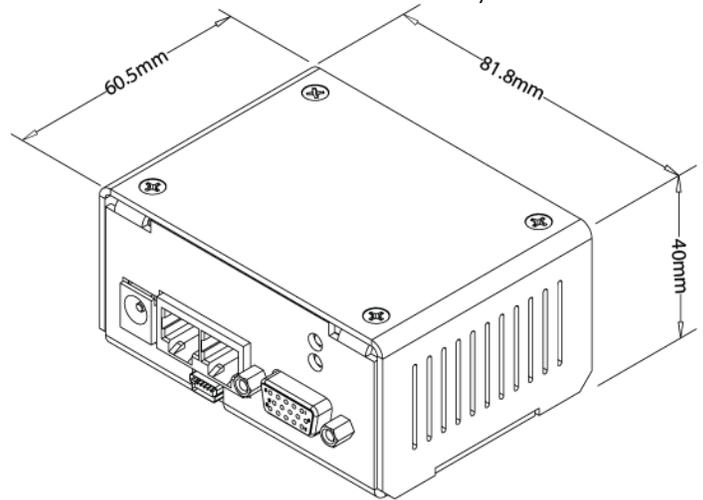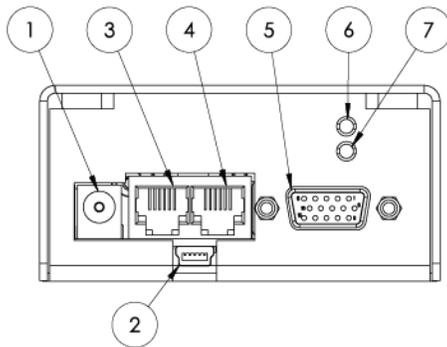
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1. Introduction

This document is a quick start guide to be used to get the MMC-10 and accompanying stages connected and functional.

1.1   Product Description

The MMC-10 is a low cost two phase piezo motor controller/driver designed to be used as a standalone single axis unit or interconnected for multi-axis functionality.

1. 12V to 36V DC in (24V Nominal, peak current draw 0.5A)
2. USB Connector
3. Intermodular/RS-485 Input
4. Intermodular/RS-485 Output
5. Motor/Encoder
6. LED Addressing Indicator 2
    a. Orange – Stage is Unaddressed
    b. Green – Stage has an address and is ready
7. LED Error Indicator 1
    a. Red – An error has occurred

1.2   Features

- Integrated controller/driver for MICRONIX USA stick-slip piezo motors
- Ultra-compact design
- Open loop/closed loop operation
- Closed loop resolution dependent on the encoder

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2. Quick Start

2.1   Inventory

We will begin the setup process by making sure all the components we will need are accounted for. With every MMC-10 controller, the following should be included:

Package Contents:
1. MMC-10 Controller
2. 24V Power Supply
3. Power Cable
4. 6' USB Cable
5. User Manual
6. Supplemental CD
7. RJ-11 Daisy Chain Cable

2.2 Quick Start: Connecting Your Motion Device.

1. Connect MMC-10 to Motion Devices:
   Each stage to be used with an MMC-10 will have a male DSUB15 HD connector attached to it. Plug this in to the motor/encoder plug on the MMC-10 unit. This connector will connect the motor to the drive circuitry of the controller, and on closed loop stages will additionally serve to relay the encoder data back to the controller (Pinout available in complete user manual).

2. Connect MMC-10 to Computer:
   Connect the mini USB connector on the MMC-10 unit to your pc using the included 6' USB cable.

3. (Optional) Connect MMC-10 units together
   The MMC-10 has both an in and an out jack for RS-485 communication. This jack also distributes power and is responsible for addressing in situations where

   the auto address function is used. Connect the output of one MMC-10 to the input of another to daisy chain multiple MMC-10 controllers together, sharing power and a communication bus. (Pinout available in complete user manual) Axes will be addressed in the order they are connected, a unit who's "in" jack is connected to another units "out" jack will have an address one higher than the unit it is daisy chained to, starting with 1.

4. Connect MMC-10 to Power
   Now that everything is connected, power on the device by plugging in the 24V power supply. At this point, the upper LED should be lit green.

2.3 Getting Your Target PC Ready

There are a number of ways to control Micronix controllers, but let's start by setting up the Micronix MCP user interface on your PC.

1. Install
    a. To install the Micronix motion controller platform double click the setup.exe file on the supplied CD or downloaded from http://www.micronixusa.com/motion/support/softwares.cfm and follow the on screen instructions.
    b. If the on screen instructions do not take you all the way through the installation process, see the Troubleshooting section on page 10 of this manual.
2. Run
    a. Open the start menu (Windows 7/Vista) or the Start screen (Windows 8/10)
    b. Open the 'all programs' tab (Windows 7/Vista) or use the down arrow to navigate to the Apps screen (Windows 8/10)
    c. Open the Micronix folder (Windows 7/Vista) or navigate to the Micronix section of the Apps screen by scrolling sideways (Windows 8/10)
    d. Run the Micronix MCP program.
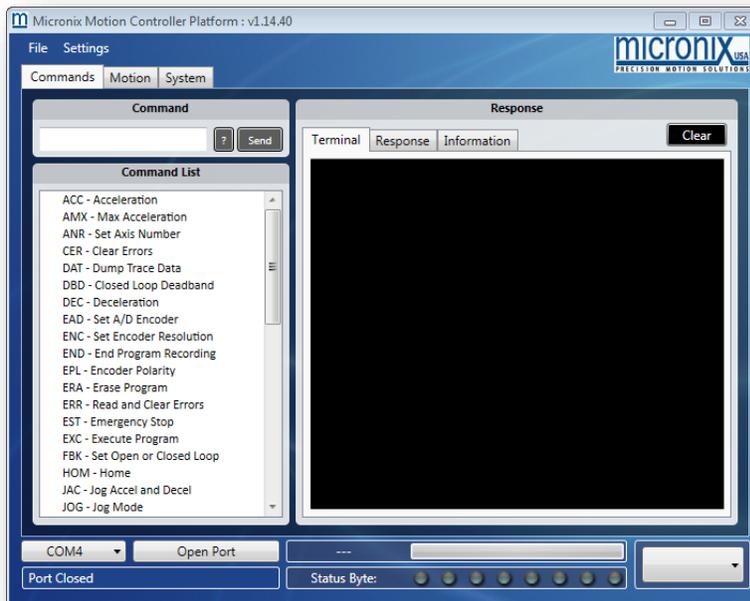
Micronix MCP GUI

2.4   Quick Start: Using the Micronix Motion Controller Platform

Now that we have connected a stage to a controller, and a controller to a PC, it's time to tie it all together. Your PC should automatically recognize the device plugged into it (your controller) as a com port with the following specs:

By default, Micronix devices will appear as "COM 4". If this com port is already occupied, it will appear as the next available com port. If there is uncertainty about which COM port your Micronix device is occupying, or if you are unable to communicate with your Micronix device via com port, skip to the troubleshooting section on page 10 of this manual for help resolving this issue.

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With a com port identified, it is time to connect to the MMC-10 using the Micronix MCP program installed in section 2.2.

Port Control section of Micronix MCP software

Port Control

    a. Select the COM port associated with your MMC-10 device
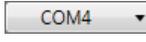
    b. Click the Open Port button to connect to the MMC-10
       i. This button should change giving you the option to close the port
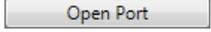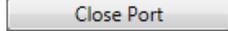
    c. The Port field should change to indicate the Port is Open.

    d. You will see the progress bar fill and the adjacent field change with information regarding the query process as the program initializes. You are now ready to start moving a stage with your MMC-10.

    e. The Axis selector will allow you to switch control between different axes, if multiple axes are being used.

2. Motion

    a. Now that everything is connected, it is time to use the Micronix Motion Control Platform (MMCP) to move a stage. If your stage has an encoder, navigate to the "Commands" section of the MMCP as pictured below.

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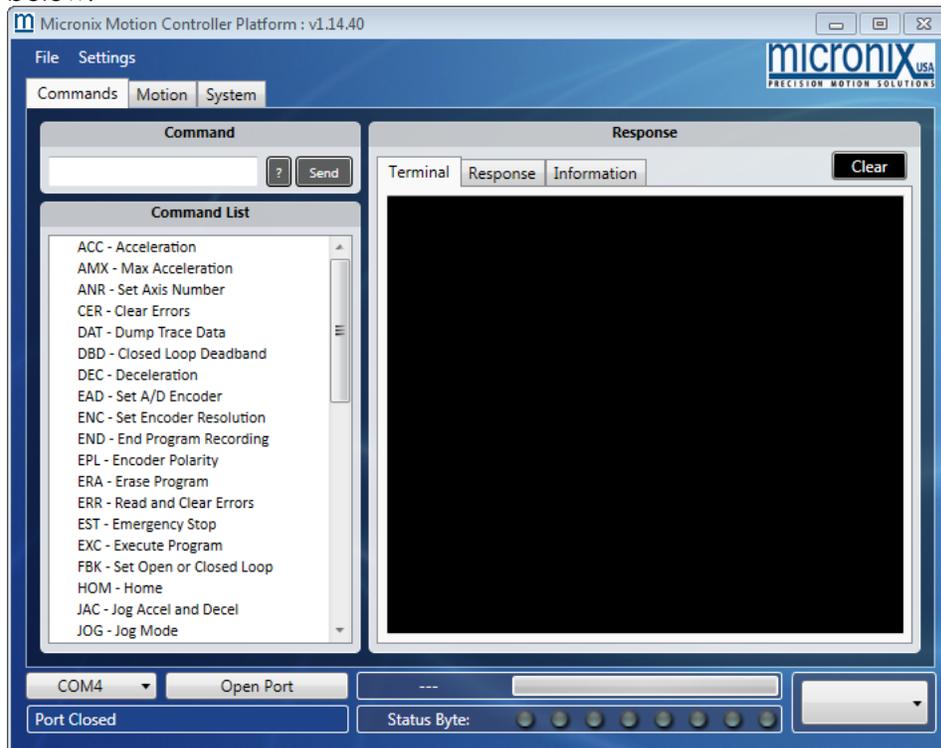
b. In the "Command" text field, enter the text "1MLP" and press the "Send" button. This instructs controller axis 1 to move its stage to the positive limit (a complete list of commands is available in the full version of the manual). The stage attached to axis one should move to its negative limit, and then stop.

c. Now enter the text "1MLN" and press the send button. The stage will now move to its negative limit and stop. It is important to note here that most Micronix piezo stages do not have limit switches, but use a process that we call "hard stop detection". The controller tracks the motion of the stage using the encoder and uses positional data to detect hard stops.

d. Now navigate to the "Motion" tab of the MMCP, as pictured below.

e. Now we will perform a 2mm relative move in the positive direction. In the field in the "Motion" section of the MMCP labeled "Increment", input a value of 2. The arrow buttons to the right of the field will now move the stage 2mm in the positive or negative direction relative to the stages current position. Since we left our stage at the negative limit, we will move 2mm in the positive direction by clicking on the right facing arrow.

f. Note in the "Position" section of the MMCP the "Calc" and "Enc" positions. If you are in open loop, they are likely different. The "Calc" (calculated) position is a theoretical value, based on the number of pulses of the motor and the estimated distance per pulse. The "Enc" (encoder) position is the position of the stage as measured by the encoder (Note: if the stage has no encoder, this field will always read 0.000000). In open loop, these values will be different. In closed loop, the controller will reconcile the calculated

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position to the encoder position within the allowable margin of error, or "deadband". Feedback modes are covered more in depth in the full version of the manual, if you are concerned about irregular sounds or inconsistencies in the position or trajectory of your stage, it may help to understand the feedback modes of the MMC-10 controller.

g. Now press the button labeled "Zero" in the position section of the MMCP. Both the calculated and encoder position should now be set at zero. Micronix uses relative encoders, so only changes in position are tracked. Our encoder position is relative to a zero point. A zero point is automatically set every time the controller is power cycled, and can be manually reset at any time.

h. In the "Target Pos 1" field in the "Motion" section of the MMCP, enter the value -1. Click the "Go" button next to this field and the stage will attempt to move to the absolute position of 1 mm in the negative direction from the zero point you just set (since we are in open loop, the "Calc" value will read -1 and the "Enc" value will likely read something less than -1). In this way, you can set a custom zero point to use as a reference in your motion. Moving to an absolute position of 0 in closed loop will always return you to this position.

i. It is important to note here that in closed loop, telling a stage to move to a position it cannot actually reach (i.e. telling a stage with 20mm travel to move to absolute position 100) will cause the stage to move indefinitely into the limit. The hard stop detection discussed earlier will only work with the MLN and MLP commands. If this happens, motion can be terminated by pressing the "Stop" button in the "Motion" section of the MMCP, or by entering the text command <axis number>STP (stop command) or <axis number> EST (emergency stop command). In general, moving into a hard stop for a short time (a few seconds) will not cause damage to a piezo motor, but being left running into a limit for a significant period of time can eventually cause damage.

j. The values in the "Motion Parameters" section of the MMCP are fairly straight forward. On a linear stage, acceleration, velocity, and deceleration are exactly what one would expect. On a rotary stage, the mm/s and mm/s/s values can be substituted with degrees/s and degrees/s/s. These values do have maximums depending on the controller settings, which can be queried in the "Commands" tab by entering the command <axis number>VMX? for maximum velocity and <axis number>AMX? for maximum acceleration and deceleration.

3. Now you are familiar with the basics of achieving motion with the MMC-10 Piezo Motor Controller. The full version of the user manual included on the CD that shipped with your order contains much more detail, including a full command list and pinouts If you have questions or concerns not covered in these manuals feel free to contact Micronix support.

Micronix Support:
Phone: (949) 480-0538 x705

3. Trouble Shooting

Difficulty Installing the Micronix Motion Control Platform

To run the Micronix MCP software, you will need the .NET Framework 4.0 or higher to already be installed on the target computer. If the target computer has Windows 7 or later installed and is current on all updates, .NET 4.0 should already be installed. If the target computer does not have .NET 4.0 or you are unsure if the target computer has the .NET Framework 4.0, follow these steps:

a.   Navigate to the support section of the Micronix Website at
http://www.micronixusa.com/motion/support/softwares.cfm
b.   Download the file labeled DOT_NET Installation.
c.   Run the application and follow the on screen instructions.
d.   Return to section 2.2 and follow instructions. If you are still encountering problems, contact Micronix support.

My MMC-10 is not being recognized as a com port by my system.

In some cases, due to a variety of factors, controllers will not be recognized as Com ports. Here are steps to take to resolve this issue.

1. Make sure the device is powered on and the top LED is lit green. If the top LED is not lit green, or if power is connected but no LEDs are lit, contact Micronix support.

2. Make sure the USB port the controller is plugged in to is functional. Try to plug the MMC-10 into another USB port, or if using a USB hub try plugging the unit directly into the PC USB port. Try another device like a thumb drive in the USB port and make sure it connects.

3. If the controller is powered on and plugged in to a functional USB port, but is still not being recognized, try installing the Com Port drivers located at
http://www.micronixusa.com/motion/support/softwares.cfm
and restarting your computer. If this does not solve the problem, please contact Micronix Support.

4. If the com port is recognized, but the Micronix Motion Control Platform is unable to communicate with it, double check the setting of the port. To do this, open the control panel in Microsoft windows and navigate to the device manager. Locate the com port associated with the MMC unit (if there are multiple com ports open, unplug and replug the unit and look for the com port that responds). Right click the com port associated with the MMC unit and select "Properties" from the menu that appears. On the "Port Settings" tab, make sure the following values are set.

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

Difficulty Identifying the Correct Com Port
In some cases in which a large number of com ports are being used or com ports are tied up by the system, it may be difficult to identify which com port is associated with which device. The Micronix MCP programs drop down menu will display the most recently connected com port on the bottom of the list. As such, an easy way to identify a device is to power cycle it, it should now be the last listed com port.

4. Frequently Asked Questions

Why is my stage continuously running in one direction when set to closed loop (nFBK2, nFBK3)?
Most likely your encoder polarity is backwards. Use the nEPL? command to query the current setting and then if it is 1 send nEPL0 if it is 0 send nEPL1.

How do I get my settings like velocity, acceleration, and limits to remain when I power down the controller?
Use the nSAV command. This command writes all current settings to non-volatile RAM which will allow them to persist between power cycles. If you would like to revert to the factory settings simply use the nDEF command to revert the controller to its default parameters. (Note: to have these persist between power cycles don't forget to run the nSAV command)

What do the red and green LEDs mean?
The top LED is an address indicator. At startup it will flash from Red (unaddressed) to orange (currently being addressed) to Green (addressed and ready for commands). The bottom LED is an error indicator. When an error occurs, the LED will illuminate red. Use the nERR? command to read all errors. By default this LED will be off.

Why are the responses to my query commands coming back with garbage characters?
The communication bus for the MMC-10 is half-duplexed. It is important to ensure that you do not send commands when there are responses coming back from the MMC-10. Also, please ensure that the end of line character is a \r. If you sent \r\n a response will be sent at the same time as the \n is on the bus and will cause bus contention.