

Apollo III

INSTALLATION MANUAL



5/1/14

N0112

This manual covers the setup and configuration of the Apollo III motion controller connected to the control using Mach3.

Formatting Overview:

- Menus, options, icons, fields, and text boxes on the screen will be bold (e.g. the **Help** icon).
- Clickable buttons will be bold and within brackets (e.g. the **[OK]** button).
- Directory names, commands, and examples of editing program files will appear in `Courier New` font

This manual as well as all other MachMotion manuals can be found at www.MachMotion.com

Copyright © 2014, MachMotion
All rights reserved.

Apollo III

N0112

Table of Contents

1	INTRODUCTION	5
1.1	Overview	5
1.2	Tools Required	5
2	HARDWARE STARTUP	5
2.1	Supplying Power	5
2.2	Starting Mach3	6
3	AXIS SETUP	7
3.1	Apollo III Cover Removal	7
3.2	Enabling Axes	8
3.3	Axis Calibration.....	9
3.3.1	Manual Calibration.....	9
3.3.2	Calibration Wizard	11
3.4	Backlash Calculation.....	12
3.5	Reversing Direction	13
3.6	Slaving an Axis.....	14
4	SPINDLE SETUP	14
4.1	Wiring a Spindle.....	15
4.1.1	VFD from MachMotion.....	15
4.1.2	VFD Other Than from MachMotion.....	15
4.1.3	No VFD.....	15
4.2	Spindle Configuration	16
4.2.1	Spindle Pulley Setup.....	16
4.3	Turning on the Spindle.....	17
4.4	Reversing Direction	17
5	LIMITS AND HOMING SETUP	18
5.1	Homing Setup.....	19
5.2	Soft Limits Setup	20
6	INPUT SETUP	21
6.1	Generic Inputs.....	21
6.2	Wiring Inputs.....	22
6.2.1	Standard 24V Inputs	22
6.2.2	Sinking Inputs (NPN).....	23

6.2.3	Sourcing Inputs (PNP).....	24
6.3	Configuring Inputs	24
7	OUTPUT SETUP	25
7.1	Generic Outputs	25
7.2	Wiring Outputs.....	26
7.3	Configuring Outputs	27
7.4	Using Outputs.....	27
7.5	Mist and Flood Control.....	28
8	ADVANCED OPTIONS	29
9	APPENDIX	31
9.1	Warranty Information.....	31
9.2	Additional Resources	31

1 INTRODUCTION

1.1 Overview

System Components:

- Apollo III

1.2 Tools Required

- Small flat head screw driver



FIGURE 1 APOLLO III MOTION CONTROLLER

2 HARDWARE STARTUP

2.1 Supplying Power

To power the Apollo III, you must supply 24VDC to the power connection located at the top right of the board as shown below. The top orange LED labeled Power will turn on

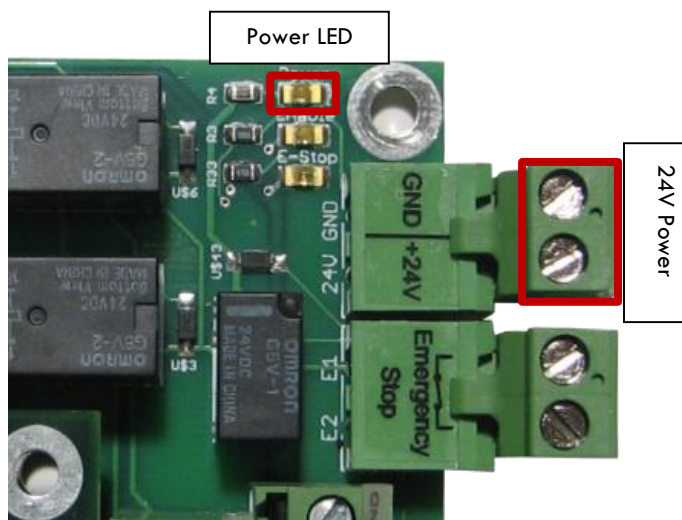


FIGURE 2 24V POWER CONNECTOR

2.2 Starting Mach3

On the desktop of your control there is a Mach3 shortcut for your machine type. Below are examples of a Mill, Lathe, and Plasma shortcut.



FIGURE 1 PROFILES

There is also a shortcut for Mach3 Loader. This allows any of the profiles to be loaded from one location. Double clicking on the Mach3 Loader shortcut opens the following window:

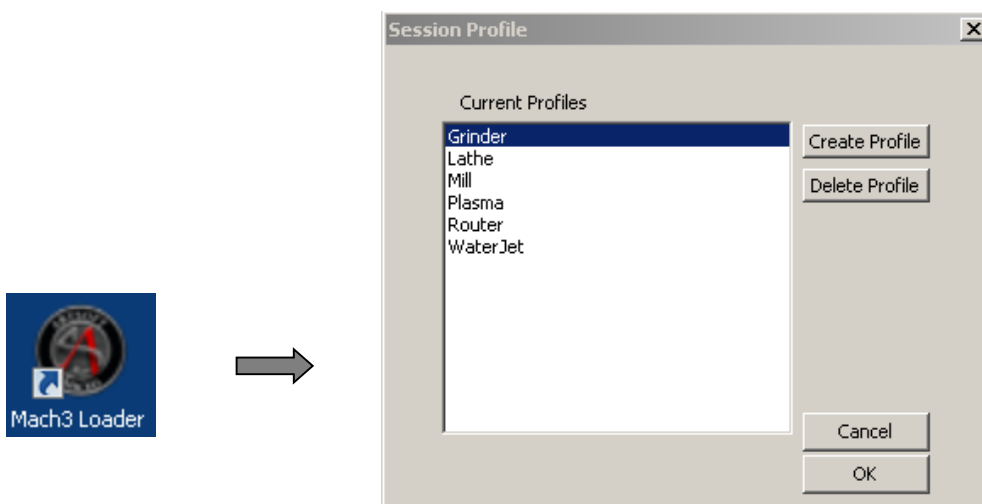


FIGURE 2 LOADER

After double clicking on a profile or opening a profile from Mach3 Loader, a window will come up asking for agreement with the *Mach3 Legal Notice*.

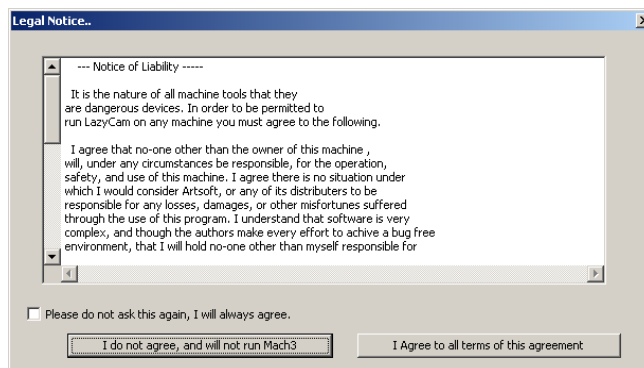


FIGURE 3 LEGAL NOTICE

Read the legal notice and click on the check box **Please do not ask this again, I will always agree**. Then press **[I Agree to all terms of this agreement]**.

When Mach3 loads, clear the **[Reset]** button so it is not flashing. **[Reset]** must be cleared for Mach3 to operate.

3 AXIS SETUP

3.1 Apollo III Cover Removal

All of the drives and external I/O will be wired into the Apollo III. Begin by removing the cover by loosening the four black knobs on the sides.

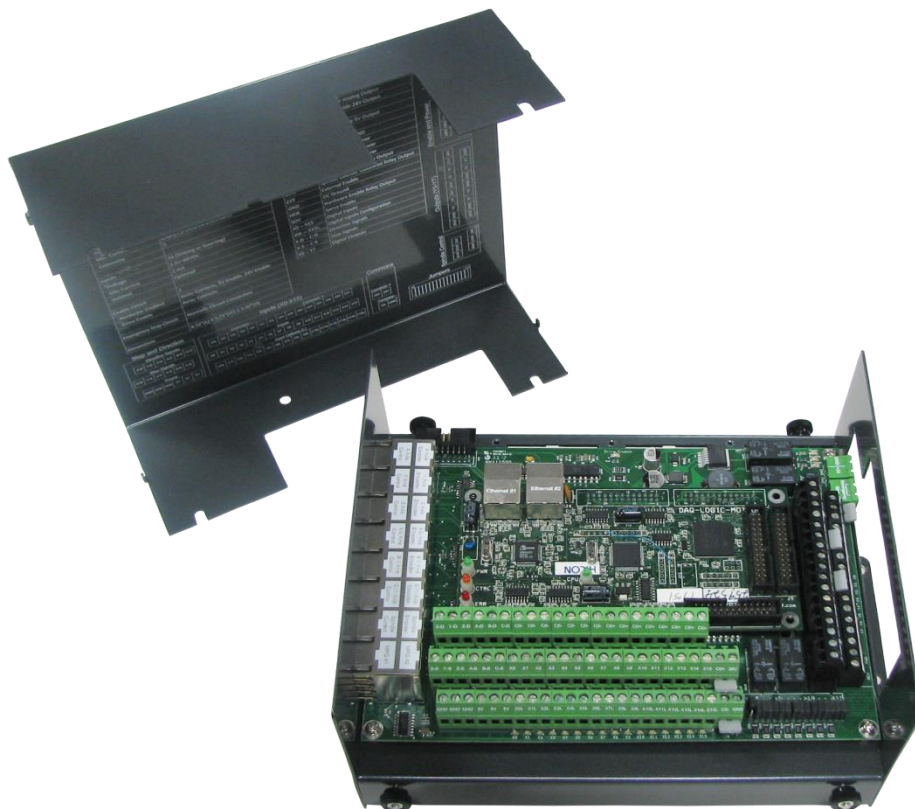


FIGURE 4 APOLLO III COVER REMOVED

Note: For more information about the Apollo III see the Apollo III User's Manual.

Next, plug the drive control and encoder cables into the Apollo III motion controller. The drive control connections are located on the bottom row of the large RJ45 block. The encoder control connections are located on the top row of the large RJ45 block. See the picture below.



FIGURE 5 DIFFERENTIAL STEP AND DIRECTION, AND ENCODER FEEDBACK RJ45 CONNECTIONS

3.2 Enabling Axes

After the drives are connected to the Apollo III, open up Mach3, and enable the axes as follows:

Note: This may already be setup depending on your system.

1. On the menu bar, click **Config->Ports and Pins**.
2. Select the **Motor Outputs** tab to see the axis enable options as pictured below.

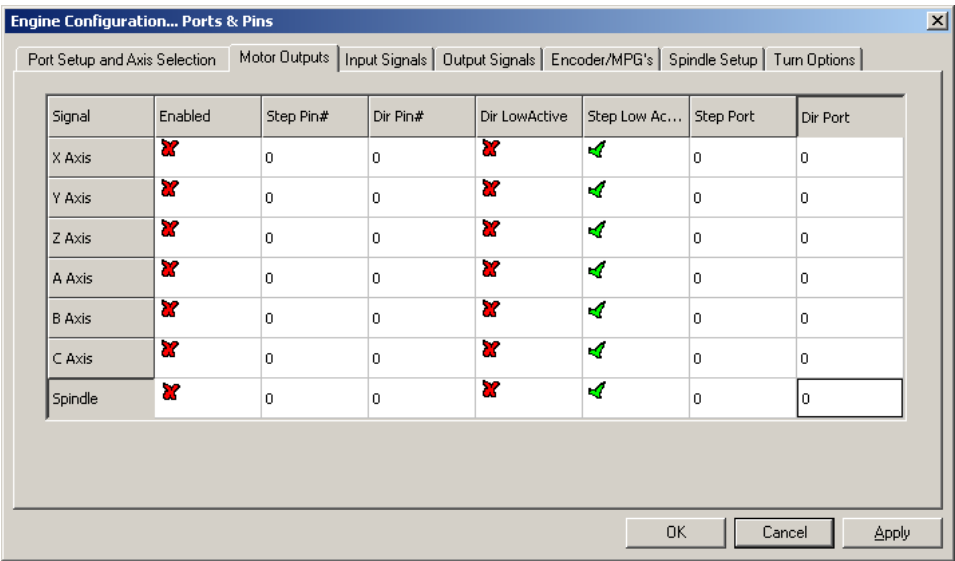


FIGURE 6 AXIS SETUP

3. Enable all the axes that are to be controlled by setting the respective boxes in the **Enabled** column to green checks. In the example below, the X, Y, and Z axes are enabled.

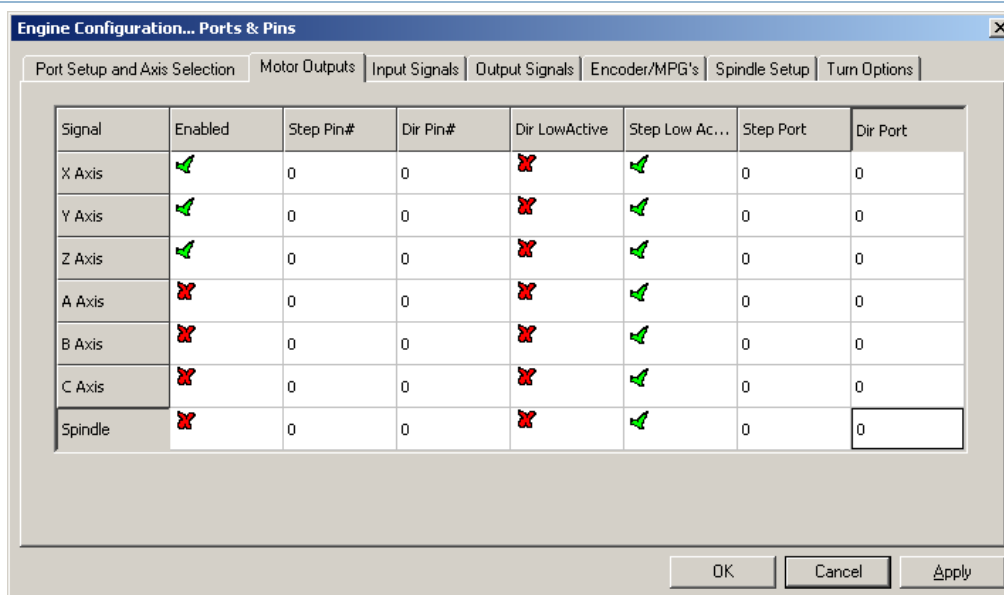


FIGURE 7 X, Y, AND Z AXES ENABLED

4. Press [OK] to save any changes and close the window.

The system is now set up for motion.

WARNING

The machine can be crashed very easily. No limit switches have been set up and the units have not been configured yet.



3.3 Axis Calibration

For the machine to move the correct distance, the axes need to be calibrated. To get the units perfect, they must be calculated manually from the machine specifications. However, you can get them extremely close if you use the calibration wizard (see Calibration Wizard on page 11).

3.3.1 Manual Calibration

Complete the following procedure to do the manual calibration:

Note: If the MachMotion plugin is not listed under PlugIn Control, see the Axis Configuration Worksheet to do the calculations by hand or use the calibration wizard on page 11. The worksheet can be found on the MachMotion website under software setup documentation.

1. Go to **PlugIn Control->MachMotion Plugin**.
2. Select the **Calibration** tab.
3. Select the drive type of the axis being configured.
4. Enter the max motor RPM.
5. Enter the correct drive ratio.

Drive Ratio Apollo III	Drive Type
1	Teco
32	Mitsubishi
64	Yaskawa
1	Stepper

TABLE 1 – DEFAULT DRIVE RATIO VALUES

The screenshot shows the 'MachMotion Configuration' dialog box with the 'Calibration' tab selected. The 'Drive Type' is set to 'Stepper' and 'RPM' is '0'. The 'Drive Ratio' is '0'. Under 'Machine Configuration', the 'Ball Screw' option is selected, with 'Ballscrew Pitch' set to '0 units/teeth' and 'Gearing Ratio between Motor and Shaft' set to '0'. The 'Rack and Pinion' options are also visible but not selected. The 'Output' section shows 'Steps Per' as '0 steps/unit', 'Resolution' as '1/1000 Unit', and 'Velocity' as '0 units/minute'. Buttons for 'Calibrate Axis', 'Calculate', 'Reset', 'Save', and 'Cancel' are at the bottom.

FIGURE 8 - MACHMOTION PLUGIN CALIBRATION CALCULATOR

6. Choose the machine configuration for the axis from the following three options.
 - a. **Ball Screw**
 - i. Enter the ball screw pitch
 - ii. Enter the gearing ratio between the shaft and the motor

Note: If the system has a pulley ratio and a gear box use this equation to get the total gear ratio:

$$[\text{Gear Box Ratio}] \times [\text{Pulley Ratio}] = [\text{Total Gear Ratio}]$$

$$\text{Ex: } [10:1 \text{ Gear Box}] \times [30 \text{ Motor Pulley Teeth} / 15 \text{ Shaft Pulley Teeth}] = [10] \times [30/15] = [20 \text{ Total Gear Ratio}]$$

- b. **Rack and Pinion – Pinion Diameter**
 - i. Enter pinion diameter
 - ii. Enter the gearing ratio between the shaft and the motor

c. **Rack and Pinion** – Rack Pitch

- i. Enter number of teeth on pinion
- ii. Enter the rack pitch
- iii. Enter the gearing ratio between the shaft and the motor

7. Press the **[Calculate]** button.
8. Select the axis to calibrate.
9. Press the **[Calibrate Axis]** button.
10. Repeat starting at step 3 for each additional axis.
11. Restart Mach3 to save the calibration settings.

3.3.2 Calibration Wizard

Complete the following procedure to use the calibration wizard:

1. Run “M9990” from the MDI line.
2. Select the axis to calibrate.
3. Enter in the distance and federate the axis should move.
4. Measure how far the axis moved.
5. Enter in the distance the axis moved.
6. Allow it to update the Steps Per Unit for that axis if the measurement was correct.
7. Repeat this procedure until the axis is within the required accuracy.

If you want to adjust your velocity, select **Config** on the top menu bar, then **Motor Tuning**. You should see the *Motor Tuning and Setup* window as shown below.

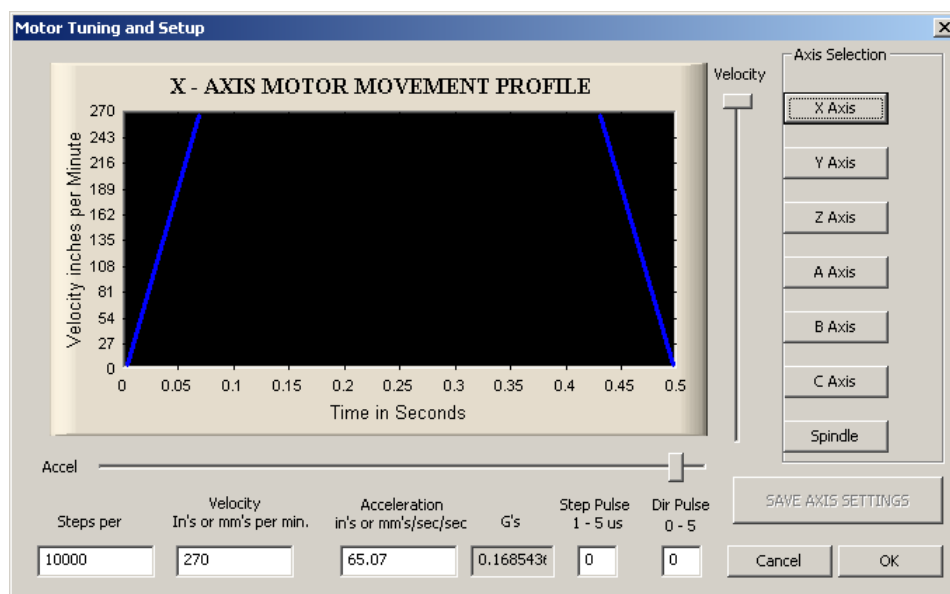


FIGURE 9 MOTOR TUNING AND SETUP

column titled **Axis Selection**, press the button corresponding to the axis you want to set up. The selected axis's parameters will be loaded. Now you can adjust your velocity setting as shown below.

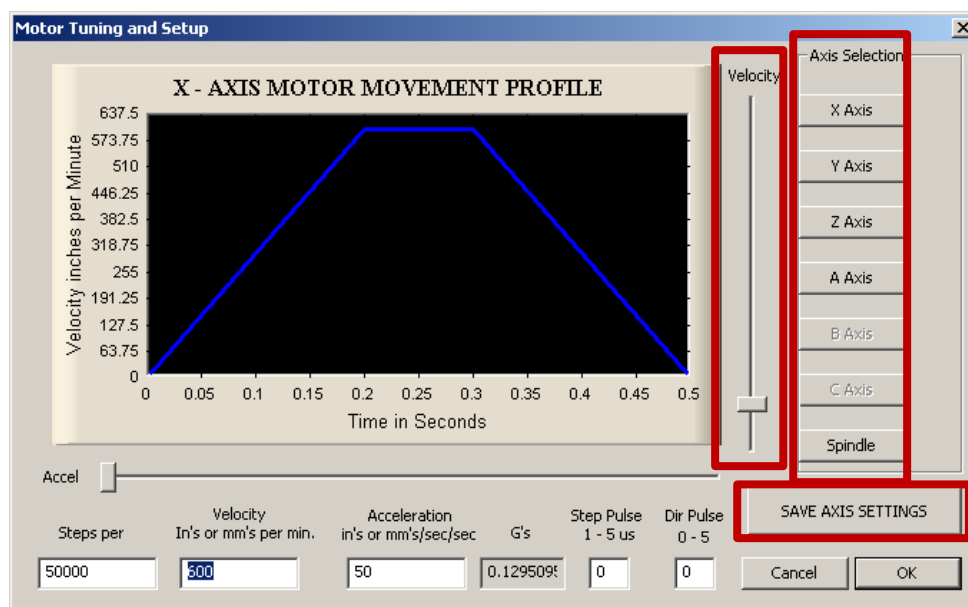


FIGURE 10 VELOCITY IN MOTOR TUNING

Press [**SAVE AXIS SETTINGS**] before clicking on another axis or closing out the *Motor Tuning and Setup* window.

WARNING

No limits have been set up. DEATH, INJURY or serious PROPERTY DAMAGE can occur if the system is not operated carefully.



3.4 Backlash Calculation

The Apollo III has backlash compensation. Use the MDI line to enter G-Code to move the axes. To calculate the machine's backlash, follow the steps below.

1. Move an axis in one direction farther than the maximum possible backlash.
2. Mount a dial indicator and zero it.
3. Move the axis again in the same direction for a specific distance (it doesn't matter how far).
4. Move the axis backwards the same distance.
5. Note how far the dial indicator was off from zero to see the axis's backlash value.
6. On the menu bar go to **Config->Config Plugins** and press the [**CONFIG**] button on the HiCON plugin line.
7. Select the tab corresponding to the desired axis.
8. Enter the backlash distance and speed as described below.

Backlash (mm,inch)	Backlash Speed %
0	0

FIGURE 11 BACKLASH COMPENSATION

Backlash (mm, inch) – This field defines the backlash distance in inches or mm. The Apollo III uses this value to calculate virtual load position.

Backlash Speed % – This field adjusts the maximum acceleration that the backlash counts can be applied. The Apollo III takes the max acceleration from the motor tuning and multiplies it by this percentage. Valid values are 10-400 (0.1 to 4 times max acceleration). A common value is 20%.

WARNING

Do not leave the backlash speed zero if you enter in a backlash distance. The Apollo III will not function.



3.5 Reversing Direction

If an axis moves the wrong direction, it can be reversed in the Mach3 software.

1. Navigate to the menu bar and click **Config->Homing/Limits**.

The following window will come up:

Motor Home/SoftLimits

Entries are in setup units.

Axis	Reversed	Soft Max	Soft Min	Slow Zone	Home Off.	Home Neg	Auto Zero	Speed %
X		100.00	-100.00	1.00	0.0000			20
Y		100.00	-100.00	1.00	0.0000			20
Z		100.00	-100.00	1.00	0.0000			20
A		100.00	-100.00	1.00	0.0000			20
B		100.00	-100.00	1.00	0.0000			20
C		100.00	-100.00	1.00	0.0000			90

G28 home location coordinates

X	0	A	0
Y	0	B	0
Z	0	C	0

OK

FIGURE 12 REVERSING DIRECTION

2. Under the **Reversed** column click on the red "X" if the axis needs to be reversed.
3. After making all the changes, press [OK].

The axis will now move the opposite direction than it did before.

3.6 Slaving an Axis

To configure an axis as a slave, follow the steps outlined below.

1. Click **Config->Slave Axis** on the main menu bar. It will display the *Slave Axis Selection* window.

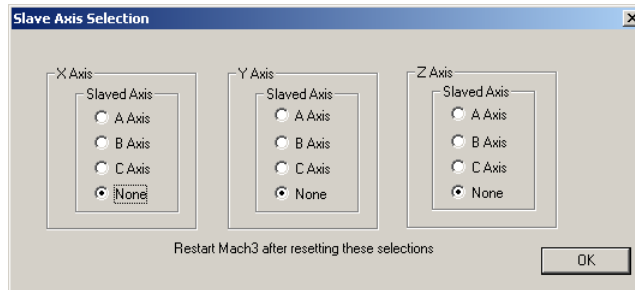


FIGURE 13 SLAVE AXIS SELECTION WINDOW

2. Select the axis to be slaved. The X, Y, and Z axes can have A, B, or C as slaves. For example, the configuration below is used to slave the A axis to the Y axis.

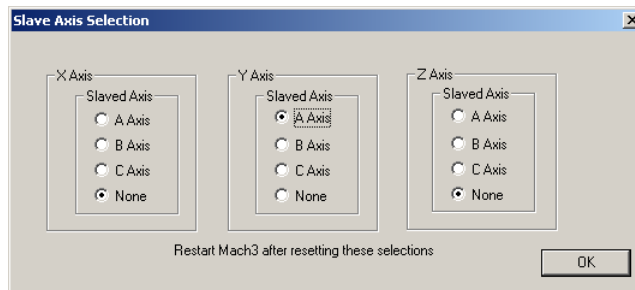


FIGURE 14 A AXIS SLAVED TO Y

3. Press [OK] and then restart Mach3.

4 SPINDLE SETUP

This section goes through the wiring and configuration process for spindle integration with Mach3. The Apollo III spindle control consists of a 0-10V analog signal for spindle speed and two relays (CW and CCW) for spindle direction. Below the spindle terminals there are two LEDs for spindle forward (FWD) and reverse (REV).

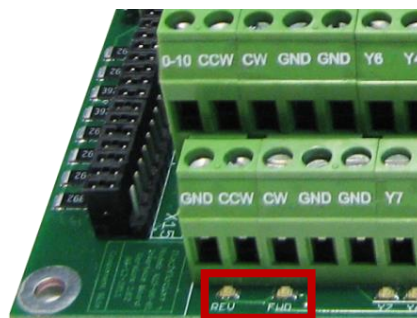


FIGURE 15 SPINDLE LEDs

4.1 Wiring a Spindle

4.1.1 VFD from MachMotion

The process for setting up a VFD from MachMotion is extremely simple. Simply plug the control cable into the Spindle Control RJ45 jack located on the bottom row of the large RJ45 block.



FIGURE 16 SPINDLE CONTROL RJ45 JACK

4.1.2 VFD Other Than from MachMotion

Any VFD can be wired into the Spindle Control RJ45 jack by cutting the end off of a CAT5 cable and wiring the loose ends to the VFD according the following pin out.

Function	Analog 0-10VDC	CW Relay	CW Relay	Drive Enable	GND	N/C	CCW Relay	CCW Relay
RJ45 Pins	1	2	3	4	5	6	7	8
Colors	White & Orange	Orange	White & Green	Blue	White & Blue	Green	White & Brown	Brown

TABLE 2 SPINDLE CONTROL RJ45 JACK

4.1.3 No VFD

If the system does not use a VFD to control the spindle, wire the spindle into the small green connector as shown below. Notice that 24V is wired to the CW and CCW relay contacts on the top row of the green connector.

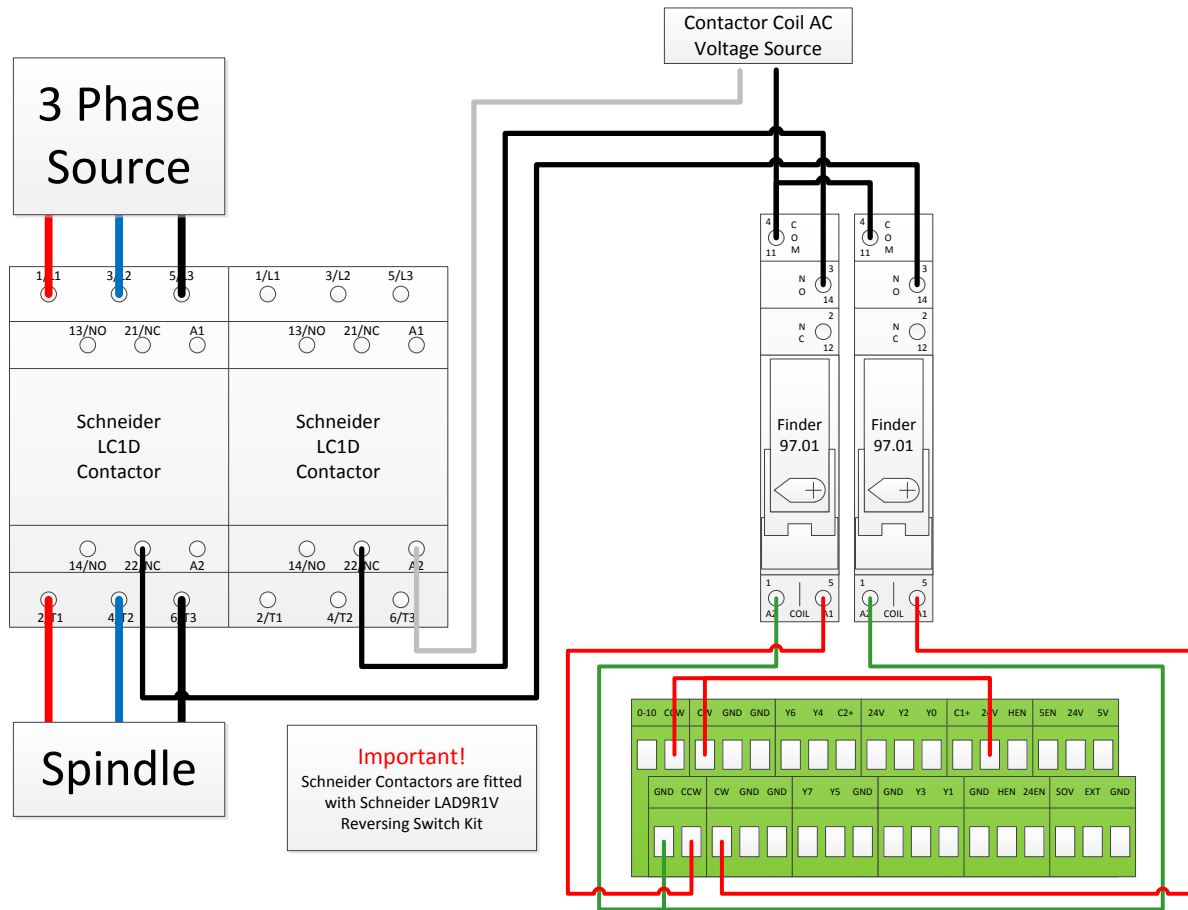


FIGURE 17 NO VFD SPINDLE WIRING

4.2 Spindle Configuration

4.2.1 Spindle Pulley Setup

For Mach3 to know how to scale the analog voltage output, the maximum RPM for the spindle motor must be defined. If the machine has different gears Mach3 can have multiple maximum speeds. Mach3 uses a different pulley for each different speed configuration.

For example, one pulley could be set to 75 to 300 RPM for a low speed (at 300 RPM the control will output 10V). A medium speed pulley could go from 300 to 1200 RPM and high speed pulley could run from 1200 to 2400 RPM.

To change the pulleys, go to **Config->Spindle Pulleys**. The *Pulley Selection* window will appear as shown in Figure 18.

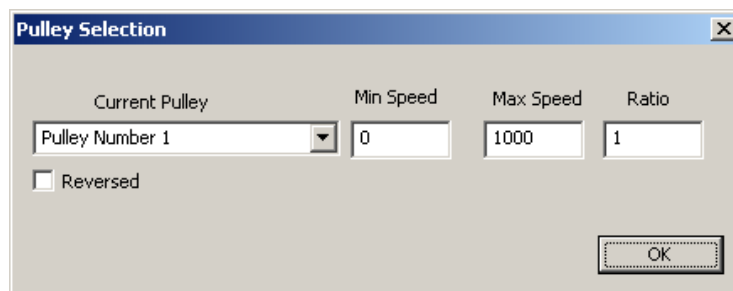


FIGURE 18 PULLEY SPEED SETUP

Use the drop down menu titled **Current Pulley** to select the pulley to be updated. Enter in the maximum and minimum speeds for each pulley. Then select the current pulley and press **[OK]**.

Note: Only set up multiple pulleys if the machine has different gears.

Note: If the spindle is turning the wrong direction check the reversed box in the Spindle Pulleys window.

The pulleys can also be changed by using M41-M45. The macros can be used to just change pulleys in Mach3 or they can be used to automatically change gears on the machine. Outputs 12-16 are configured to shift between gears 1 and 5. To shift the machine into neutral, run M40. Open up the macros (M41-M45) with the VB Script Editor for more details.

4.3 Turning on the Spindle

To control the spindle use the following M-Codes with an S word for spindle RPM in the MDI line (Ex. M3 S2000).

M-Code	Function
M3	Clockwise
M4	Counter/Clockwise
M5	Stop

TABLE 3 SPINDLE M-CODES

If the spindle is not running correctly at this point some settings may need to change inside the VFD. In this situation reference the VFD manufacturer manual.

Note: See the Mitsubishi VFD Installation Guide for setup information if it was purchased from MachMotion.

4.4 Reversing Direction

To reverse a pulley's direction, go to **Config->Spindle Pulleys**. Select the pulley that needs to be reversed and then check the small box called **Reversed** as shown below.

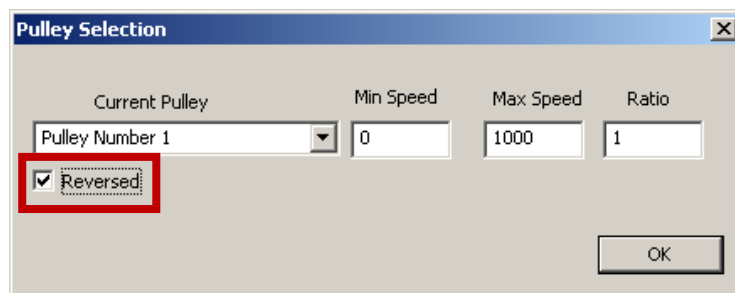


FIGURE 19 REVERSE PULLEY

5 LIMITS AND HOMING SETUP

The Apollo III motion controller has up to 16 inputs that can be used for the limit and home switches. To maximize the number of inputs available for other functions, wire multiple switches in series as shown below.

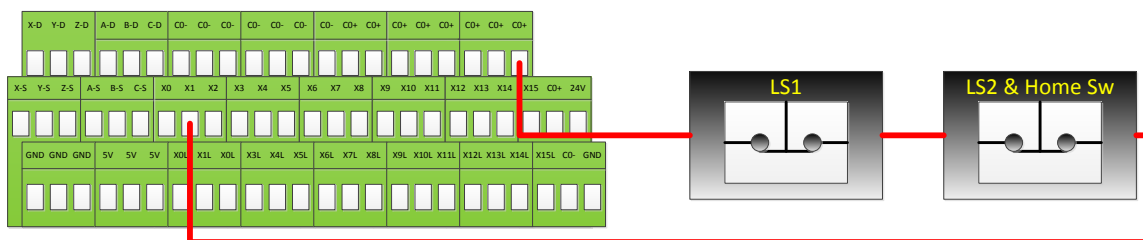


FIGURE 20 LIMIT SWITCHES IN SERIES

Note: For the highest level of safety, wire the limit switches Normally Closed.

The standard limit input allocation is show below.

Axis	Input Number	Axis	Input Number
X	X1	A	X4
Y	X2	B	X5
Z	X3	C	X6

TABLE 4 INPUT PORT AND PIN NUMBERS

To set up and wire 24V limit/home switches, follow the steps outlined below.

1. Pick two limit switches closest to the end of the axis' maximum and minimum travel.
2. Wire the two switches normally closed in series as shown in Figure 20.
3. Wire the remaining side of the first switch to C0+ from the Apollo III motion controller.
4. Wire the remaining side of the limit/home switch into the correct input (see Table 4) depending on which axis is being wired.
5. On the menu bar at the top of the screen select **Config->Ports and Pins**.
6. Click on the **Input Signals** tab (See Figure 21).
7. Enable the limit and home switches by clicking the red [X] by the signal to make it a green check.

Note: Each axis has three signals the max travel (X++), the min travel (X--), and the home (X Home). All three must be enabled and set to the correct port and pin address for everything to work correctly using the wiring description above.

8. Set the Port Number and Pin Number to the desired input. All input signals use port 11 and the pin number corresponds to the X number it is wired to (Ex. An input wired into X3 will have a port number of 11 and a pin number of 3).
9. Set up the active low checkbox to a red X.

Note: Under the active low column the active state can be changed by clicking on the [X] or check mark.
If the limit switches are normally open the green check mark should be used. However, this is not recommended as it is not as safe.

10. When the limit and home switches are completely configured, press **[Apply]** and then **[OK]**.

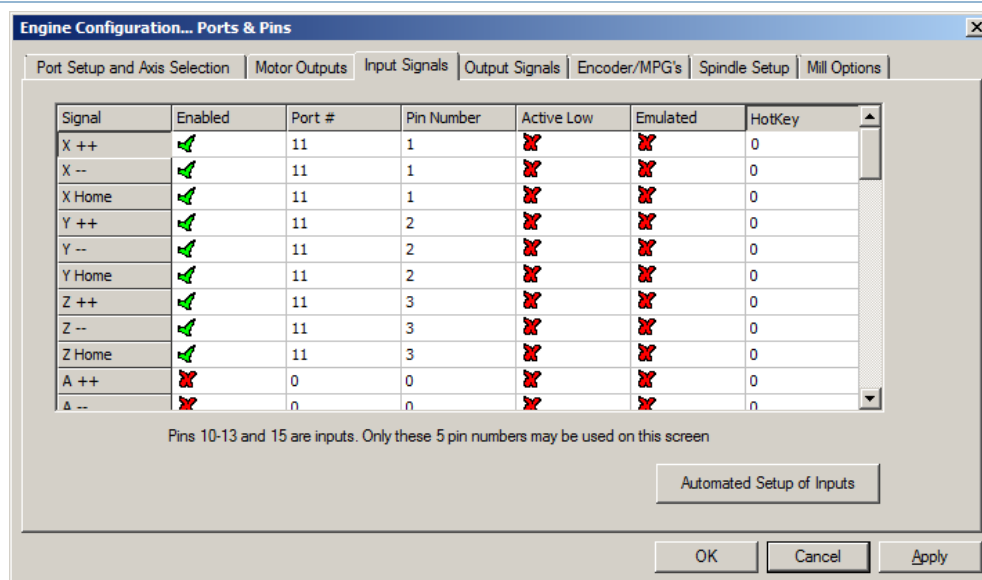


FIGURE 21 INPUT SIGNALS

For example, the configuration above has X, Y, and Z limit and home switches enabled. All of them are wired normally closed. The port and pin for X is port 11 pin 1 (X1) and for Y it is port 11 pin 2 (X2). Notice that all the limit switches and the home switch for an axis have the same port and pin numbers.

5.1 Homing Setup

Now the limit and homing switches are set up correctly it is time to finish setting up homing.

1. Home each axis of the machine individually if possible. Note which axes home in the wrong direction.

Note: See the system operating manual for individual axis homing instructions.

WARNING

If the limit switches are not set up correctly or if an axis moves in the opposite direction of the home switch, the machine could crash. Make sure to keep a hand on the Emergency Stop button the first time the machine homes.



2. Open to the menu bar and click **Config->Homing/Limits**. The *Motor Home/Soft Limits* window will come up as shown below.



FIGURE 22 MOTOR HOME/SOFT LIMITS

3. If any of the axes homed in the wrong direction, click on the red X next to the axis on the **Home Neg** column.
4. Set the speed of the axis by changing the percentage under the **Speed %** column. Press **[OK]** to close the *Motor Home/Soft Limits* window.

Homing on the machine should now be completely set up. Press the **[Home All]** button again to make sure that everything works correctly.

5.2 Soft Limits Setup

Soft limits are utilized to keep the machine from crashing. If the soft limits are set up correctly, the machine will never be able to hit a physical limit switch unless it is not homed properly. If at any time a command is made for the machine to move outside of the soft limits (while they are enabled), an error will appear in the status line or a window will pop up asking if the program should continue. To set up the soft limits, follow the procedure outlined below.

1. Jog the machine to the maximum distance from the homing switches.
Note: Make sure to stay inside the physical limit switches. If the machine is jogged outside of the limit switches, it completely defeats the purpose of soft limits.
2. Record the machine coordinates at the end of the travel.
3. Open the menu bar and click **Config->Homing/Limits** to bring up the *Motor Home/Soft Limits* window will come up (See Figure 22).
4. For each axis enter in the recorded values.
Note: If the value is positive, place it into the Soft Max limit and set the Soft Min limit to zero. Otherwise, with a negative value, set the Soft Max to zero and the Soft Min to the recorded value.
5. Press **[OK]**.

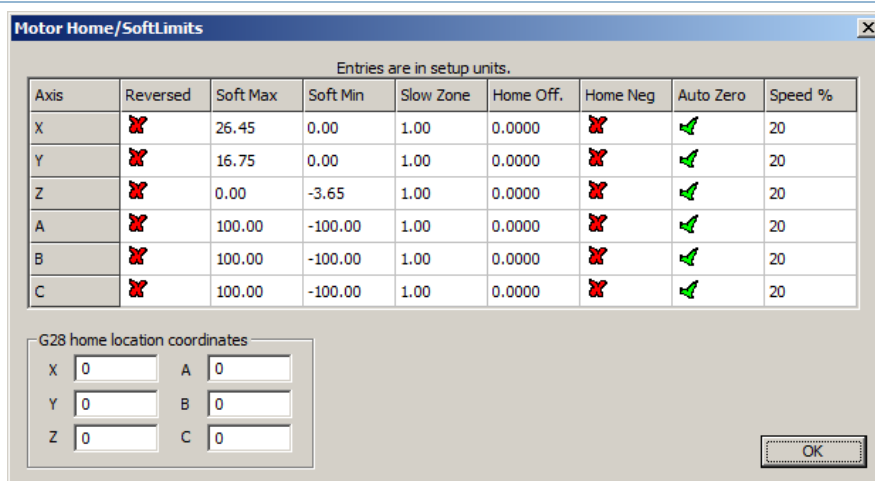


FIGURE 23 SOFT LIMITS

6. Enable the soft limits (See the Operating Manual for more detail).

Note: Soft limits prevent the machine from being able to jog outside of the acceptable range. Also when starting a G-Code file it will warn the operator if the file will go outside of the limits. However, if the warning is ignored it will not prevent a G-Code file from overrunning them.

Test the soft limits by jogging the axes in all directions. As long as the machine is homed, it will never be able to hit a hard limit switch.

6 INPUT SETUP

6.1 Generic Inputs

All 16 inputs on the Apollo III can be used for limit switches, home switches, tool changers, or anything else. To learn how to set up limit switches, go to Setting up Limits and Homing on page 17. As shown below, the inputs are located on the main green terminal block.

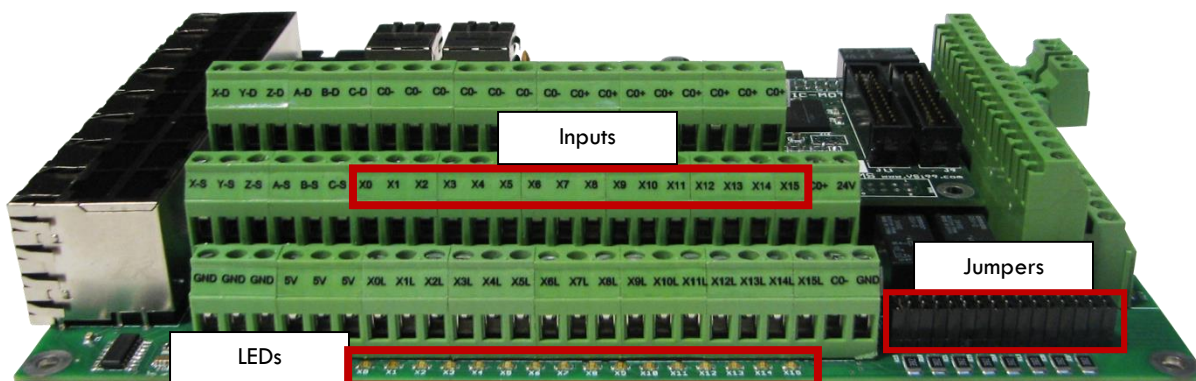


FIGURE 24 INPUTS

Note: Some of the input terminals and jumpers are not used for the Apollo I.

Each input has an LED that shows the current state of the input. Both the LED and input are labeled with the input name. The inputs run from X0, up to X15. If the LED is on, then the input is activated. Different configurations can be selected for each input by using the jumpers near the bottom right of Apollo III. Each jumper corresponds to an input. For example, the jumper labeled X10 corresponds to the input on TB1 labeled X10 and the LED X10.

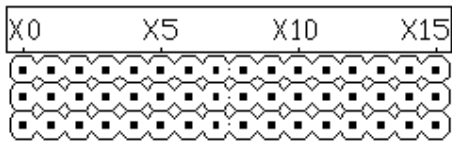


FIGURE 25 INPUT JUMPERS

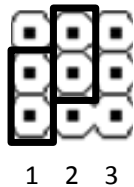


FIGURE 26 JUMPER POSITIONS

WARNING

Input X0 is configured as drive fault by default. If you have servo drives from MachMotion, DO NOT connect anything to X0. It could damage your drives or Apollo III motion controller.

6.2 Wiring Inputs

6.2.1 Standard 24V Inputs

For a standard 24V input, place the jumper on the bottom two pins. In the example below, all the inputs are set up as standard 24V inputs. Next, connect C0+ to 24V and C0- to GND on TB1 as shown below.

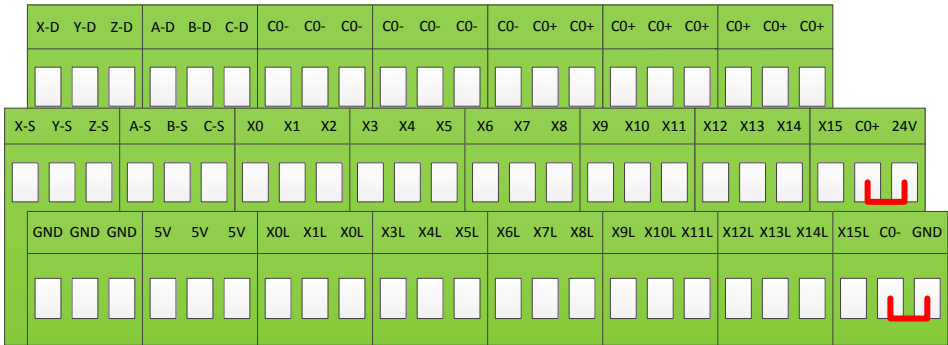


FIGURE 27 24V CONFIGURATION

Then connect the input to the input terminal on the middle row (X1, X2, etc.). See the diagram below.

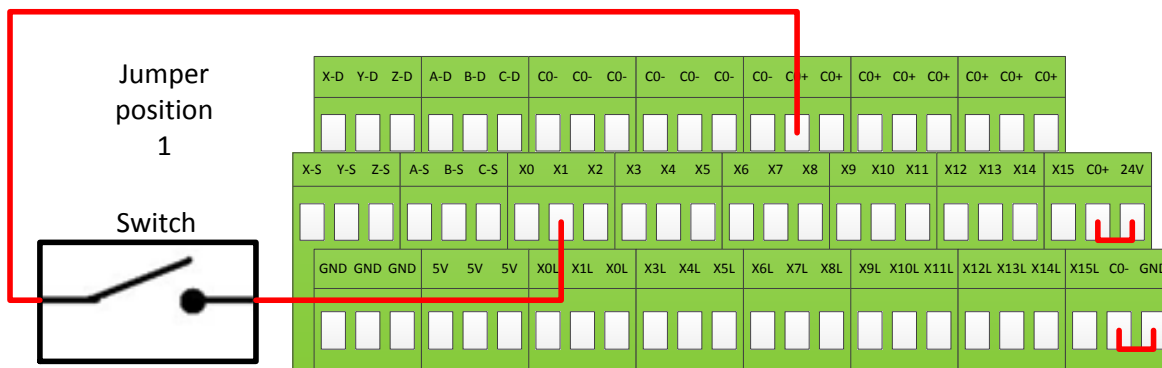


FIGURE 28 STANDARD 24V INPUT

To activate the input, 24V must be supplied to the input. A floating signal or a ground will not turn on the input. The LED corresponding to the input will turn on brightly when the input is activated.

6.2.2 Sinking Inputs (NPN)

For most NPN proxys place the jumper on the top two pins. Then connect the signal into the corresponding input. See the example below.

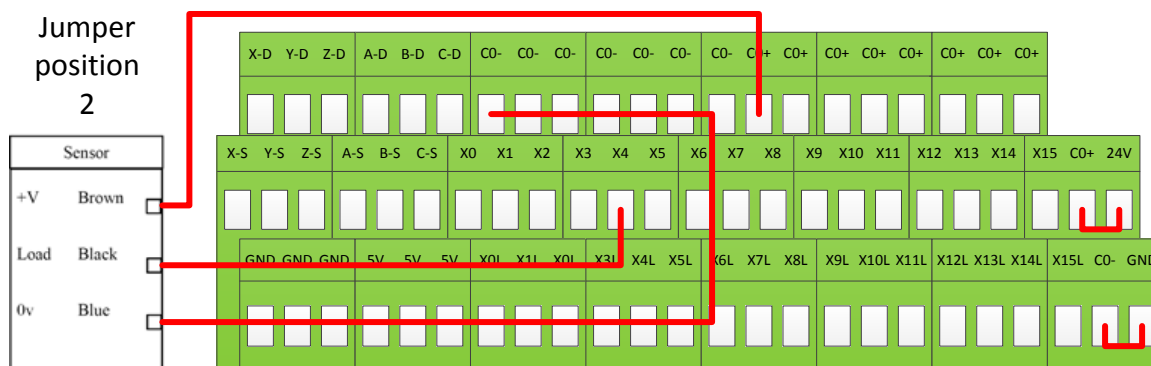


FIGURE 29 STANDARD NPN PROXY

If the proxy has an internal pull-up resistor, depending on its size, it could require the jumper to be completely removed. Use a 3.9k ohm resistor and connect it between XSL and C0+.

Below is an example of a 24V NPN proxy with an internal pull-up resistor. The jumper on the Apollo III must be completely removed for this to work.

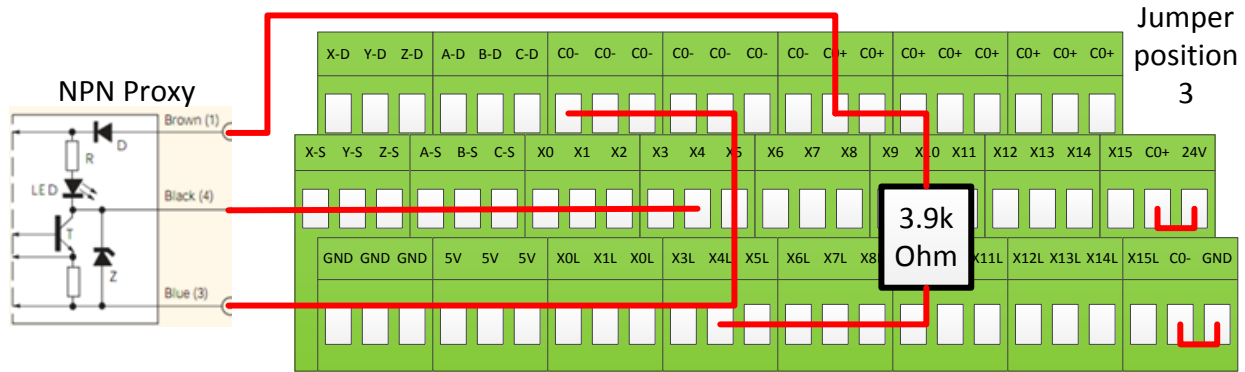


FIGURE 30 NPN PROXY WITH INTERNAL PULLUP

6.2.3 Sourcing Inputs (PNP)

For PNP proxys place the jumper on the bottom two pins. Then connect the signal into the corresponding input. See the example below.



Figure 31 24V Proxy Example

6.3 Configuring Inputs

To configure an input, follow the procedure below.

1. On the menu bar click on **Config->Ports and Pins**.
2. Select the **Input Signals** tab. Scroll down to the desired input. There are 4 inputs and 15 OEM triggers. An OEM trigger acts exactly like an input.

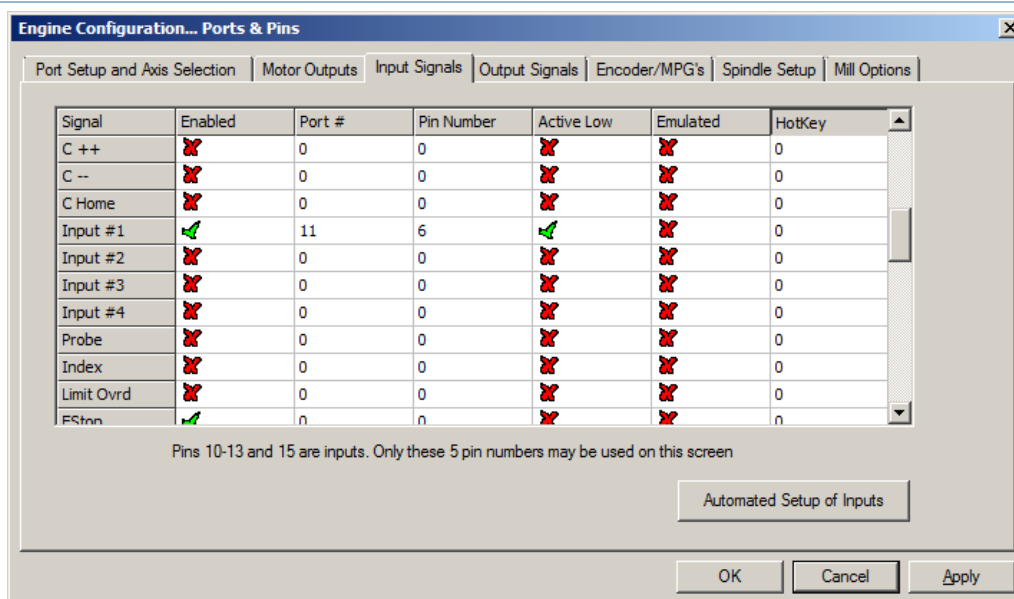


FIGURE 32 INPUT CONFIGURATION

Note: The note below the input signal window is referencing parallel port systems. Ignore this.

3. Enable the input by clicking on the red "X". If it is a green check mark, it is already enabled.
4. Set the Port Number and Pin Number to the desired input.

Note: All input port numbers are 11 and the pin numbers correspond to the X number (X4 would be pin 4)

5. To change when the input is active, click on the **Active Low** column. A green check mark means that the input is active low and a red X means that the input is active high.

The input is now be set up.

7 OUTPUT SETUP

7.1 Generic Outputs

The Apollo III has 8 logic outputs that can be used for any low current application. They are located on the small green terminal block as shown below.

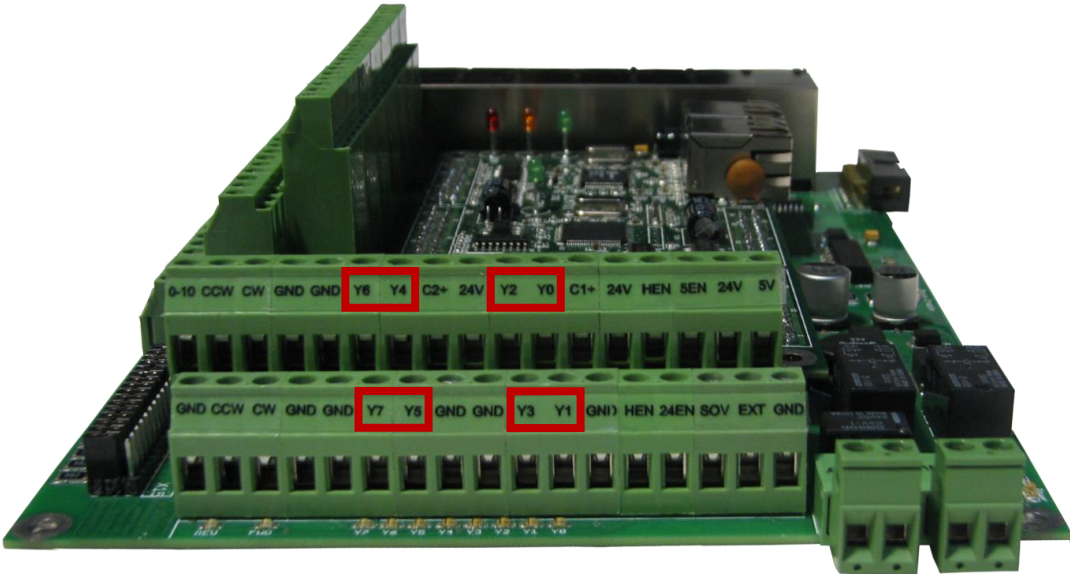


FIGURE 33 OUTPUTS

Each output has an LED that shows its current state. The outputs and LEDs are labeled Y0 through Y7. If the LED is on, the output is activated.

7.2 Wiring Outputs

There are two separate commons for the outputs. The common C1+ is for outputs Y0-Y3 and C2+ is for Y4-Y7. Each common can take 7-48VDC. If the outputs being used are using the voltage supply from Apollo III, each output can only supply 125mA. However, if they are supplied using a separate voltage source, each output can source up to 250mA.

For standard operation the outputs can have their commons jumpered to 24V on the Apollo III. At that point simply connect the load between the output and GND. See the figure below.

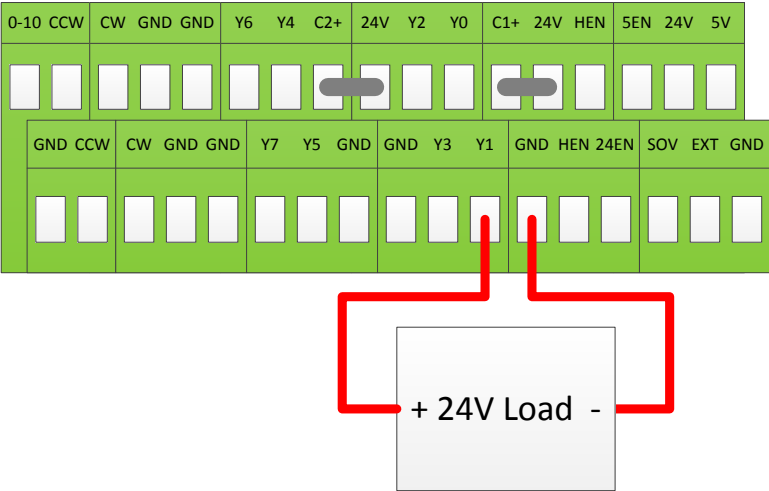


FIGURE 34 STANDARD 24V 125MA OUTPUTS

7.3 Configuring Outputs

To configure an output, follow the procedure below.

1. On the menu bar click on **Config->Ports and Pins**.
2. Select the **Output Signals** tab.
3. Scroll down to the desired output (There are 20 outputs that can be used).

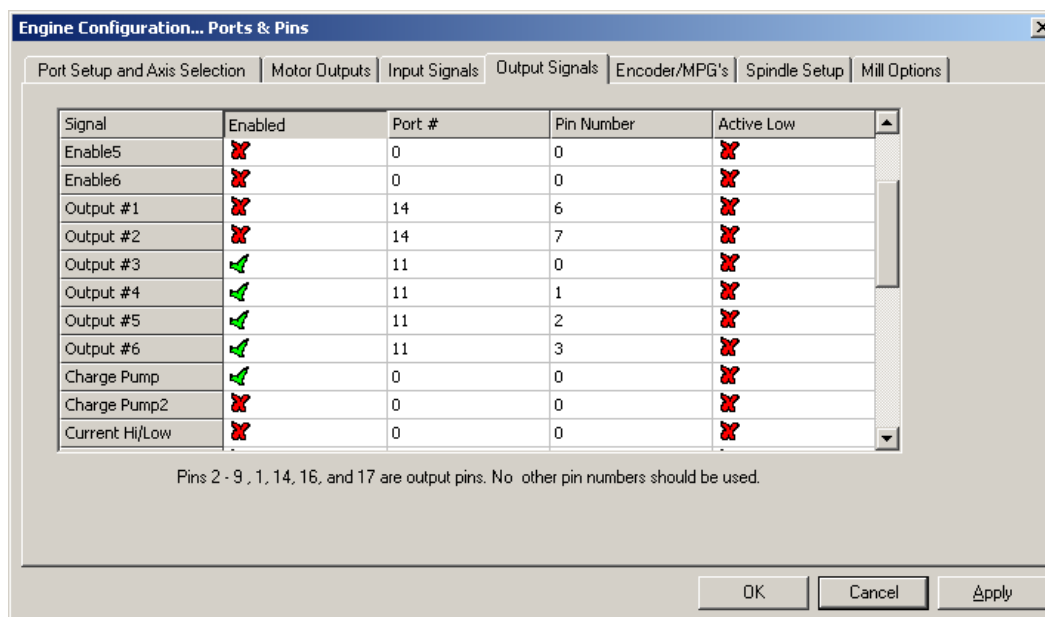


FIGURE 35 OUTPUT CONFIGURATION

Note: The note below the output signal window is referencing parallel port systems. Ignore this.

4. Enable the output by setting the Enabled box to a green check.
5. Set the Port Number to 11 and the Pin Number to the corresponding Y number (Y3 would be pin number 3).
6. Set the Active Low column to a green check for a normally closed signal or red x for normally open.

7.4 Using Outputs

Outputs 5-10 can be controlled with M-Codes. One M-Code turns an output on, and the other M-Code turns the output off. Use the table below for a reference.

Custom M-Codes	Functions	Default Output
M200	Output 5 on	Y2
M201	Output 5 off	
M202	Output 6 on	Y3
M203	Output 6 off	
M204	Output 7 on	Y4
M205	Output 7 off	
M206	Output 8 on	Y5
M207	Output 8 off	
M208	Output 9 on	Y6
M209	Output 9 off	
M210	Output 10 on	Y7
M211	Output 10 off	

TABLE 5 M-CODES FOR OUTPUTS

The outputs can also be accessed inside the *MachMotion* plugin. Read

Advanced Options on page 29 for more information on how to use outputs inside the plugin.

7.5 Mist and Flood Control

Mist is already preconfigured in Mach3 to be wired into Y0 on the small green connector.

Feature	ON M-Code	OFF M-Code	Preconfigured Output
Mist	M7	M9	Output 3 - Y0
Flood	M8		Output 4 - Y1

TABLE 6 MIST AND FLOOD CONTROL

8 ADVANCED OPTIONS

A number of advanced features can be accessed and configured in the MachMotion plugin such as periodic oiler control and custom user messages. Begin by going to **PlugIn Control->MachMotion Config** to open the MachMotion plugin.

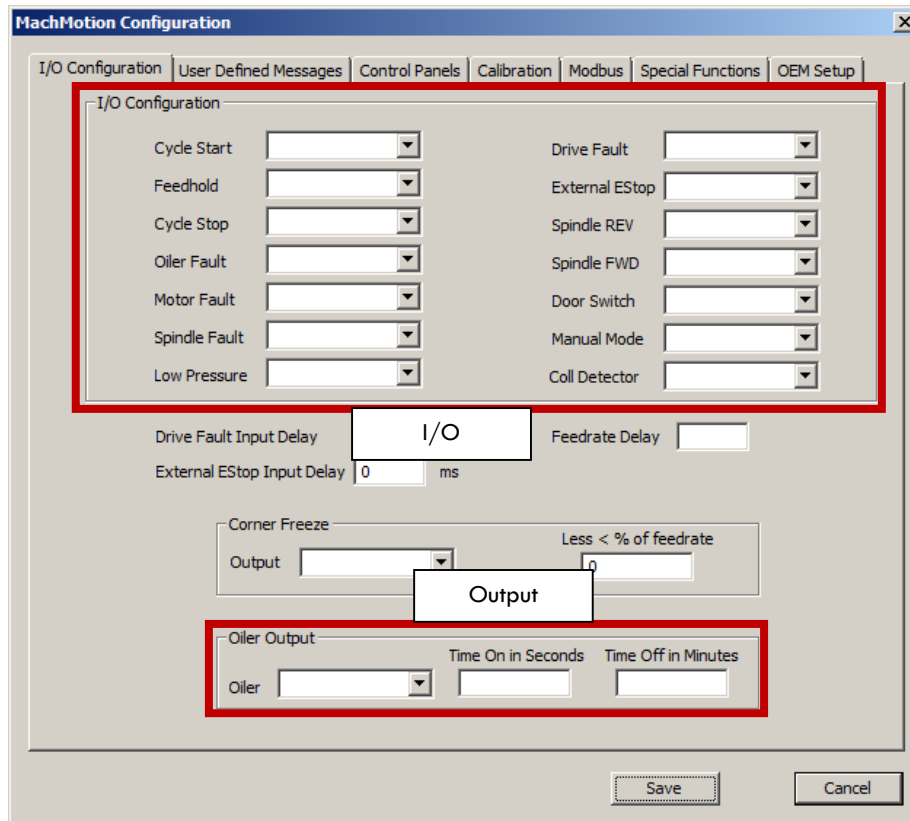


FIGURE 36 - MACHMOTION PLUGIN, IO CONFIGURATION

In general, only change values and settings in the red boxes shown above. The rest of the options are used to set up the control at the factory. Please do not change these settings.

The I/O Configuration section allows an input to turn on a function. The input in the drop down menu turns on the corresponding function. In the figure above, OEM trigger 1 (OEMTRIGGER1) turns on the drive fault. For example, to set up an external E-Stop, configure a normal input in ports and pins (See Setting up Inputs). Let's assume we set up Input 4. Then use the drop down menu in the System Configuration window to select the input as shown below.

The system may also require an oiler. Just define an output, set the time run time of the oiler, and the time between cycles. In the example below the oiler is attached to output 6. It is turned on for 10 seconds every 1 minute. The spindle has to be on for the oiler to turn on.

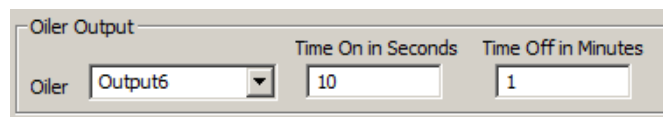


FIGURE 37 OILER

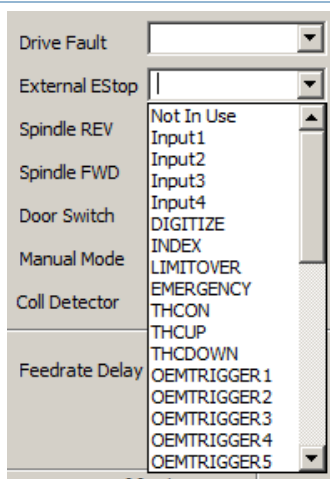


FIGURE 38 CYCLE START

Now whenever Input4 is active, E-Stop will be flagged.

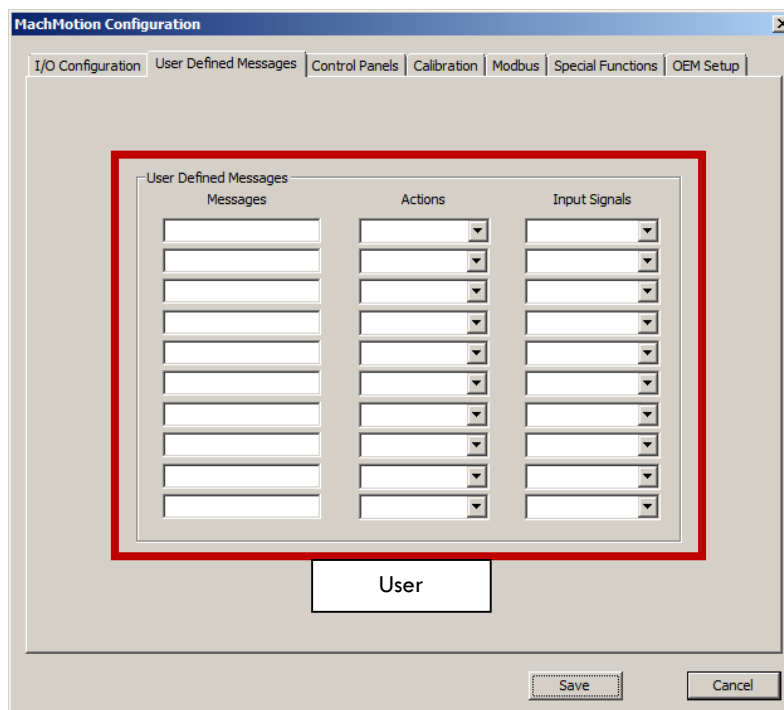


FIGURE 39 - MACHMOTION PLUGIN, USER DEFINED MESSAGES

The User Messages can be configured to have custom messages displayed. Each input will do a specific function (E-Stop, feed hold, stop) and write to the status bar except the No Action option. The No Action just displays the message on the status bar whenever the input is active. In the example below, when OEM trigger 4 is activated, the message “**MCR Reset!**” will be displayed on the status bar.

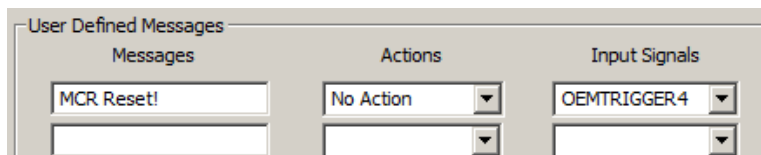


FIGURE 40 USER MESSAGES

9 APPENDIX

9.1 Warranty Information

MachMotion guarantees all products to be free from manufacturer defects for a period of one year from the date of purchase. Products which prove to be defective under normal conditions and proper use, during the warranty period, will be repaired or exchanged free of charge. For warranty service the customer must contact MachMotion for an RMA number and then return the defective product to MachMotion. If a product is sent to MachMotion without an RMA number, the product may be misdirected or delayed. When a product or part is exchanged, any replacement item becomes the customer's property and the replaced item becomes MachMotion's property.

If the defect is found to be caused by improper use or installation, the warranty is void. Otherwise the product will be repaired or exchanged and returned to the address located on the Product Return/Repair Form.

MachMotion will cover ground shipping cost for the replacement/repaired product being returned to the customer. MachMotion does offer expedited shipping at the customer's expense.

If a replacement product is needed quickly, a replacement can be sent immediately. In this case the customer will be charged for the replacement part at the time of the order and be refunded that charge when the defective component is returned to MachMotion, assuming the defective item falls under the warranty guidelines. MachMotion will issue a refund within two work weeks after receiving the faulty component.

9.2 Additional Resources

Additional manuals and resources can be found at MachMotion.com

The Mach Motion Team

<http://www.machmotion.com>

14518 County Road 7240, Newburg, MO 65550

(573) 368-7399 • Fax (573) 341-2672