

MachineApps - Path Following (MachineMotion 1 version)

Contents

[Introduction](#)

[Step 1: Creating your DWG/DXF file](#)

[Step 2: Convert DXF/DXF file to G-code](#)

[Step 3: Accessing MachineApps](#)

[Step 4: Setting up machine configuration files](#)

[Step 4A - Setting up MachineMotion controller](#)

[Step 4B - Setting up x, y, and z actuators](#)

[Step 4C - Setting up digital outputs](#)

[Step 4D - Review machine configuration](#)

[Accessing the jogger](#)

[Step 5: Setting path configuration files](#)

[Step 5A - Home and initialize actuator positions](#)

[Step 5B - Jog EOAT to the origin position for the path](#)

[Step 5C - Add outputs, actuator commands, speed and acceleration commands into the G-code path](#)

[Step 6: Review the path following configuration](#)

[Step 7: Run your program](#)

[Path display and execution menu](#)

[System status](#)

[Information console](#)

Introduction

The Path Following MachineApp for MachineMotion 1 is an easy-to-use and intuitive application to configure, program and operate your Vention path following machine. The Path Following MachineApp comes pre-loaded on the MachineMotion controller and can be accessed from Vention's pendant, or through a computer located on the same network. It includes features such as machine and path following configuration setups; including error and notification management, customizable commands, real-time process performance, and a visual display the path following operations.

The MachineApp will allow your Vention 3-axes machine to execute a g-code file that contains your custom path. Ensure that the 3-axes machine is plugged into a single MachineMotion controller. This technical document will explain various ways you could configure your source file into g-code and how to deploy the g-code file into the path following app.

Step 1: Creating your DWG/DXF file

1. Use your preferred CAD software (AutoCAD, Autodesk, SOLIDWORKS, CATIA, Onshape, etc) to design your path.
2. Define the dimensions of your path and ensure that the path is fully defined.
3. Save the file as a DWG or DWF file.

Step 2: Convert DXF/DXF file to G-code

1. Choose a software program (Fusion 360, DXF2GCODE, Makercam, Inkscape, etc) to convert your DXF/DWG to a G-code file.
2. Specify your origin point for your G-code file. This origin point represents where you need to teach the EOAT to start on your Vention machine to draw your desired path. It's recommended to create a z-direction clearance after you create the origin point.
3. Specify the depth settings for your clearance heights, feed heights, etc.
4. **Optional:** Specify any IO commands you would like to execute on your path. You may also specify IO commands in your Vention path following MachineApps later.
5. Export as .ngc (G-code) file and ensure it is a 1:1 ratio.

Step 3: Accessing MachineApps

Your path following MachineApps software will be preconfigured on your MachineMotion controller. To access the software, follow the steps below:

1. Once you have assembled your Vention machine, plug your controls, motors, and EOAT into the MachineMotion controller. Refer to [MachineMotion user manual](#) to learn more on how to configure your components to the controller.
2. Connect your MachineMotion controller (using the fixed IP 192.168.7.2 Ethernet port) to a computer using an ethernet cable.
3. **POWER ON** the MachineMotion controller by switching on the rocker switch. **Wait for the status LED to turn green (~90 seconds).**
4. Open up your internet browser and enter "192.168.7.2/pathfollowing" in the address bar.
5. You will be directed to the following screen:

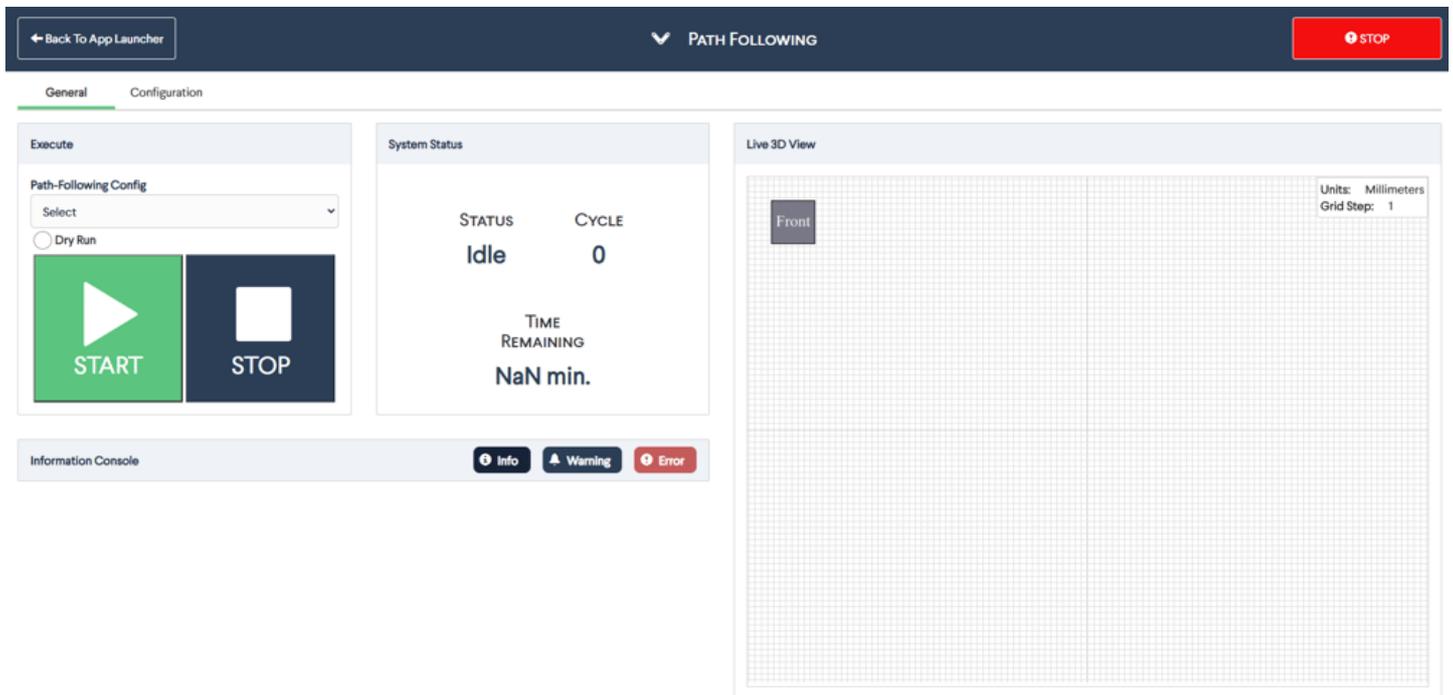
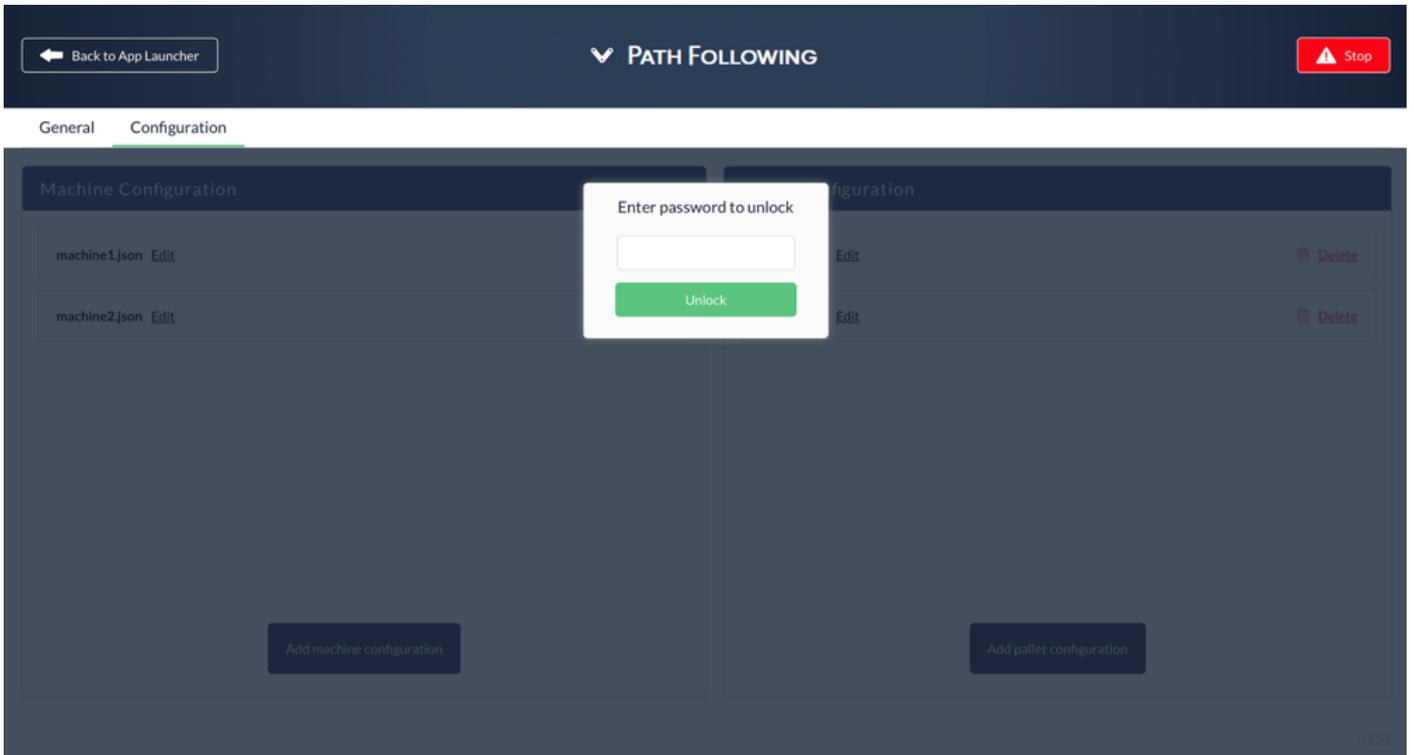


figure 1: Path following MachineApp: General

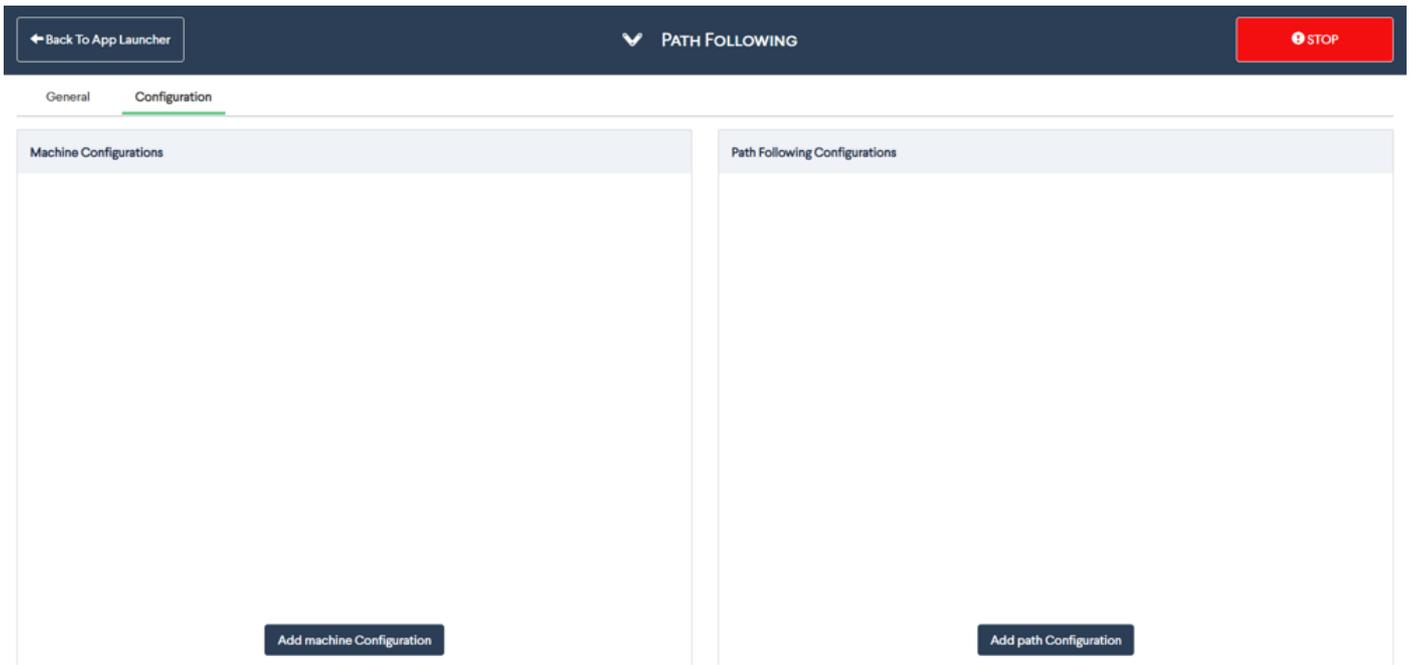
Step 4: Setting up machine configuration files

Step 4A - Setting up MachineMotion controller

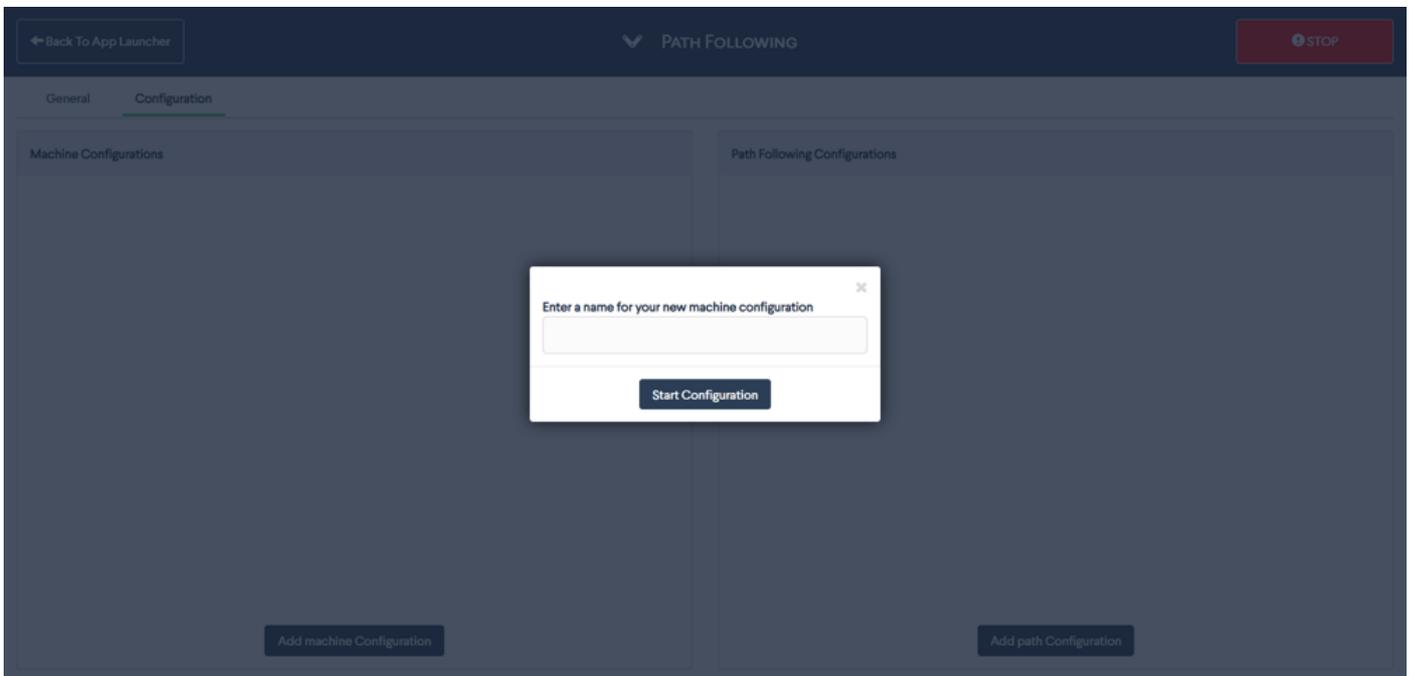
1. Click on the "Configuration" tab and enter the password to unlock the screen. This is to allow only trained persons to modify the configuration files (both machine and path configuration files). The password will be shipped with each order.



2. Click on "Add machine configuration".



3. Give the machine configuration a friendly name and click "Start configuration"



4. Set up your MachineMotion controllers and enter the following information for the controller:

- **Name:** Enter a name for the controller you can later refer to, to configure drives to the connected controller.
- **Version:** v1
- **IP address:** 192.168.7.2
- **Gateway:** 192.168.0.1
- **Subnet Mask:** 255.255.255.1



Step 1: Define machine motion version and network parameters

Name:

Version:

IP address:

Gateway:

Subnet Mask:



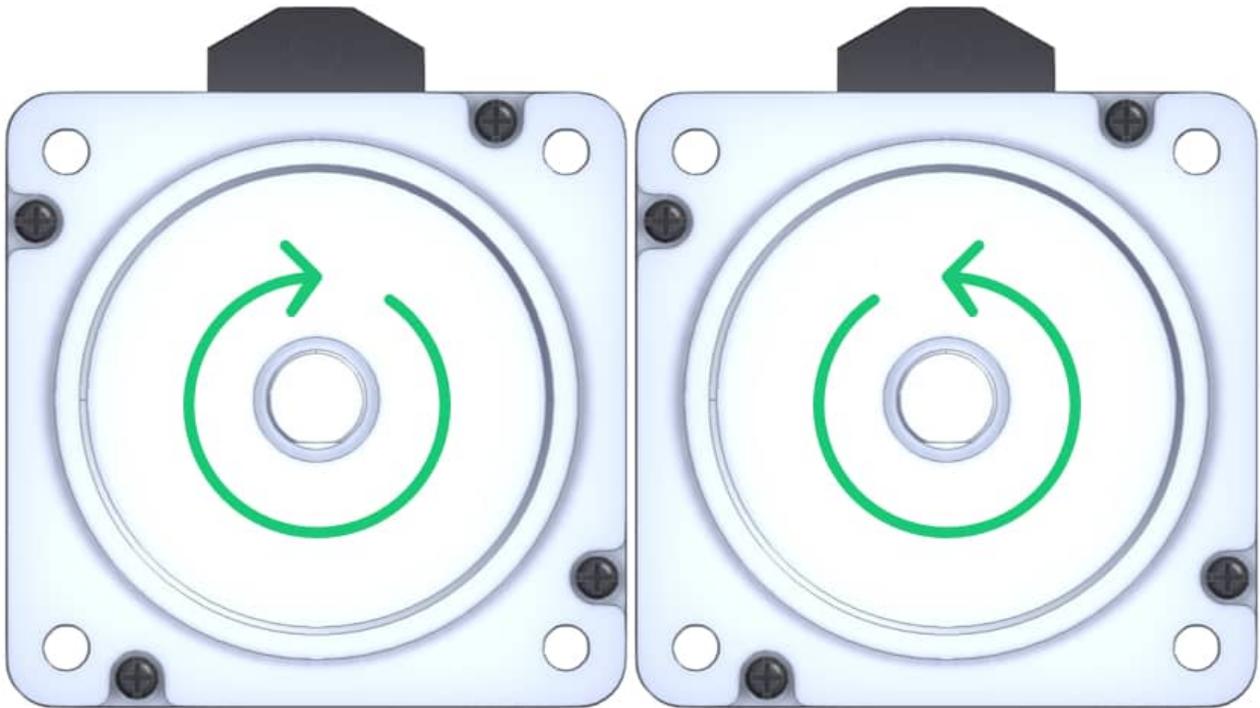
Back

Done

Step 4B - Setting up x, y, and z actuators

1. Configure your "X" axis by selecting the actuator specified in your "Automated Systems Diagram", provided with your order.
 - **MachineMotion:** Select the MachineMotion controller associated with the "x-axis" actuator
 - **Drive:** Select from the drop-down menu, the drive that is connected to your "x-axis" actuator. This should also be specified in the custom Automated System Diagram, that is shipped with your Vention equipment.
 - **Type:** From the drop-down menu, select the actuator type
 - **Micro Steps:** This is an advanced feature if more precision or more torque is required. Refer to your Automated System Diagram to enter the recommended microsteps.

- **Gearbox:** If you have a gearbox installed on the actuator, check-off “Gearbox”.
- **Homing speed (mm/s):** Set a homing speed for each actuator. You may change the homing speed in the machine configuration file.
- **Direction:** Rotation direction, see reference figure for motor rotation direction below:



Machine Configuration Step 2 / 4

Step 2: Configure drives for X axis

Drive	Type	Microsteps	Gearbox	Direction	Homing Speed (mm/s)	
Drive1	Timing Belt	8	<input type="radio"/>	Positive	100	<input type="button" value="Add drive"/>

2. **Optional:** If two motors are splitting the current from one drive using an out-of-phase power harness (CE-CA-026-0002), click “Add drive”. Configure the same MachineMotion, drive, actuator type, micro steps, and gearbox. Under the “Direction” drop down menu, select the opposite motor direction that you have configured for the same axis.

Important note: Only one drive set-up is required if two drives are internally synchronized. This means that two motors are using two drives, however, they are synchronized prior to shipment of the order. Please refer to your Automated System Diagram to confirm how motors are synchronized if multiple motors are used to drive an axis.

3. Repeat the same steps for “y, and z” axes. Ensure you always refer to your “Automated Systems Diagram”.
4. Jog each actuator using the left or right arrows. Each click jogs the actuator 50 mm. Once you have verified that each actuator moves as expected, you may home each actuator.

Important note: It is recommended to always home the z-axis first and to ensure its “Home” position is sending the z-axis to its fully raised position. If you need to edit any actuator properties, click on “Edit”. To reverse your home and end-stop sensors, reverse the direction of your actuator.

Step 2: Test path-following X, Y, and Z axes by jogging the actuators

X Axis	1 Drive	←	Home	→	Edit
Y Axis	1 Drive	←	Home	→	Edit
Z Axis	1 Drive	←	Home	→	Edit



Back

Done

Figure 9: Path following MachineApp: Jogging and homing actuators

Step 4C - Setting up digital outputs

1. Configure the digital output for your EOAT. Enter:

- **MachineMotion:** From the drop-down menu, select the controller that is connected to the digital IO module that the EOAT is connected to.
- **IO Module:** From the drop-down menu, select the IO module that is connected to the EOAT.
- **Pin:** Select the pin on the IO module that will be used to power your EOAT.

The pin-out diagram could be found from any EOAT pin-out diagram. Configure accordingly.

Step 3: Configure the digital outputs

+ Add new output

Module Name	IO Module	Pin 0	Pin 1	Pin 2	Pin 3	Test	🗑️
Lasers	Module 2	0	0	0	1		

Back

Next

2. Once the suction off configuration is completed, click "Test". If properly configured, the digital IO module should light up for that output.

Step 4D - Review machine configuration

1. Last step is to review your machine configuration. Once all information is verified, click "Save and exit".

Machine Configuration Step 4 / 4

Step 4: Confirm your machine configuration

Machine Motion Edit



MachineMotion1	Machine Motion V1	IP Address: 192.168.7.2 Gateway: 192.168.0.1 Subnet Mask: 255.255.255.1
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Axes Edit

X Axis: 1 Drive(s)
Y Axis: 1 Drive(s)
Z Axis: 1 Drive(s)

Outputs Edit

Digital Outputs				
Module: 1	Pin 0: 0	Pin 1: 0	Pin 2: 0	Pin 3: 1

BackComplete Configuration

Figure 11: Path following MachineApp: Review machine configuration

Accessing the jogger

Access the manual jogger for your machine configuration any time after you have completed configuring your machine. You may home each actuator, select the increment and speed you would like to jog each actuator. Each arrow has its respective axis labelled that corresponds to your actuator.

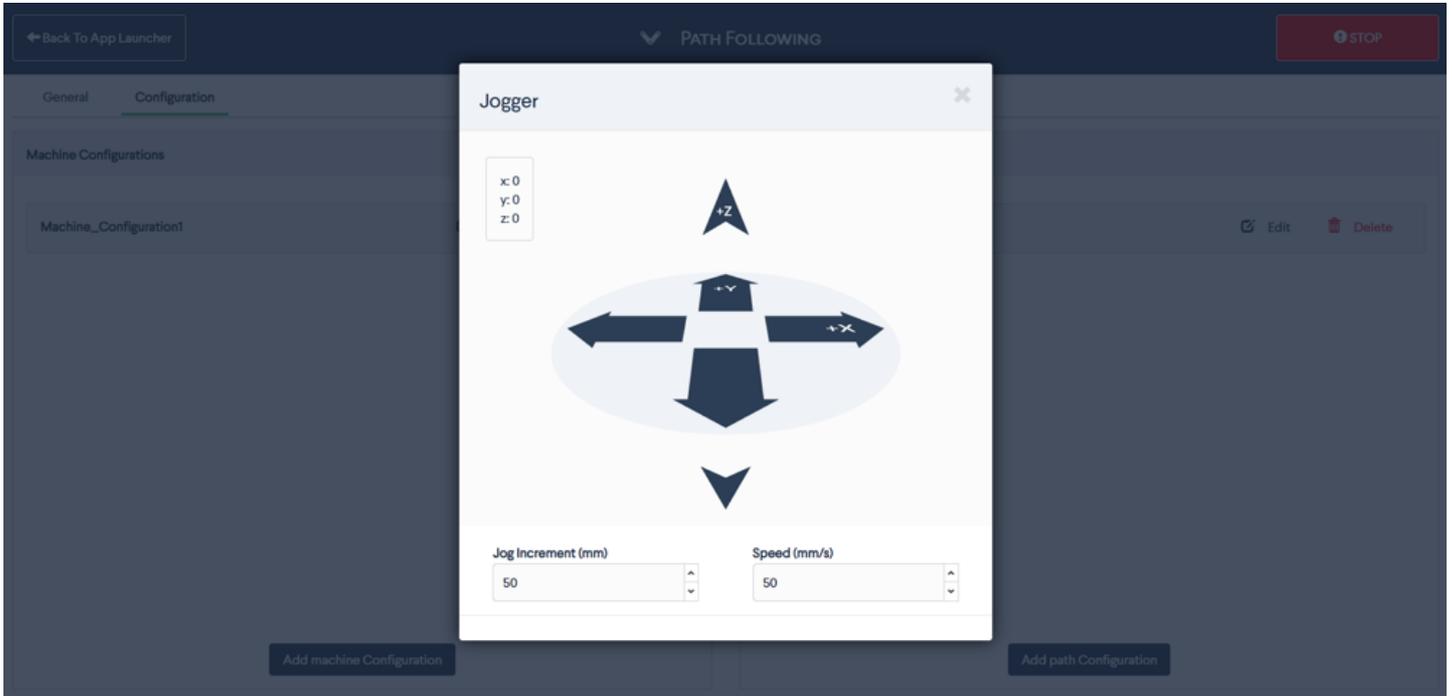


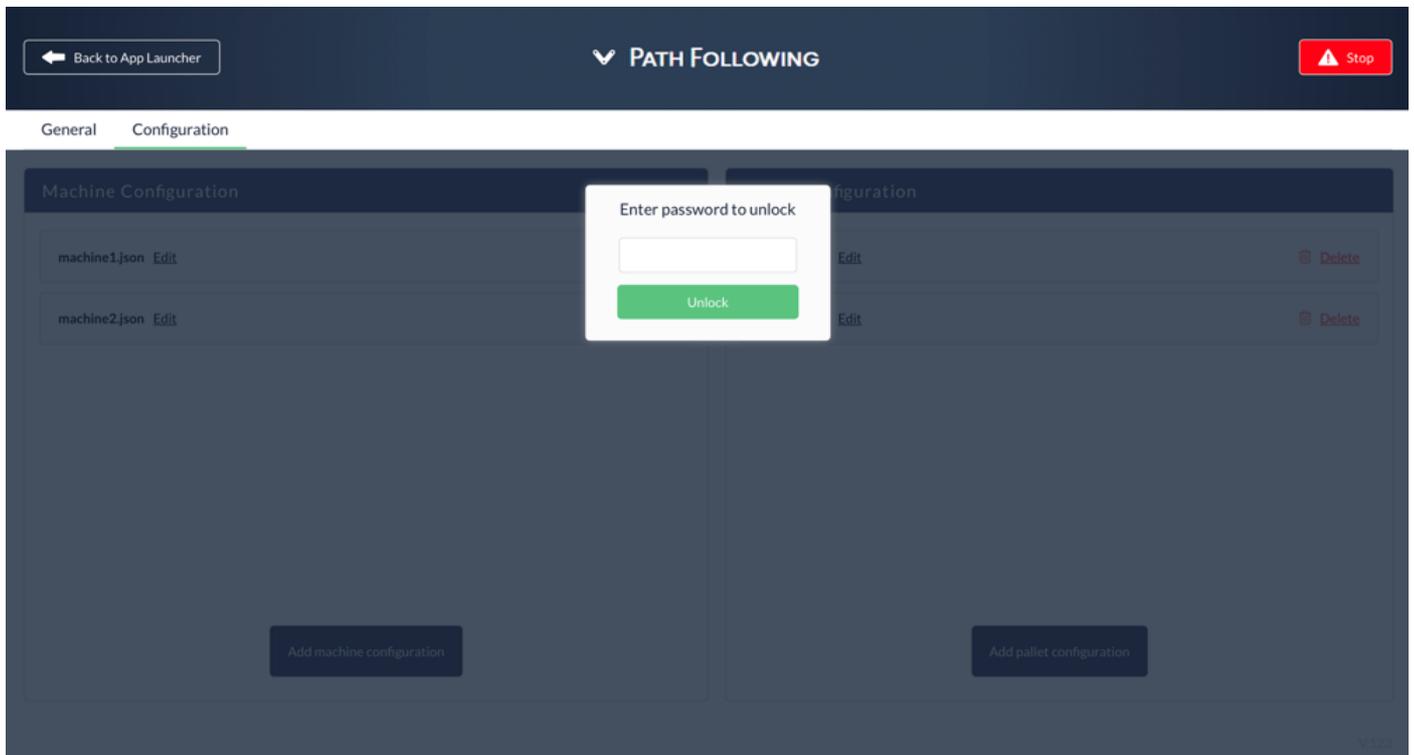
Figure 12: Path following MachineApp: Accessing jogger

Step 5: Setting path configuration files

Path configuration is where you configure your G-code path, associate a machine configuration file to the path, set up speeds, accelerations and inject IO commands or actuator commands into the path at various locations

Set-up: Associate a machine configuration and G-code file to the path following configuration file

1. Click on the “Configuration” tab, the screen will be locked. This lock is to allow only certain personnel to edit the configuration files. The configuration files should only be edited by a trained personnel. Enter the default password that came with your software package.



2. Click “Add path configuration” and enter a friendly name for your path configuration. You may have an unlimited number of path configurations that you could call to execute in the general tab.
3. Upload a G-code file into the path following configuration by clicking “Choose File”.
4. Select the machine configuration from the drop down menu to use in order to set up your path configuration.

5. Enter a default speed and default acceleration for your path.

Note: If you want to change the default speed later, you can access this screen to do so.

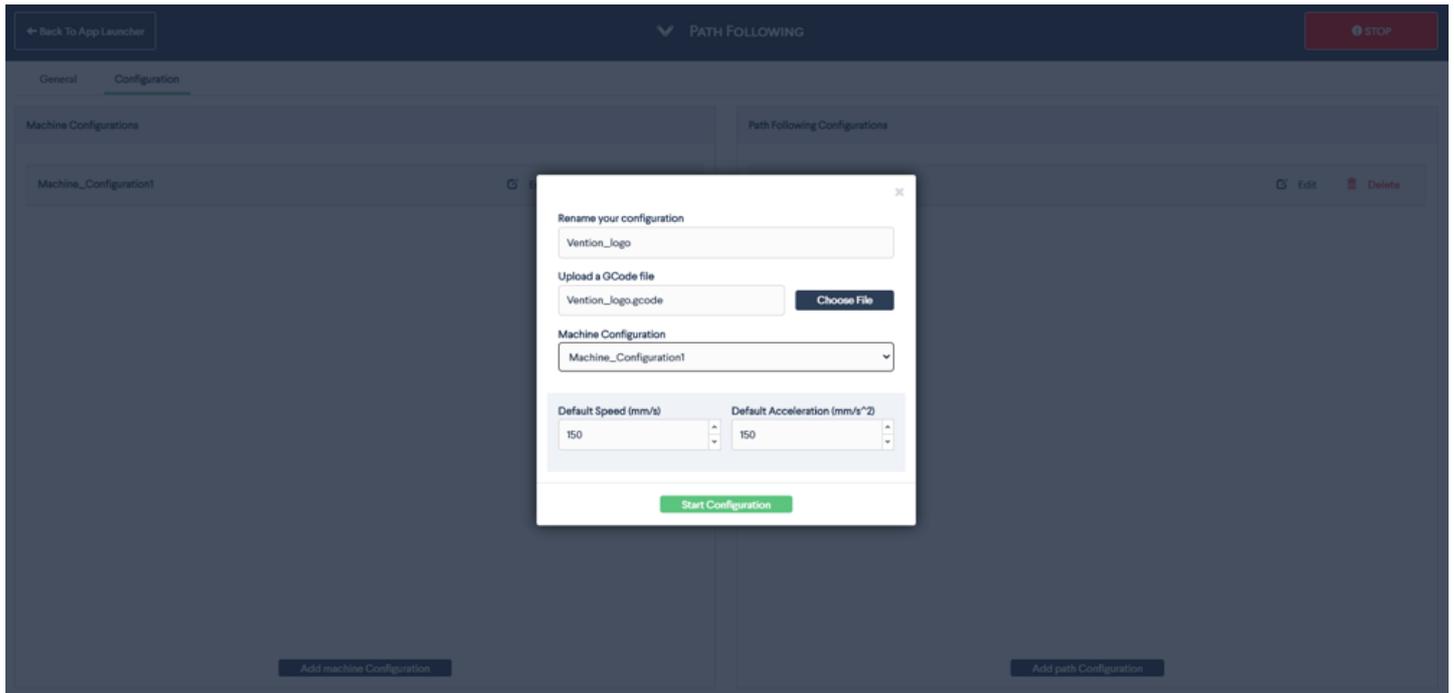


Figure 14: Path following MachineApp: Configuration set-up

Step 5A - Home and initialize actuator positions

1. Home all actuators (home the z-axis first) to zero the positions of your actuators to obtain accurate teach positions for each origin location. Note that for the path following app, the actuators will home and go to the end of the travel when you click “Home” for a specific actuator. This is to measure the total travel available for that actuator. This measurement will be represented in the grid in the next steps.
2. Click “Done” once all actuators are homed.

Step 5B - Jog EOAT to the origin position for the path

1. Set the increment and speed you would like to jog each actuator.
2. On the right-hand side, there is a representation of the G-code path you have uploaded. There is an x and y measurement that represent the available travel of your Vention machine with reference to your path.
3. The goal of this step is to jog the EOAT to the red dot (origin point of your path) that is represented in the model. You may use your mouse wheel to zoom in and out, left-click to rotate and right-click to pan.
4. Once your EOAT is positioned where you would like your path to start, click “Set Start Position” and click “Next”.

Note: If you want to change the start position you can always come back to this screen and do so.

Step 2: Jog to the start of the file

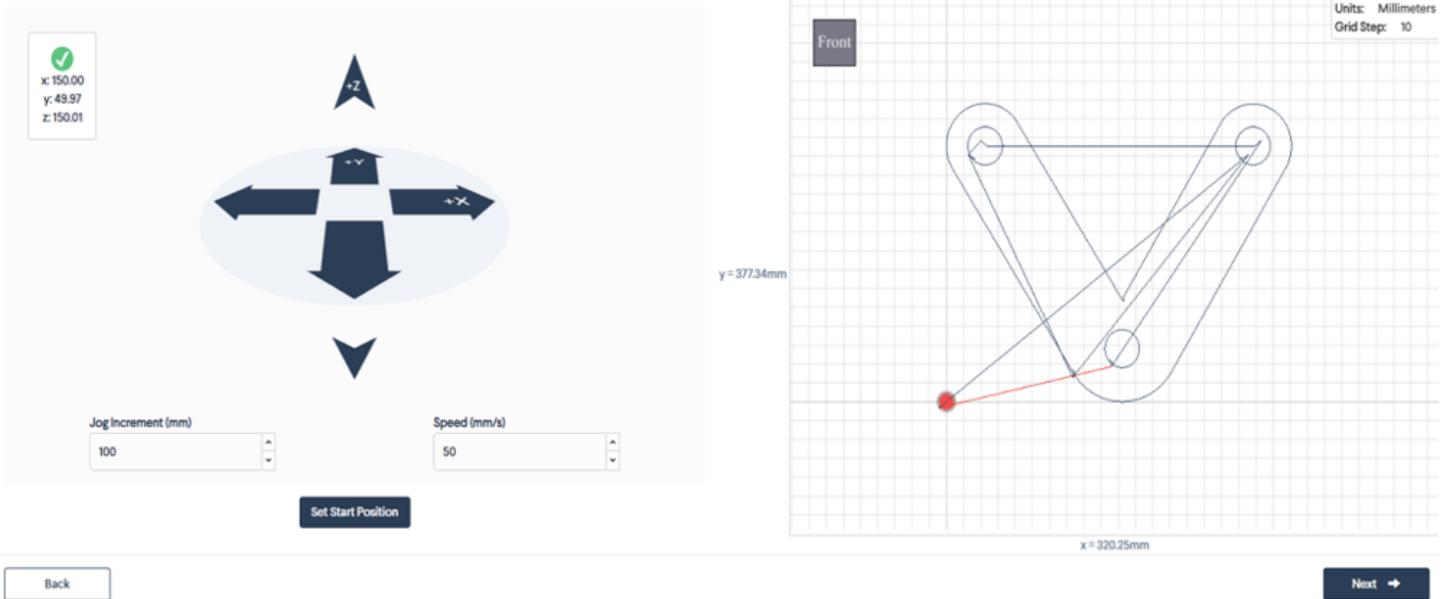
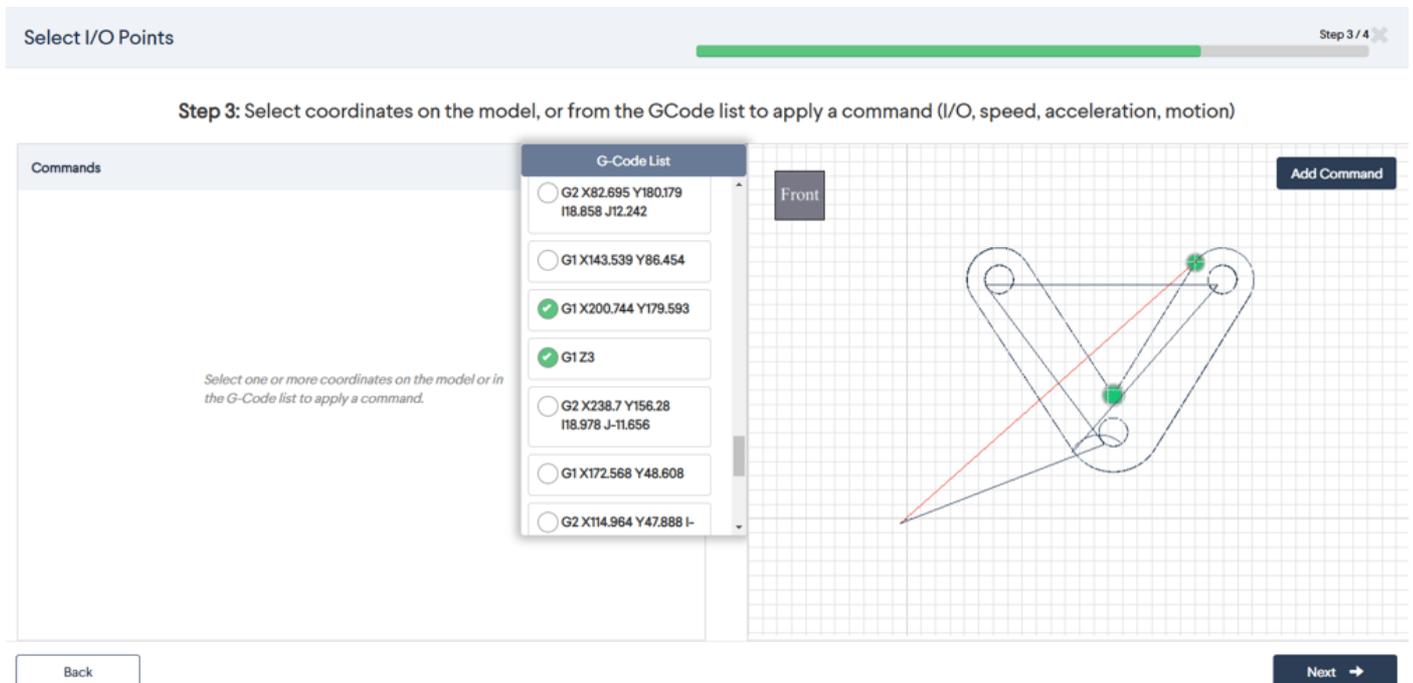


Figure 15: Path following MachineApp: Jog to the origin

Step 5C - Add outputs, actuator commands, speed and acceleration commands into the G-code path

1. Click from the G-code list or the 3D representation of the path to inject external commands into the G-code path.

Note: The G-code commands are listed in order of execution, making it easier to set the sequence of commands in the required order.



2. Select either one coordinate or two to be able to add commands. Once the coordinates are selected, click "Add Command". Selecting one coordinate allows you to add an actuator motion command, add custom G-code command and add digital outputs to activate.

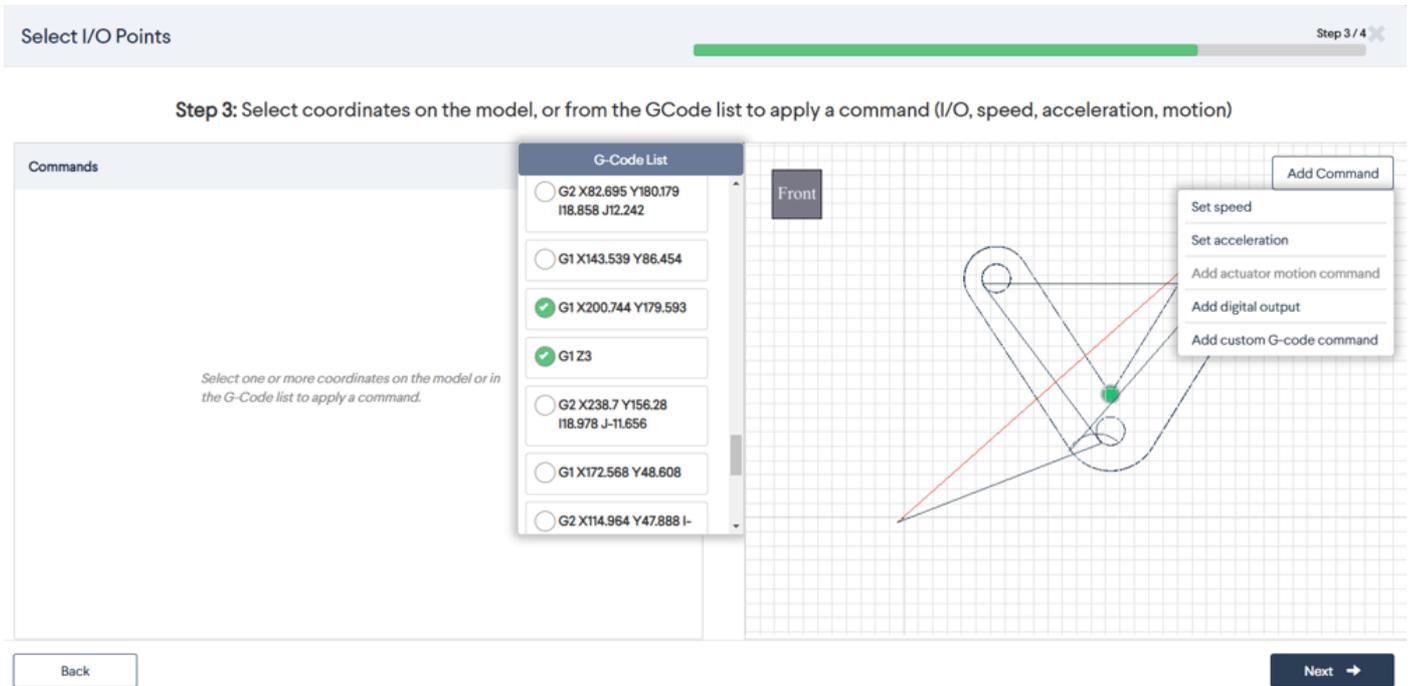
Step 3: Select coordinates on the model, or from the GCode list to apply a command (I/O, speed, acceleration, motion)

3. Selecting two coordinates allow you to set speed, set acceleration, add custom G-code command and add digital outputs.

Note: If you activate a digital IO between two points, the IO will revert to the previous state once it has passed the second selected point.

Step 3: Select coordinates on the model, or from the GCode list to apply a command (I/O, speed, acceleration, motion)

4. On the left-hand side, under "Commands", you may specify the specifics of the command (value of speed, acceleration, absolute position, custom g-code command, etc.)



- Once all the commands are added, click "Next".

Step 6: Review the path following configuration

- Review the 3D model to verify the origin point is in the intended position, review the injected commands on the left, and the rest of the configuration file.
- Once the configuration file is reviewed, click "Complete Configuration".

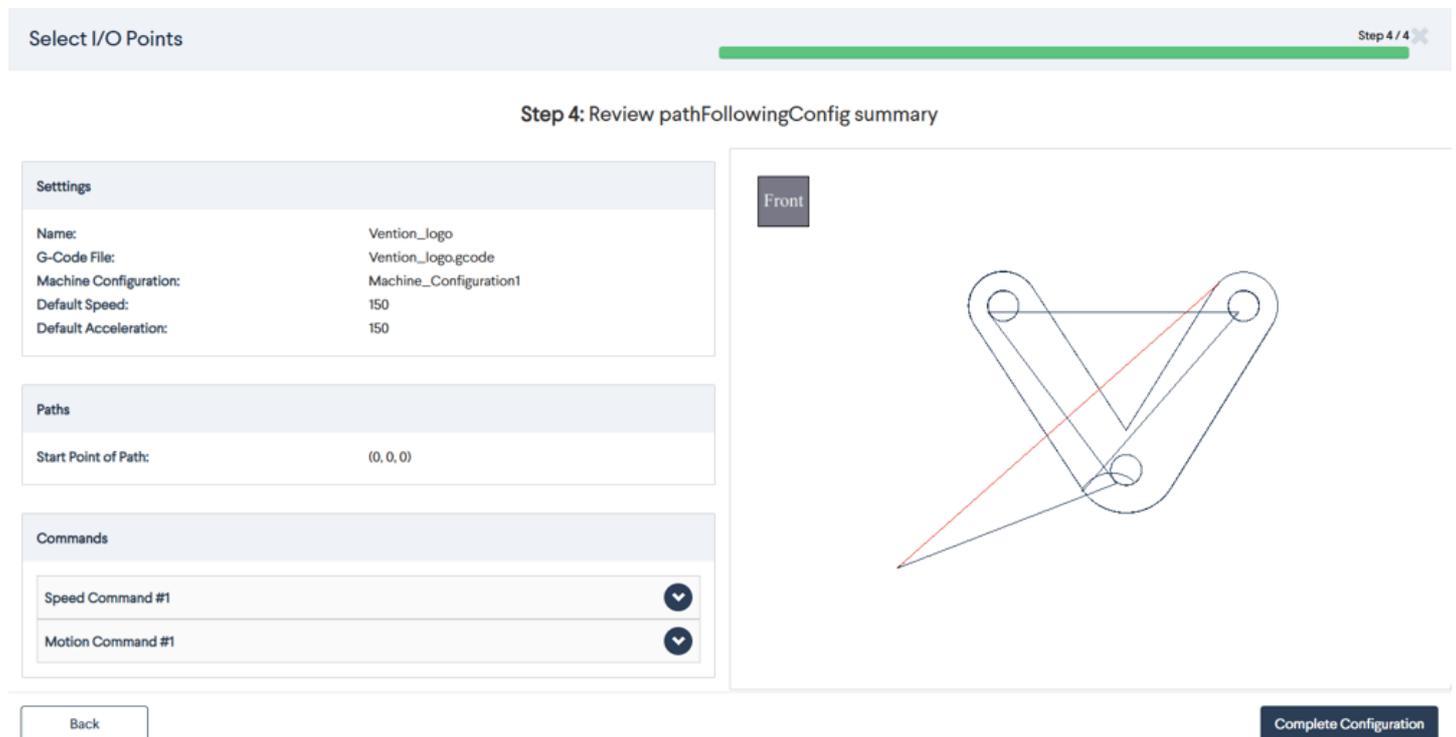


Figure 20: Path following MachineApp: Adding commands \ (two coordinates)

Step 7: Run your program

This step allows you to run the configuration files you have set up, inspect your system status and console information. **Important note:** Access the software stop any time by clicking the top right "STOP" button.

1. To operate your path following machine, go to the “General” tab.

Path display and execution menu

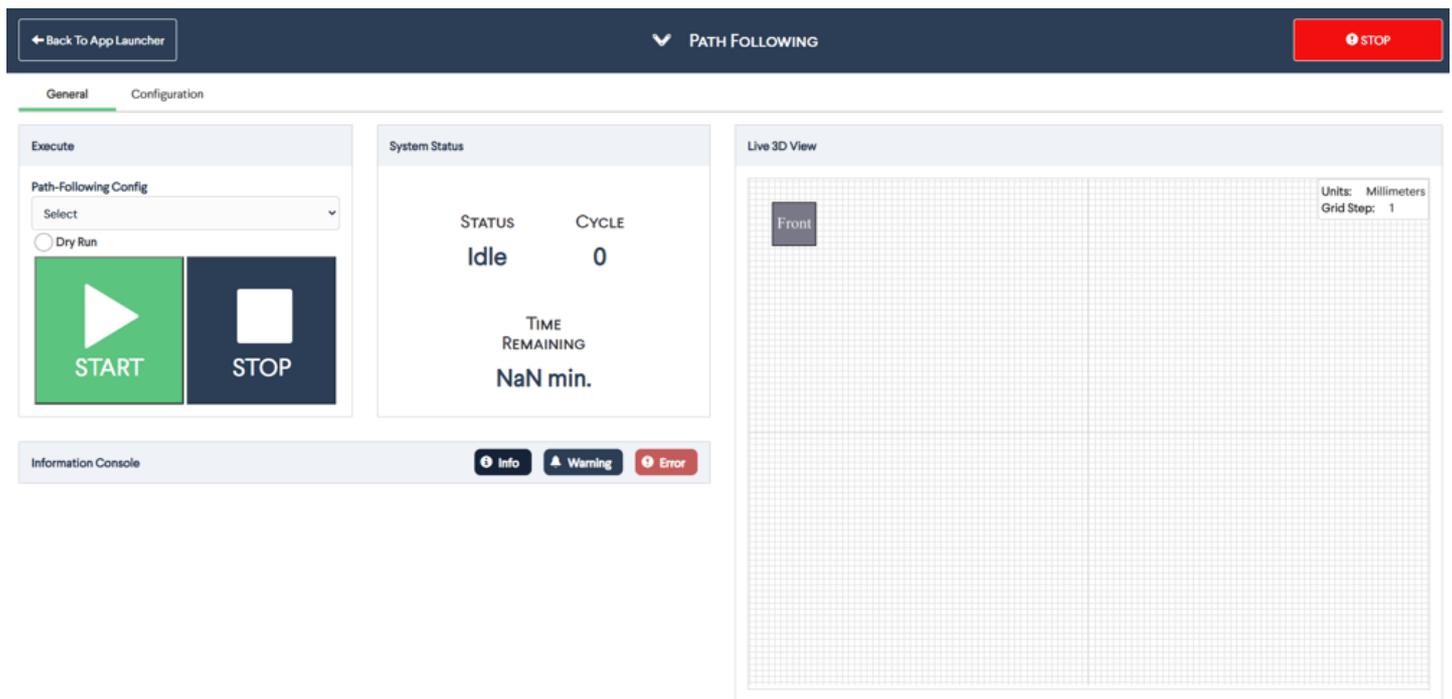
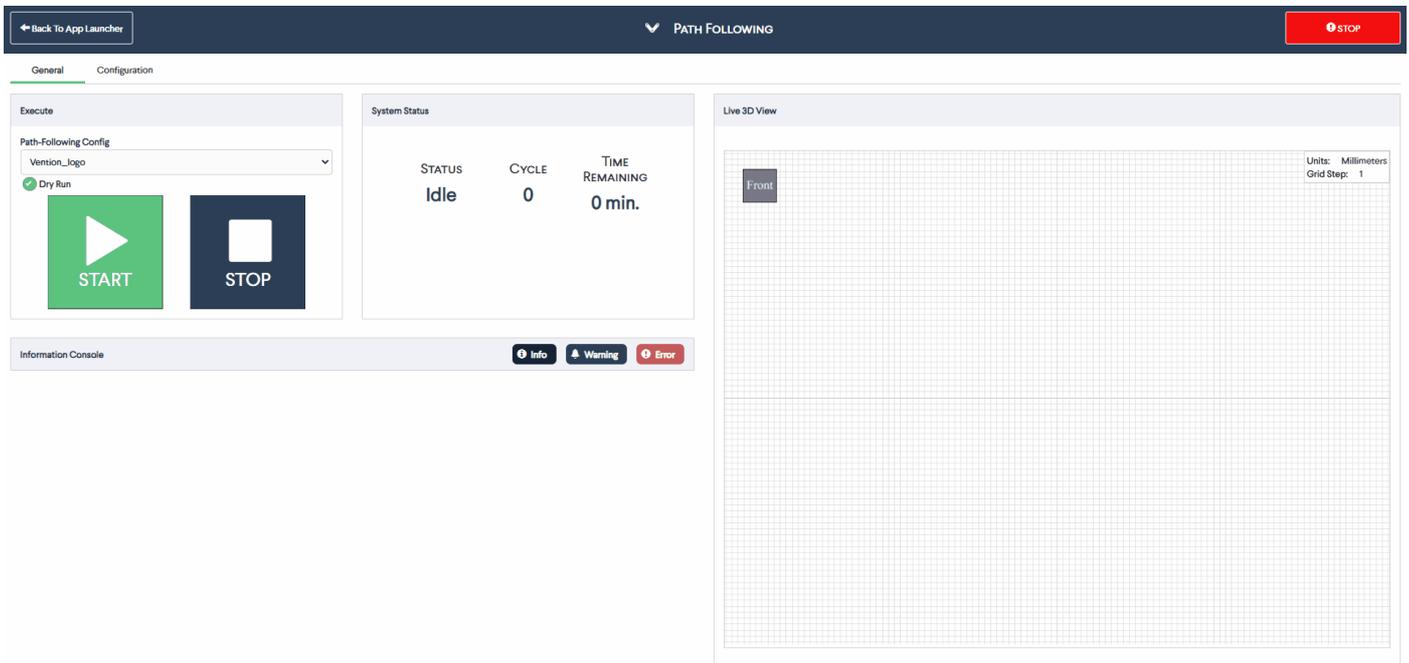


Figure 21: Path following MachineApp: Palletizer display and execute menu

1. There is a drop-down “Path following configuration” menu that will allow you to select your configured path file.
2. Press “Start” whenever you are ready to start your path file. The “Start” button will automatically toggle to a “Pause” button to allow you to temporarily pause the movement of the palletizer. **Note:** Your palletizer will home all the actuators before going to the pick location.
3. The 3D representation on the right will simulate the motion of your machine in real time.



4. Press “Stop” when you would like to stop all movement of the path following machine. The movement of the machine will default back to its home position when you press “Start” again and the path would start from the beginning.
5. Once your machine has completed the path, the machine will re-home and stay in that position until you press “Start”.

System status

Check the status of your machine:

Status:

Running: The machine is running as expected

Warning: The machine detects a potential error that may require operator assistance

Inactive: The machine has stopped due to the “Stop” button being triggered or the machine has stopped due to a detected error

Cycle: Indicates the operation cycle

Time remaining: Indicates the remaining time to complete the cycle

Information console

The information console will assist with diagnosing the errors with the machine. Each error code would either be labelled:

****Info:** **Updates on the operator of various statuses of the machine. No action required from operator.

Warning: May require attention from the operator where an error could potentially occur.

Error: The machine will stop running because the machine requires immediate assistance from an operator.

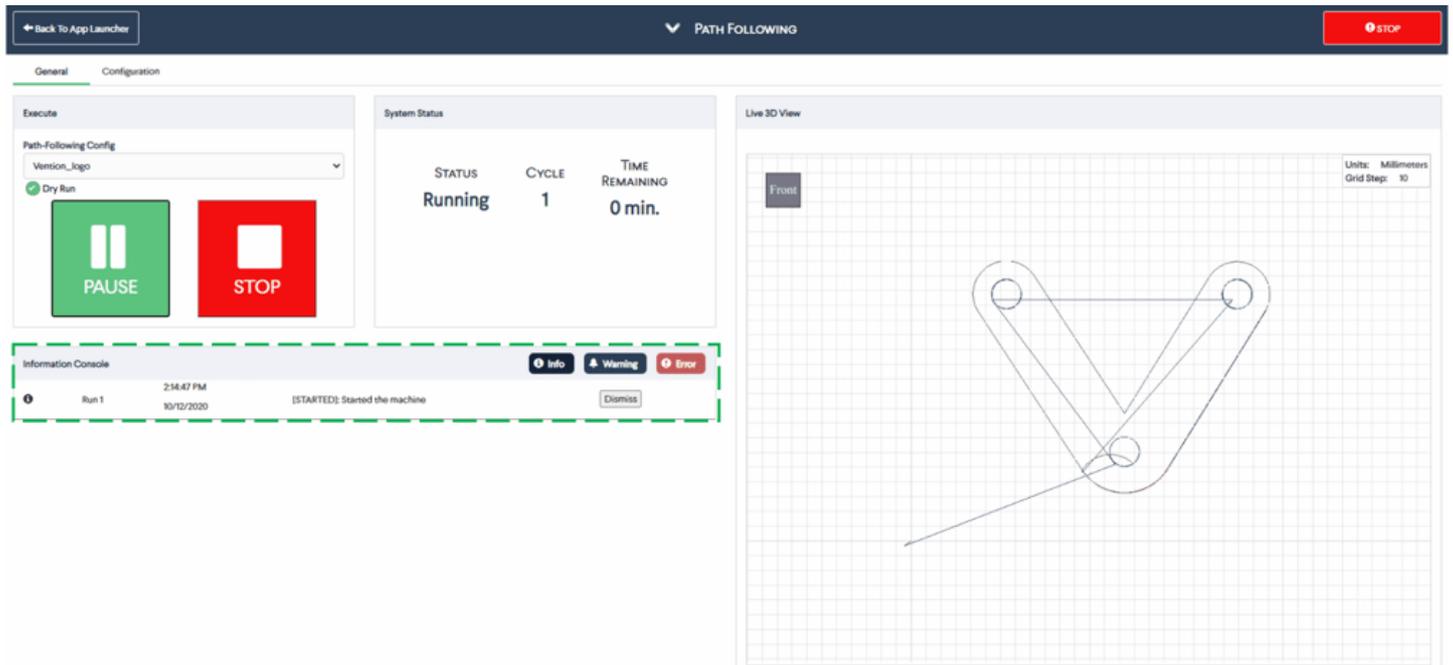


Figure 23: Path following MachineApp: Information console menu