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Sigma Benchtop Robot

Owner's Manual

Revision D

Precision Valve & Automation
6 Corporate Drive
Halfmoon, NY 12065

This document is based on information available at the time of its publication. While efforts have been made to ensure the contents of this manual are accurate, the information contained herein does not purport to cover all specific details or variations in hardware, or to provide for every possible contingency in connection with installation, operation, or maintenance. Features may be described herein which are not present in all hardware and software systems. Precision Valve and Automation, Inc. assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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1. Introduction

Before you operate this system, read the operation and setup manual. This will help you to become familiar with the product and ensure successful operation.

If any questions or problems arise, contact PVA's Technical Support department.

1.1 PVA Contact Information

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1.2 Document History

Revision	Revision Date	Reason for Changes
REV D	June 2024	Updated Download Instructions for Inkscape, G-code
REV C	April 2021	Maintenance Schedule Added
REV B	July 2020	Download Instructions for Inkscape, G-code
REV A	May 2020	Initial Release

Note: All photographs and CAD model representations in this document are a "general representation" of the system and its components. The actual appearance of the system and its components can differ based upon customer specific configuration.

1.1 Safety

Certain warning symbols are affixed to the machine and correspond to notations in this manual. Before operating the system, identify these warning labels and read the notices described below. Not all labels may be used on any specific system.

Always wear approved safety glasses when you operate or work near the workcell.

Before you operate the system, read and understand the manuals provided with the unit.

Never put hands or tools in areas with this symbol when the machine is in operation. A dangerous condition may exist.

Read and understand the manuals provided with the unit before any repairs or maintenance is done. Only a qualified individual should do service.

Use caution when there are pressurized vessels. Find and repair any leaks immediately. Always wear appropriate safety equipment when you work with pressurized vessels or vessels that contain chemicals

Shear hazard from moving parts. Avoid contact.

Do not remove protective guarding.

In situations where inattention could cause either personal injury or damage to equipment, a warning notice is used.

Do not smoke near the machine. Always have a fire extinguisher available for emergency use.

Before performing any repairs or maintenance to the system, turn off power and lock out the power disconnect switch.

Warning notices are used to emphasize that hazardous voltages, current, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use. Only qualified personnel should enter areas designated with this symbol.

Laser light source present. Do not stare directly into the beam. Do not use in the presence of highly reflective surfaces

Pinch hazard from moving parts. Avoid contact.

Hot surface. Avoid contact.

Warning, Ultraviolet (UV) light hazard. Do not look directly at the UV light source.

1.1 System Description

The Sigma benchtop is a compact three-axis robotic gantry ideal for automating a variety of dispensing and coating applications. Featuring multiple mounting positions, users can easily incorporate multiple chemistries or application techniques into their process. With remote programming capability and image background import, programs can be quickly uploaded from your desktop utilizing Sigma's internal 2.4 GHz Wi-Fi network.

1.2 Personal Protective Equipment

Workcell operation includes air pressure, electrical power, mechanical devices, and the use of hazardous materials. Only qualified personnel can operate and service workcells. Operators must use eye protection because material contents are under pressure. Always wear gloves when handling materials and solvents. Refer to MSDS sheets on the material that is used for other precautions.

1.3 Best Practices

- Do not wear loose clothes or jewelry when you operate the workcell
- Do not touch the dispense head while it is moving
- Make sure cables and pneumatics hoses are attached and do not cross walkways
- Immediately engage the Emergency Stop button if personnel is in danger
- Locate and define all safety labels on and around the workcell before you turn the machine "On"
- There must be two people during maintenance procedures
- Dispose of all used parts and materials in accordance with local laws and regulations
- Safety is a joint responsibility between the OEM and the end-user. All precautions and practices should be in accordance with local regulations.

DO NOT use incompatible tools, remove door interlocks or bypass safety devices, make custom mechanics or fluid delivery modification, or change material from the original design.

1.4 Environmental

Area of Possible Concern	System Information
Audible Noise Levels	Below 65 dBA.
Material and Chemicals	There are no known dangerous materials or chemicals on this workcell. Refer to the MSDS sheet for the dispensed material.
Hazards Due to Contact	The workcell has safety features to minimize injuries. In some modes of operation it is possible to override safety features. Only qualified personnel should enter the work area when the workcell has power. All hot surfaces have a warning label.

1.5 Workcell Location

The machine should be installed on a level surface away from standing water, possible overspray, and overhead leaks.

1.6 Handling, Transportation, and Storage

The workcell should be handled and transported with minimal vibration and shock on the system. Use an air-ride truck for roadway transport. The machine is built for an industrial environment, but excessive abuse will decrease the performance of the machine.

1.7 Storage, Temperature, and Humidity

When in storage, all enclosures and connector covers should be closed tightly. Put a cover over the system if there is dust or other airborne debris in the storage area. Store the workcell in an area that is 40°F - 105°F (4°C – 41°C) and low humidity. Do not let condensation collect on the machine.

1.8 Dispensing/Spraying Equipment

When the workcell is stored for an extended period of time, it should be flushed with a solvent compatible with the application material and workcell components.

Note: PVA is not responsible for damages incurred by incorrect transportation and handling of the workcell. The instructions given for the transportation, handling, and storage of the workcell are the correct manufacturer's procedure.

2. Installation and Setup

Before you operate the workcell, know the components. Do the steps in this manual for safe and correct operation.

Warning: Only qualified personnel should do these procedures. Obey this manual and all applicable safety regulations. A "qualified person" is defined as "a person or persons who, by possession of a recognized degree, certificate, or professional training, or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work." (Ref. ANSI/ASME B30.2-1983.)

2.1 Uncrate and Inspect

1. Use the Utility knife to cut the straps and the shrink wrap.
2. Remove the cardboard as well as all packing materials and straps.
3. Use a 9/16" wrench to remove the shipping bracket from the crate. Use a 3 mm hex key to remove the four shipping brackets. There are two on each side of the machine.

2.1.1 To Place the Dispense System

1. Move the workcell to the necessary location.
2. Loosen the lock nuts on each foot of the workcell, if necessary.
3. Make sure that all four (feet) touch the ground. If any feet do not touch the ground, use the adjustable wrench to lower the feet by turning the feet clockwise.

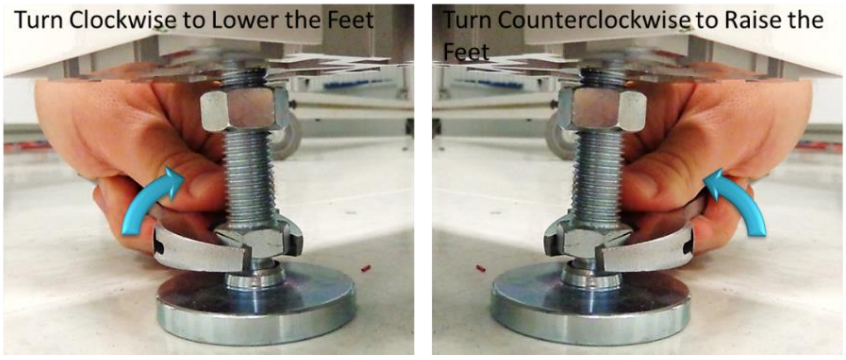


Figure 1: Adjust the Feet

NOTE: When you lower the feet, you raise the workcell. When you raise the feet, you lower the workcell.

2.1.2 Inspection

1. Open the doors and remove all straps, tie wraps, and sponges around the dispense heads and gantry. In order to prevent any movement during the shipping process, many workcells are equipped with green shipping brackets inside the machine. The placement of these brackets will vary by workcell. The shipping brackets must be removed before continuing the inspection.
2. Fully examine the workcell for damage, loose fasteners, etc.
3. Use your hands to move the X and Y-axis slide to the center of the work area.
4. Examine all tubing connections, gauges, and regulators.
5. Open the electrical enclosure and visually inspect connectors and components for signs of vibration during shipping. Close the door, the machine should not operate with the doors open.
6. Make sure all cables and connections are fully and correctly installed.

2.2 Level the Workcell

This is the procedure to level the workcell. Put the level in the center of the jig plate.

1. Look at the position of the bubble in the level window. The bubble will be centered between the two lines when the workcell is level. If the bubble is outside or closer to the right line, raise the left side of the workcell. If the bubble is outside or closer to the left line, raise the right side of the workcell.
2. If necessary, loosen the locking nut on each foot with an adjustable wrench.
3. Use an adjustable wrench to adjust the feet of the workcell. Put the wrench on the flat (unthreaded) part of the pedestal and turn in the necessary direction until the workcell is level from side to side. Turn the pedestal clockwise to raise the workcell and counterclockwise to lower the workcell.
4. In each corner, put your hands on top of the workcell and push down. If one of the feet does not touch the ground the workcell will rock back and forth. Adjust the feet so that they all bear equal weight.
5. When the workcell is level from front to back and side to side, is stable, and all four feet bear equal weight, use your hand to turn the locking nuts on the workcell feet counterclockwise until they are tight.

2.3 Power Up

After the accessories are installed, connect the workcell to air and power supplies. After the workcell is correctly connected, turn the main power switch “On” and make sure system components function correctly.

WARNING: Failure to obey electrical specifications can damage the machine and injure personnel. Electrical hookup must be done by a qualified electrician and must comply with any applicable local standards.

1. Plug the machine into an appropriate power source as shown on the legend plate on the right side of the machine.

The electrical service must be correctly grounded and the power source “clean”. If high-power equipment uses the same source, a line conditioner may be necessary. Poor power quality can cause machine errors. All workcells shipped from the PVA factory can operate with the voltage used at the installation site, per engineering design.

WARNING: Make sure that the main power switch is “Off” before you connect the workcell to the facility power source.

2. Find the main air regulator.
3. Attach the workcell to the facility air supply. There is a ¼” NPT female fitting at the rear of the machine. Connect to a source of clean, dry air. A hose of ¼” inside diameter is sufficient.
4. Slowly open the facility air valve.
5. Close any access doors and engage in the Emergency Stop button.
6. At the top of the machine, turn on the red air lockout valve.

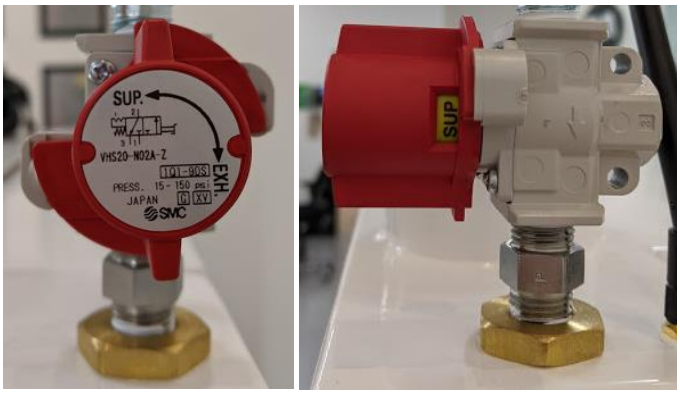


Figure 2: Red Air Lockout Valve

7. Ground any pressure vessel to earth or the machine.
8. Attach a correctly designed ventilation system to the exhaust port. It is necessary that the exhaust flow is correct for the specified CFM of your workcell.

NOTE: Refer the Material Safety Data Sheets (MSDS) for safety precautions on any chemicals used in PVA equipment.

NOTE: Do not power on the workcell or add material to the pressure vessels until they are correctly grounded.

9. Turn the main power switch “On”.

Figure 3: Main Power Switch

1. Perform the homing routine through the HMI.
2. Manually jog to make sure there are no components that can be hit by the head in the work area.
3. Make sure that the pneumatic and electrical cables do not decrease the heads travel and will not be cut or snagged when moved. Please contact Technical support if there are any problems.
4. Make sure the valve and brackets are tight and that the valve does not rock or wiggle in the bracket.
5. Close the doors.

2.4 Necessary Downloads

Prior to operating Sigma, please visit www.pva.net/sigma-setup to download a copy of the manual, Inkscape, and the PVA G-code Generator.

1. Access www.pva.net/sigma-setup via browser.

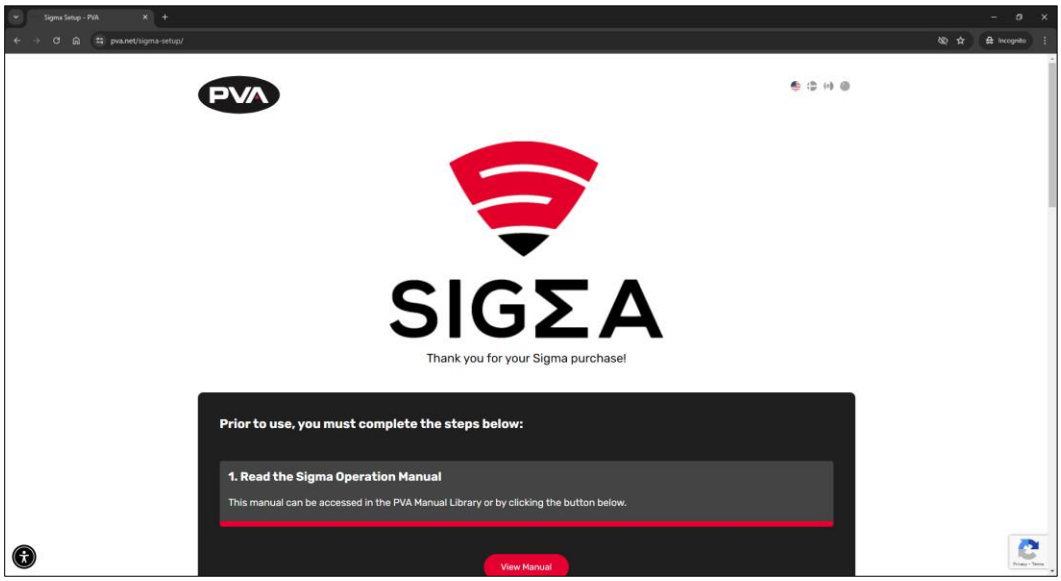


Figure 4: Sigma Download Website

2.4.1 Sigma Manual

The Sigma manual will walk you through how to install and operate Sigma as well as how to use Inkscape and the web interface. Read this manual carefully prior to use.

1. Click **View Manual**.

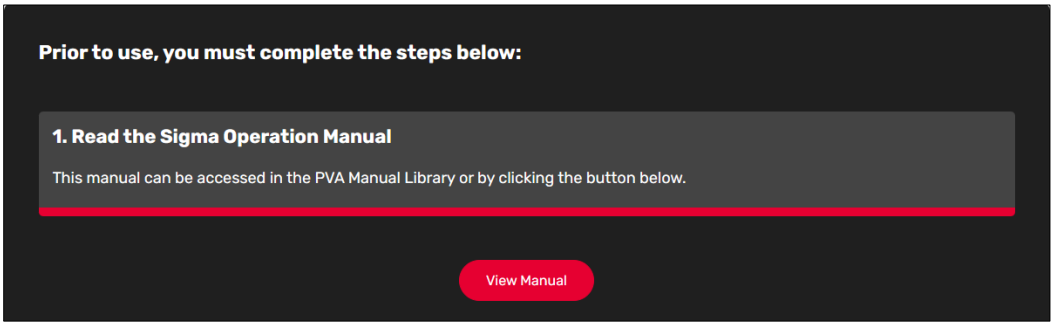


Figure 5: View Manual

2. From this screen, you can download, print, or copy link to share.

2.4.2 Download Inkscape

Sigma is designed to work exclusively with Inkscape version 0.92.4. Prior to use, Inkscape version 0.92.4 must be downloaded.

1. Click **Download Inkscape**.

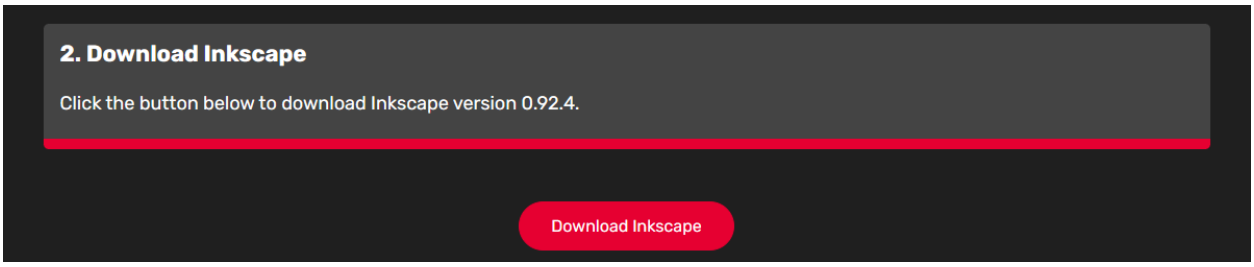


Figure 6: Download Inkscape 1

2. Follow the download prompts.

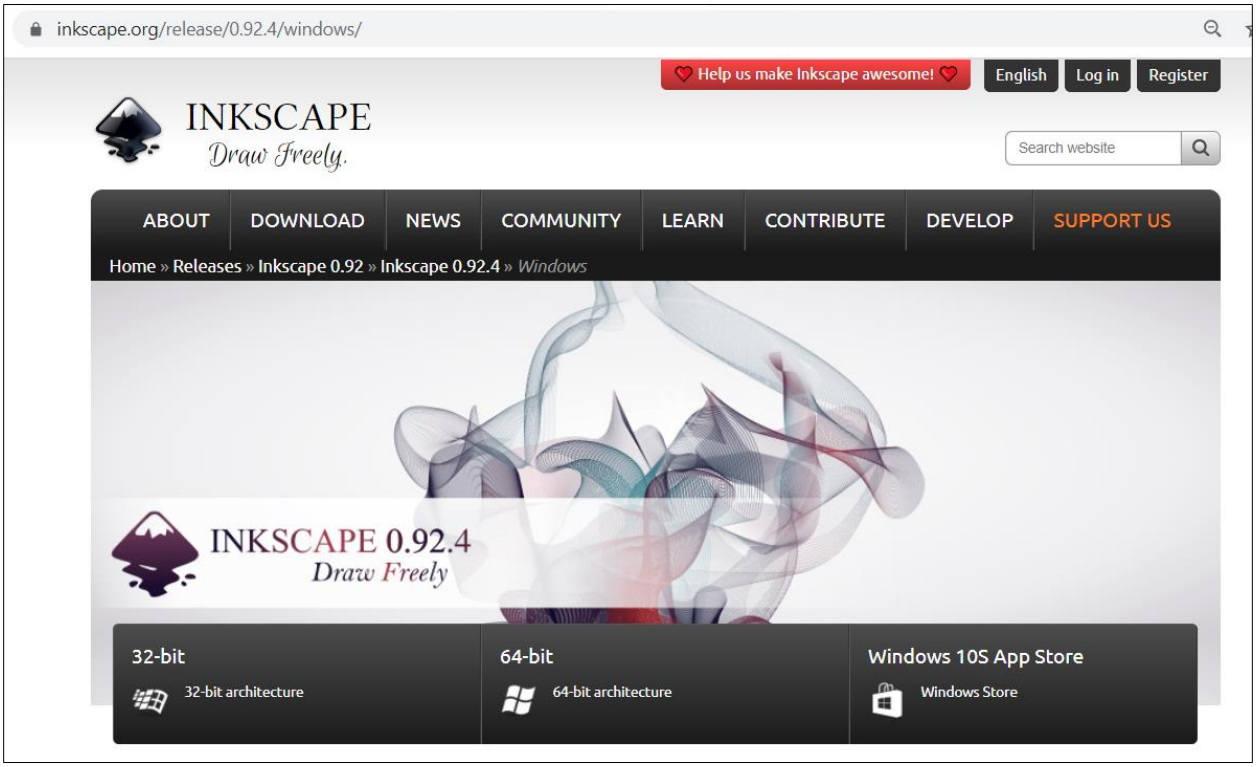


Figure 7: Download Inkscape 2

2.4.3 Install PVA G-code Generator Extension

Prior to use, the PVA G-code Generator extension must be installed within Inkscape.

1. Click **G-code Generator Extension**.

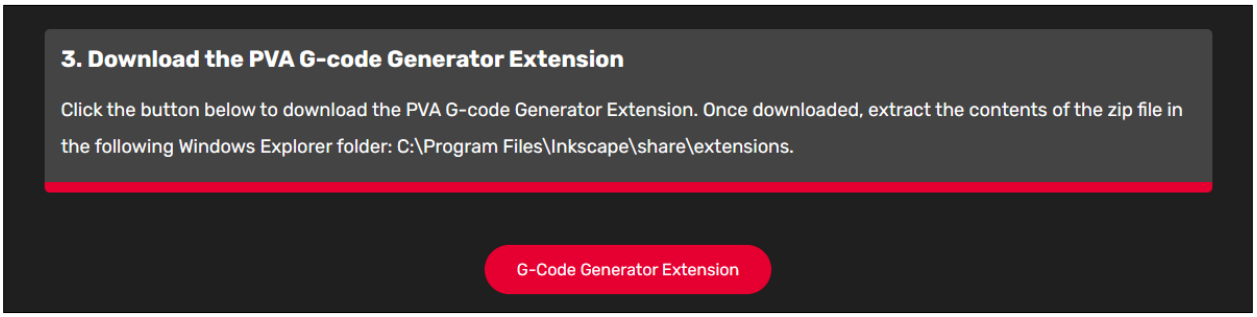


Figure 8: Download G-code Generator Extension

2. You will be redirected to the **Downloads** page.

3. Log in with your username and password or register as a new user.

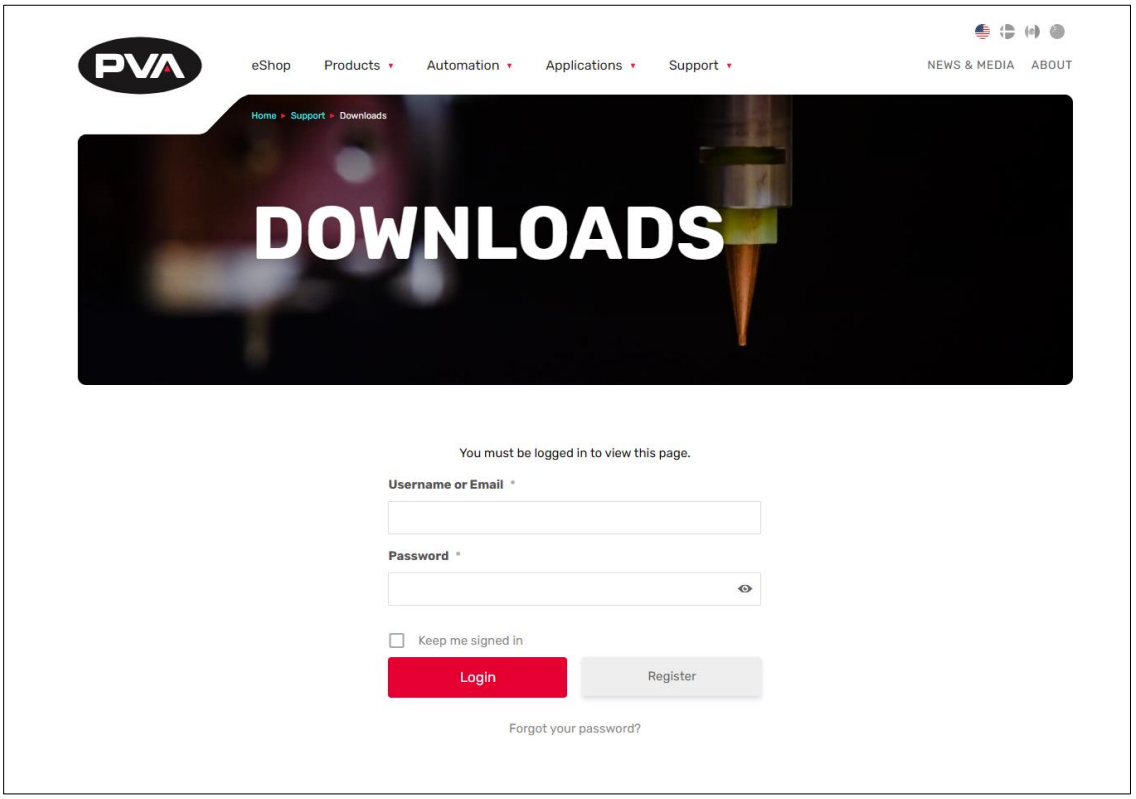


Figure 9: PVA Downloads Page

4. Once logged in, locate the PVA G-Code Generator Extension file and click **Download**.

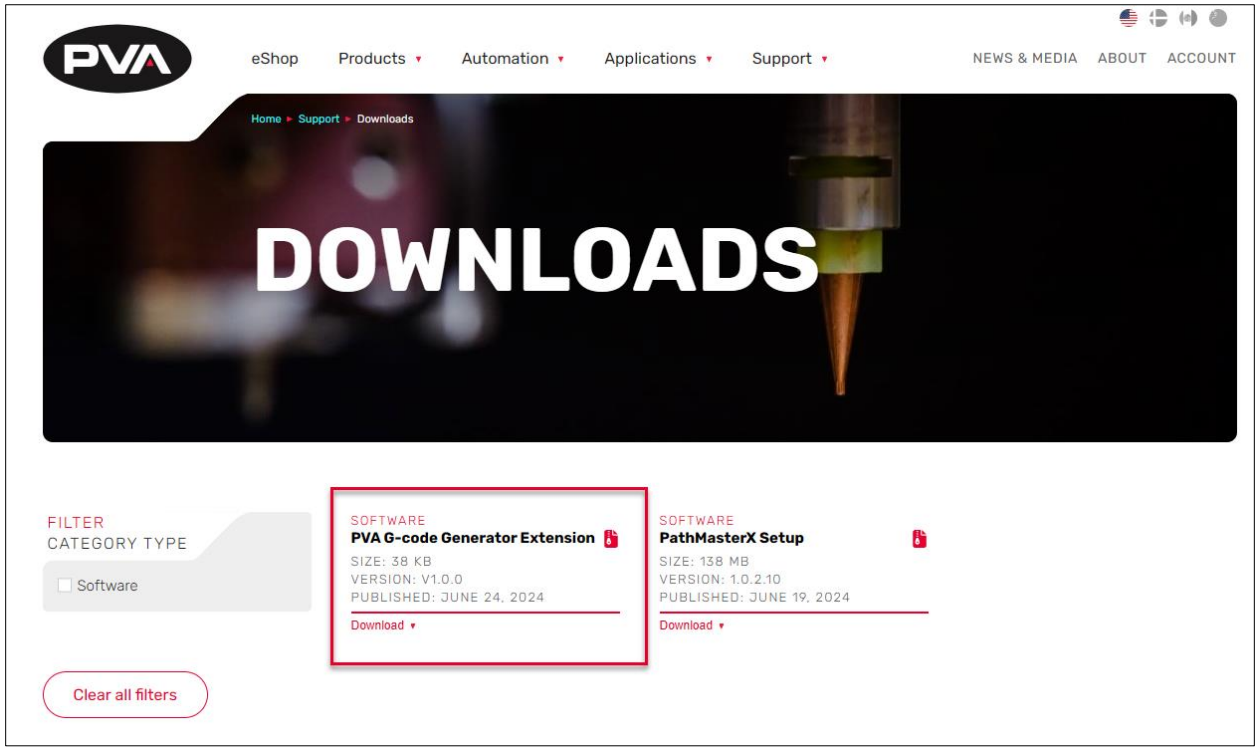


Figure 10: Download G-code Generator Extension

5. The zip file will open in Windows Explorer.

6. Select **Extract All**.

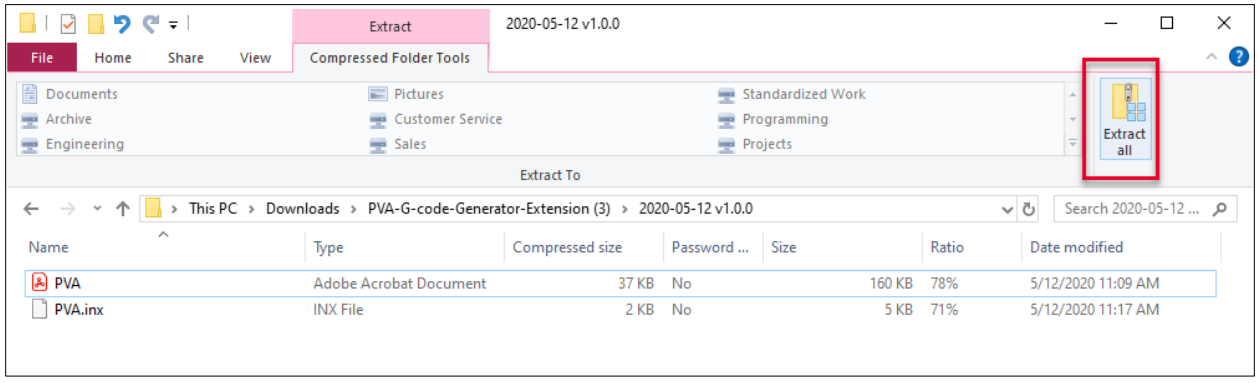


Figure 11: Extract Files

7. Select the following Windows Explorer folder to extract the files: **C:\Program Files\Inkscape\share\extensions**

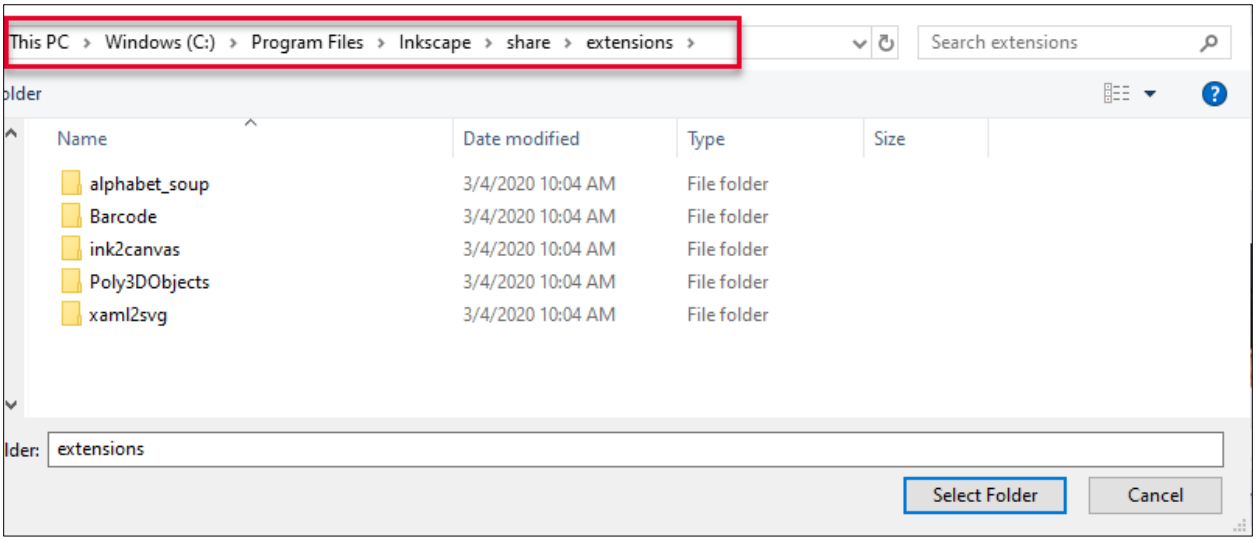


Figure 12: Install PVA G-code Extension 2

3. Operating Safety

The workcell has several safety features that protect the operator from hazards in normal machine operation.

Warning! The safety features should NEVER be bypassed, disabled, or tampered with. PVA is not responsible for any damage, mechanical or human, caused by changes or destruction of any safety features.

3.1 Safety Circuit

The main power to the workcell is monitored and controlled by the safety circuit. The safety circuit contains two relays under-voltage protection and one or more safety devices. The relays are wired in a redundant manner. The tripping contacts of the relays are connected in series so the safety circuit will disconnect power even if one of the relays fails. The relays are self-checking with positive guided contacts electrically forced to operate together. If one redundant relays fails or a safety switch is activated, the power contacts are opened.

3.2 Polycarbonate and Safety Glass Guarding

The work area is enclosed with either polycarbonate or safety glass guarding. The front of the workcell is either open, for the manual processing of parts, or has doors.

3.3 Doors

The doors on the workcell are monitored during the dispense cycle. If the door is opened while the machine is in operation, this will trigger a pause on the machine.

3.4 Exhaust Fan

The exhaust flange should be connected to a duct system that can receive the required* CFM (cubic feet per minute) while maintaining less than 1.0" H_2O static pressure in the duct. If airflow through the exhaust system is not sufficient, it will generate an error.

3.4.1 Standard Machine Exhaust Requirements

Machine	Exhaust Requirement	Machine Duct Size	Air Velocity at Test Point (ft/min)	Air Velocity at Test Point (m/sec)
Sigma	250 CFM	3" (76.2 mm)	4166	21.16

Note: Check machine specifications. Custom order machines and processes may require higher exhaust flow rates.

Note: Refer the Material Safety Data Sheets (MSDS) for safety precautions on any chemicals used in PVA equipment.

Note: The safety devices on your workcell will be different with each model.

3.5 Notices and Warnings

- You must wear safety glasses, gloves, and long sleeves
- Lock-out and tag the air and power supplies before you service or clean any part of this equipment
- Release the pressure before any hose (air or fluid) is removed
- All hoses must have the correct pressure rating
- Use only replacement parts recommended or supplied by the manufacturer
- Stay away from all parts that move when the system is in operation

4.Inkscape

Inkscape is an open-source vector graphics editor. PVA has created an extension designed to convert what is drawn in Inkscape to a G-code file that can be uploaded to Sigma. Sigma is designed to work with Inkscape version 0.92.4. Inkscape must be downloaded prior to use. Download instructions were included with Sigma.

4.1 Inkscape Manual

This manual will cover the basic functions needed to create a dispense path in Inkscape as well as the PVA G-code Generator extension. For more information on how to use Inkscape, please refer to the Inkscape manual.

4.1.1 Accessing Inkscape Manual

1. Select **Help → Inkscape Manual**. The Inkscape manual will open in your browser.

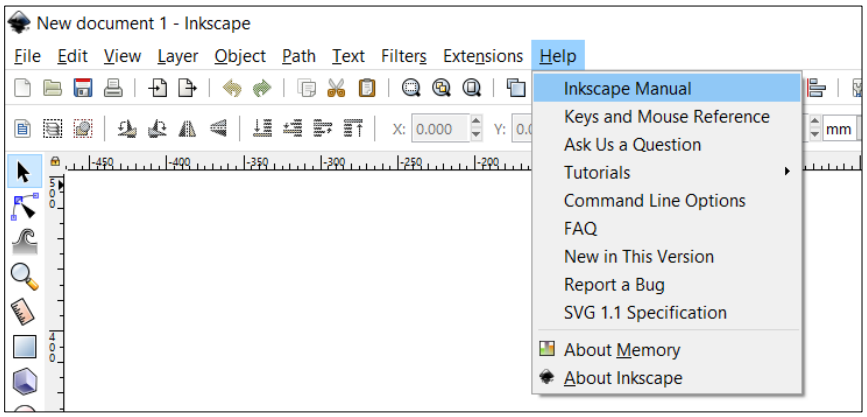


Figure 13: Access Inkscape Manual

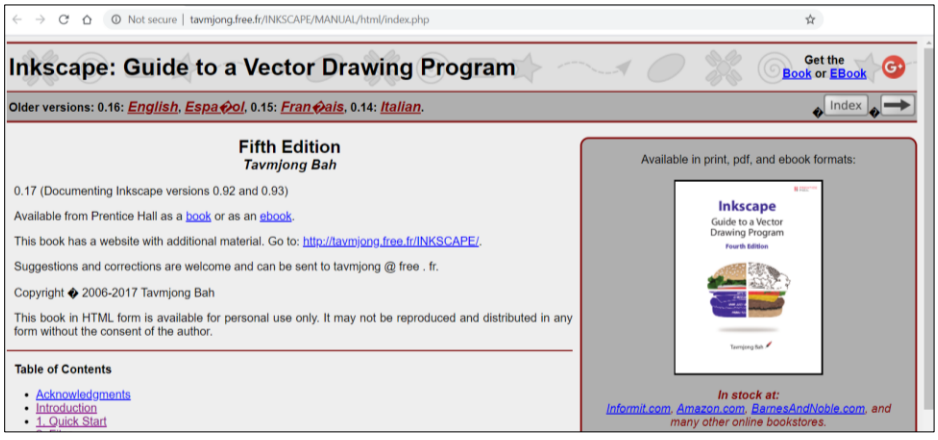


Figure 14: Inkscape Manual

4.2 Setup

1. Once Inkscape is open, select **File → Document Properties** from the taskbar.

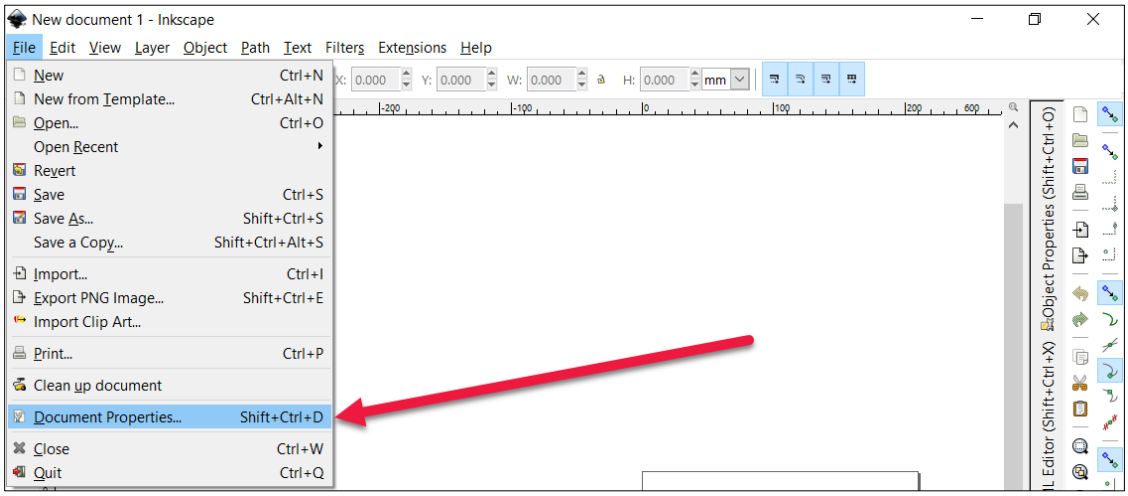


Figure 15: Select Document Properties

2. The Document Properties popup window will display. Under Custom Size, set the Sigma workspace dimensions (330 mm X 300 mm).

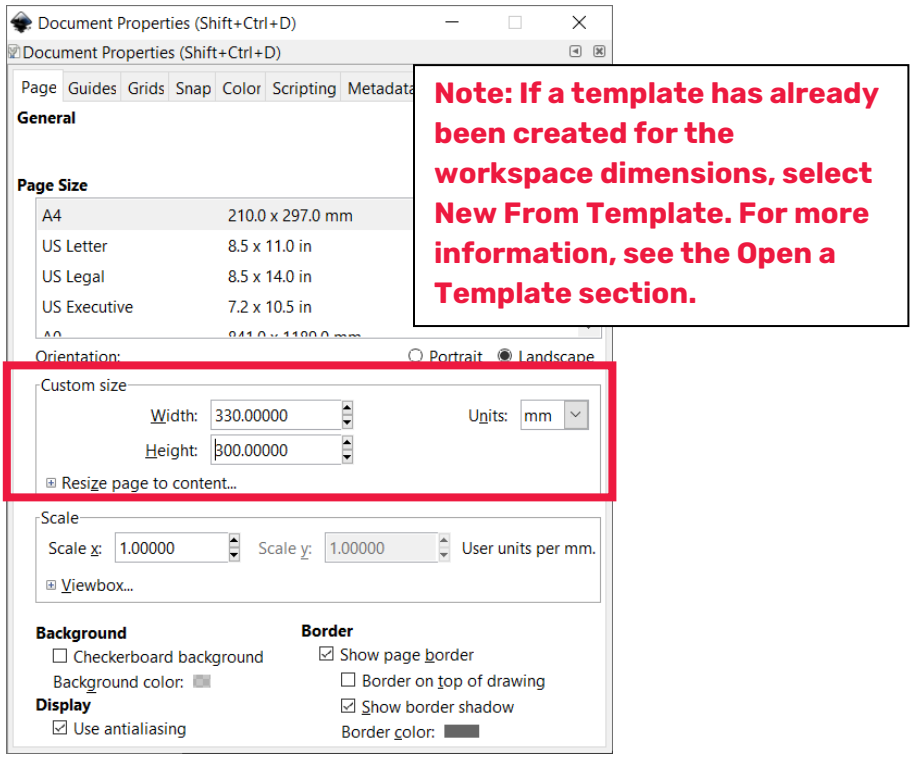


Figure 16: Set Workspace Dimensions

4.2.1 Open a Template

1. To open a pre-existing template, select **File → New from Template**.

The New From Template window will open.

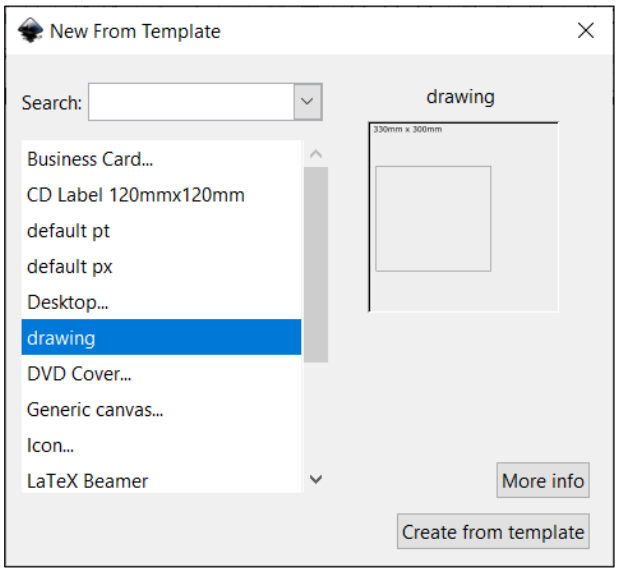


Figure 17: New From Template

2. Select the desired template from the list or use the search bar.
3. Highlight to view the template details.
4. Double-click the template or select **Create From Template**.

The template will open as a new document.

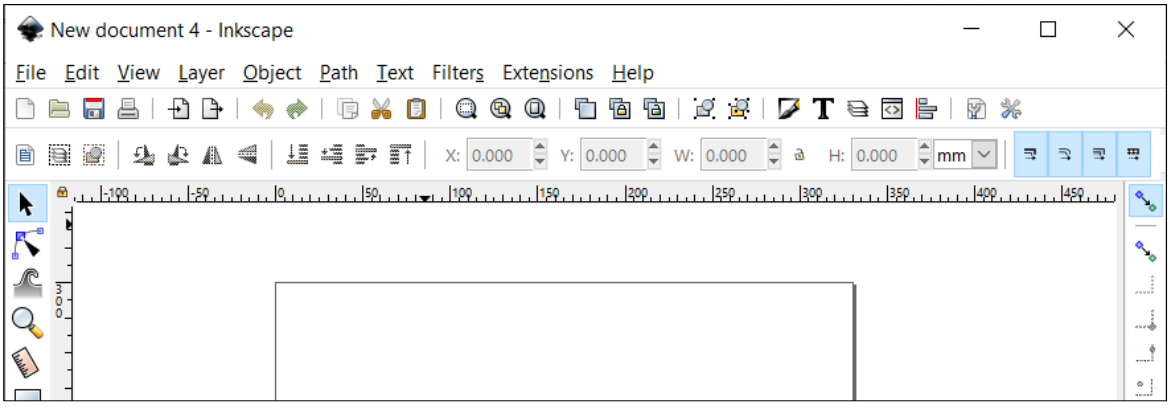


Figure 18: New Document from Template

4.2.2 Create a New Layer

1. Select **Layer → Add Layer** or **Shift+Ctrl+N**.

2. Enter a **Layer Name** for the substrate and click **Add**.

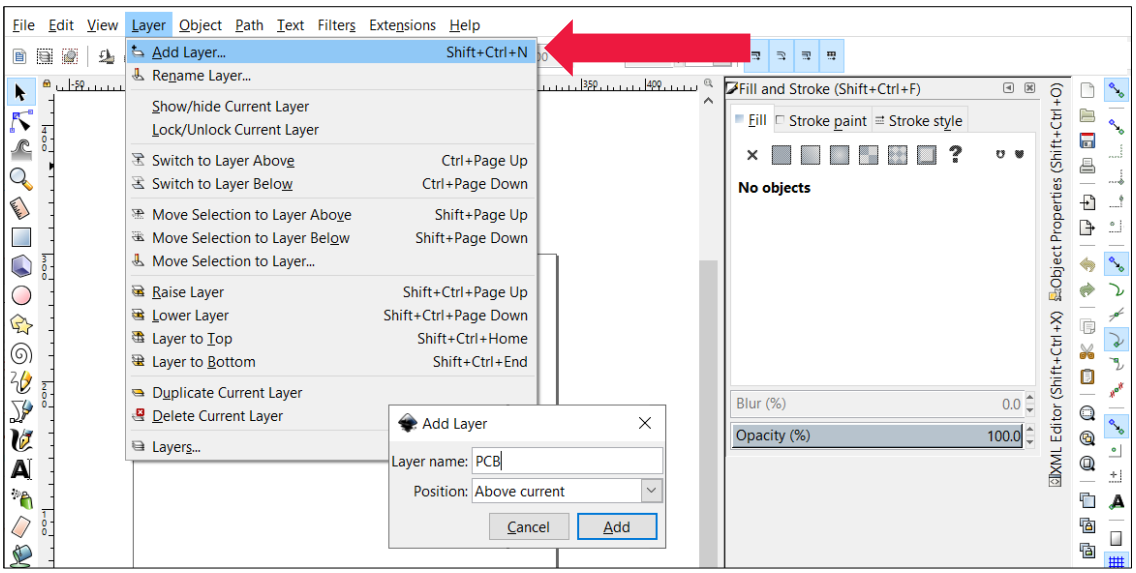


Figure 19: Add New Layer

3. You can view and toggle between layers in the layer dropdown on the bottom left of the screen.

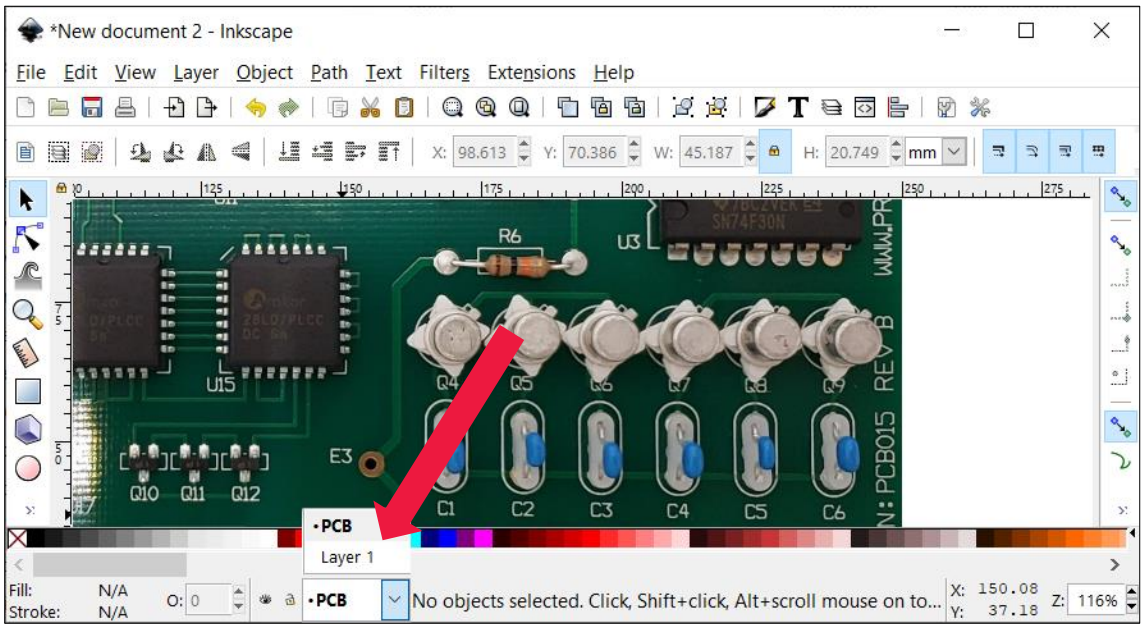


Figure 20: Layer Dropdown

4.3 Import Image (Optional)

There is an option to import an image of the substrate as a reference for the dispense path. Ensure that the reference image is scaled correctly. Skip this section if it does not apply.

1. Select **File** → **Import** or **Ctrl+I** and select the file to import.

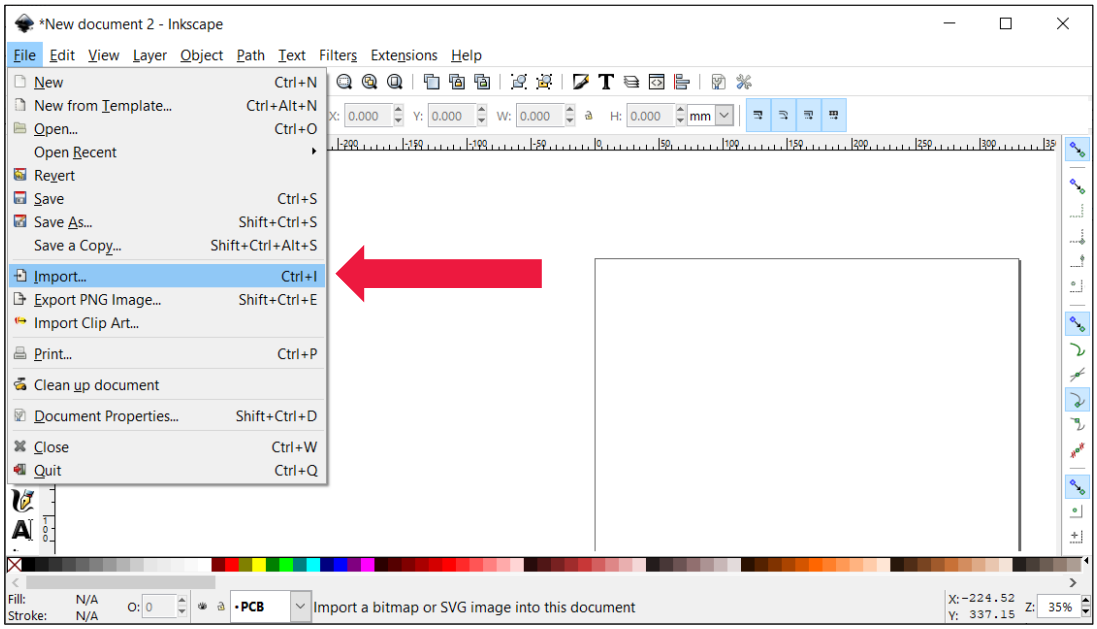


Figure 21: Import Image

2. From the **JPEG Bitmapp Image Import** window, choose the **Image Import Type**, **Image DPI**, and **Image Rendering Mode**.

3. Click **OK** to continue.

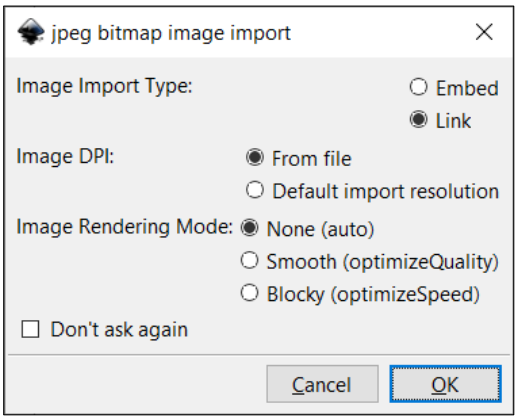


Figure 22: Import Image

Note: There is also an option to paste the image onto the active layer. Simply use Ctrl+V to paste the image onto the workspace.

The image will display in the workspace window and can be resized.

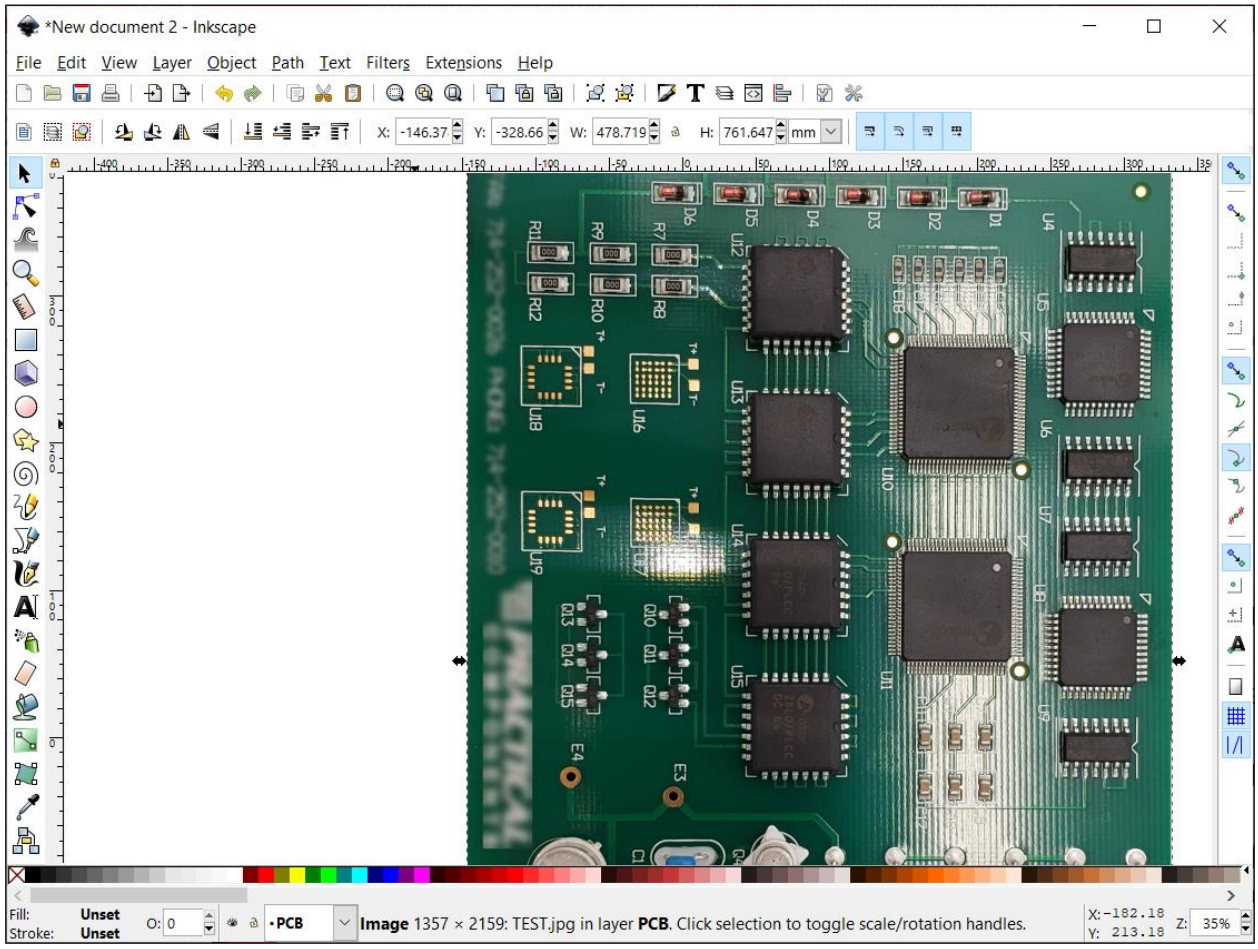


Figure 23: Image Example

4.4 Transform Image

Resize the substrate image to its accurate size.

1. Select the image.

2. Select **Object → Transform** or **Ctrl+Shift+M** to open the **Transform** panel. This panel offers the ability to Move, Scale, Rotate, and Skew the image if necessary.

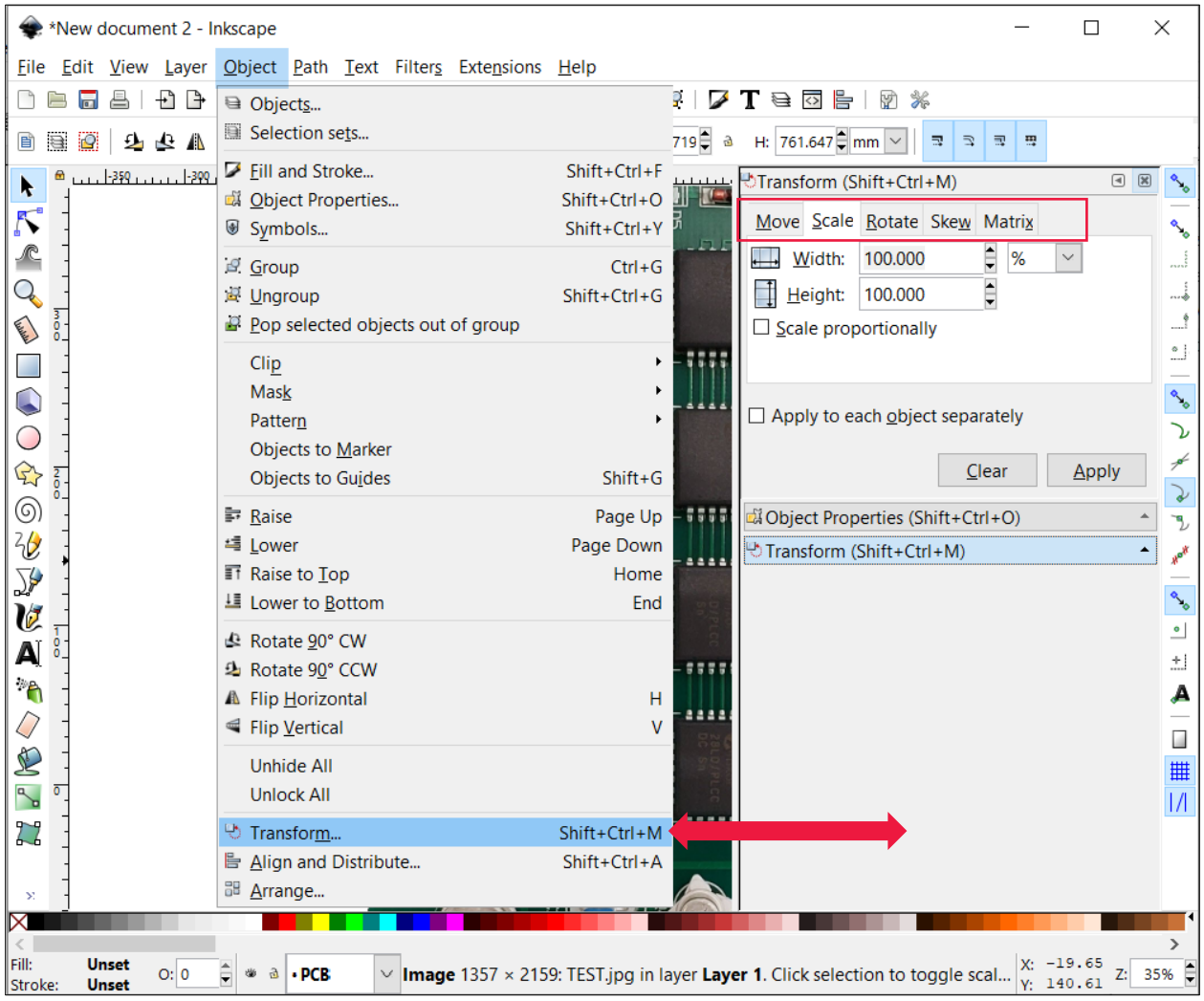


Figure 24: Transform and Object Attributes

4.4.1 Move Tab

Use the Move tab to translate an object. An object can be moved horizontally or vertically. Use the arrows or enter a value manually in the field.

An object will be translated relative to its current position if the **Relative** checkbox is selected. If the box is not checked, the lower-left corner of the objects bounding box will be moved to the given coordinate.

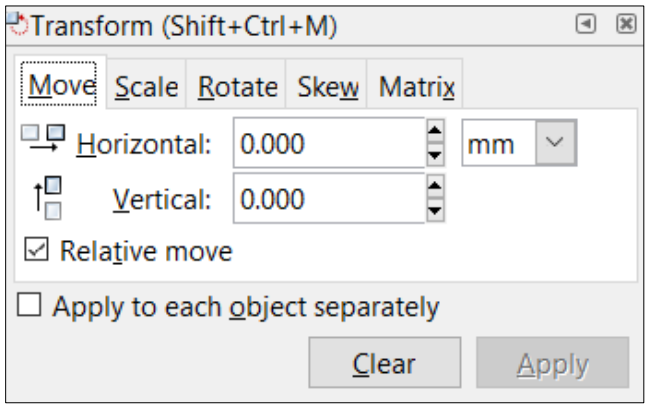


Figure 25: Move Tab

4.4.2 Scale Tab

Use the Scale tab to scale an object. An object will be scaled relative to the center of its bounding box.

Use the dropdown to change the units and manually enter the correct size in millimeters. The **Scale Proportionally** option forces the width and height to scale by the same percentage.

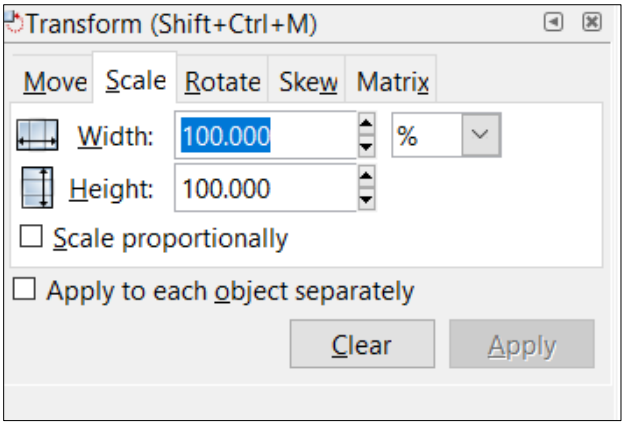


Figure 26: Scale Tab

4.4.3 Rotate Tab

Use the Rotate tab to rotate an object. An object will be rotated relative to Rotation center. The direction of the rotation is positive in the counterclockwise direction.

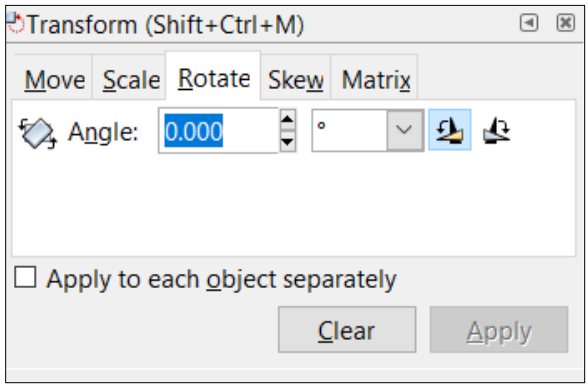


Figure 27: Rotate Tab

4.4.4 Skew Tab

Use the Skew tab to skew an object. An object can be skewed in horizontal and vertical directions separately. The skewing is relative to the center of the bounding box. The magnitude of the skew can be specified as a distance, percentage, or angle. In all cases, the skew is relative to the size of the bounding box.

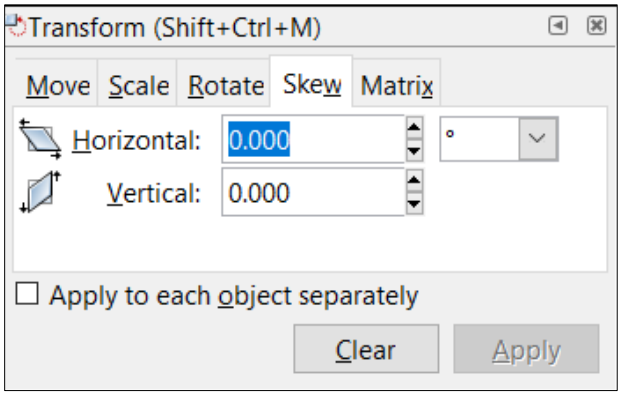


Figure 28: Skew Tab

Note: Width Height, XY Position, and Rotation of the image can also be edited from the Tool Controls Bar.

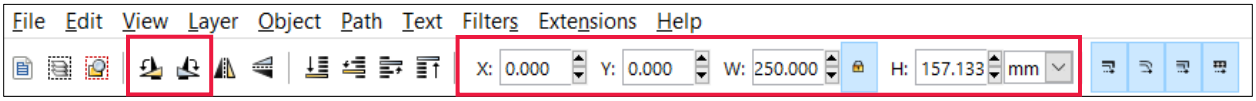


Figure 29: Tool Controls Bar

4.4.5 Move Image

There are three options to move the image to match its location on the workspace.

Note: The X and Y coordinates will be the left-hand corner of the image.

- Click and drag the image to its desired location. The position can be monitored by using the scale at the top in the Tool Controls bar or in the bottom right-hand corner in the Pointer Position window.
- Manually enter the X and Y position in the Tool Controls bar.
- Use the Move tab in the Transform panel.

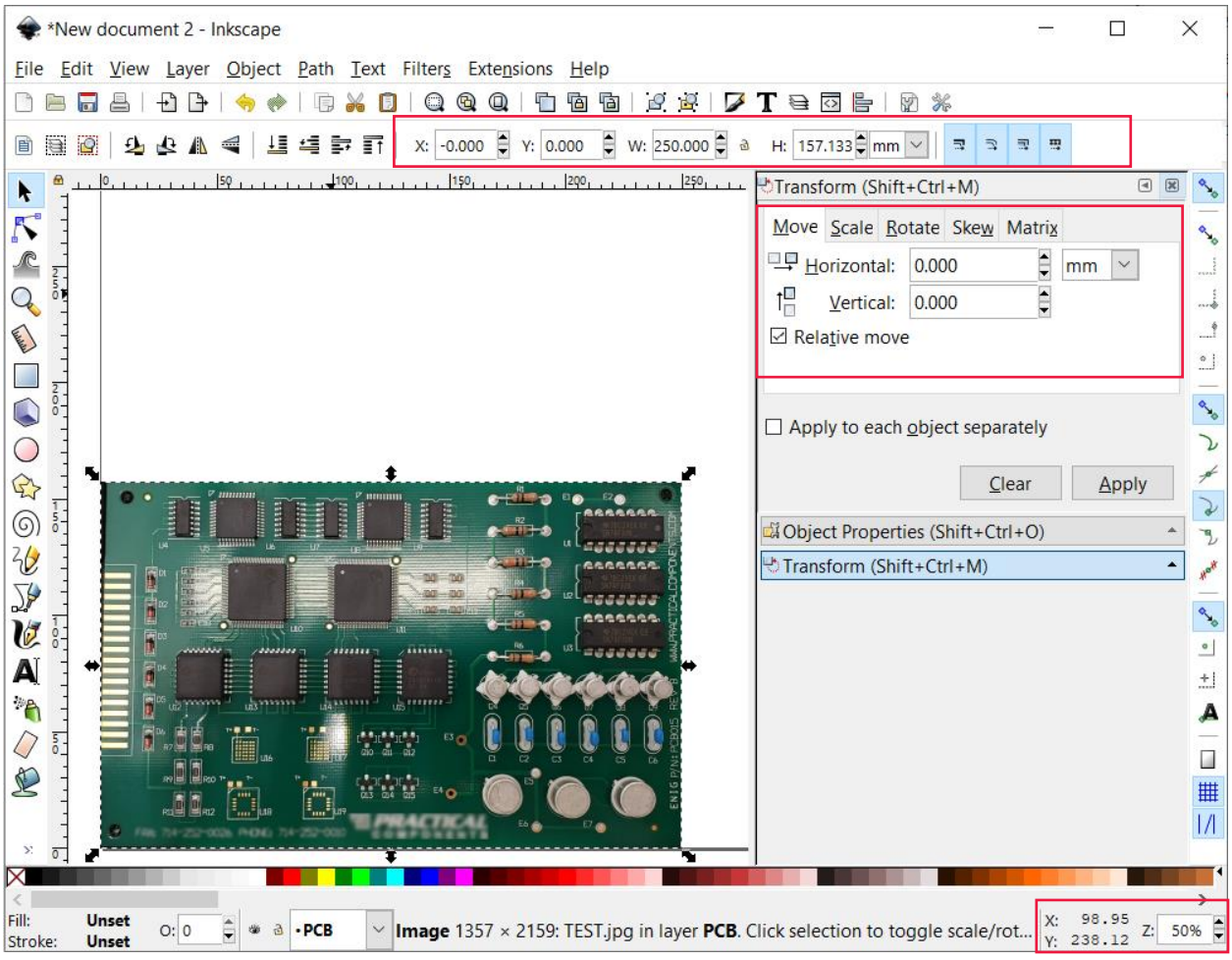


Figure 30: Move Image

4.4.6 Lock Layer

After the substrate image is resized and positioned in the desired location, PVA recommends locking the layer. There are two ways to lock a layer.

- Select the image. Select **Layer** → **Lock/Unlock Current Layer**.
- Select the image. In Layer Information at the bottom of the screen, select the layer that should be locked. Click the **Lock** icon to lock the layer.

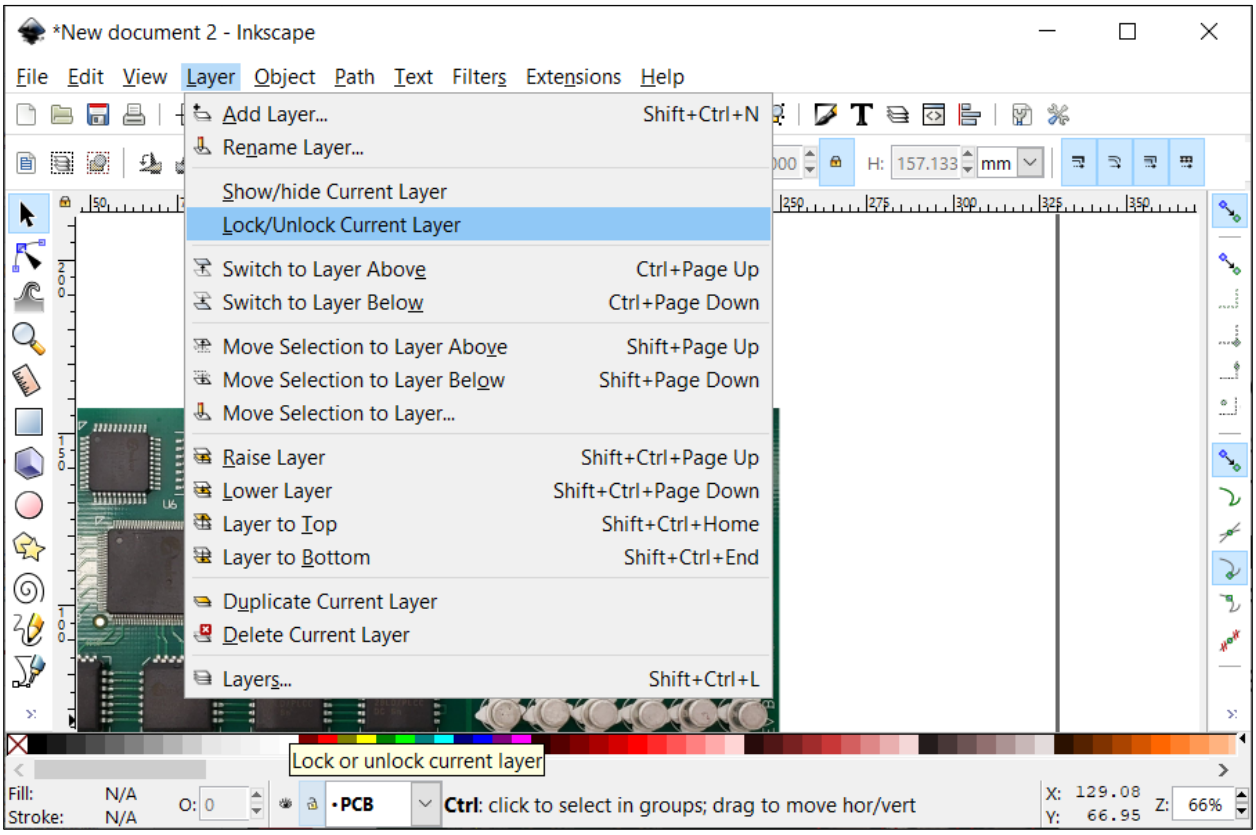


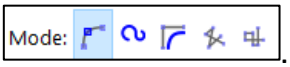
Figure 31: Lock Layer

4.5 Create Dispense Path

This section will review how to create a dispense path. It is recommended that each tool have a unique layer for its dispense path.

Note: The robot will follow the dispense path based on the direction that a line was created.

4.5.1 Create a Line

1. Once a new layer has been created, select  or **Shift+F6** to select the **Pen** tool.
2. Select the desired **Mode** from the Tool Controls bar  .

	Create regular path
	Create Spiro path
	Create BSpline path
	Create a sequence of straight line segments
	Create a sequence of paraxial line segments

Figure 32: Mode Options

3. Click on the desired start point to begin the line.

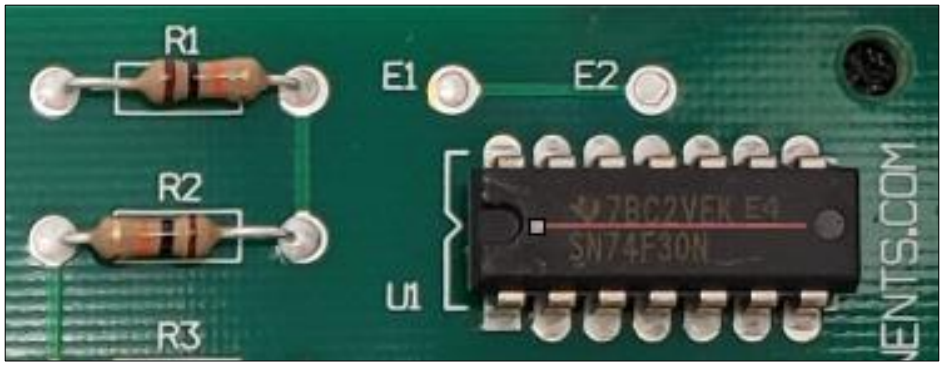


Figure 33: Starting Point

4. Click a subsequent point along the line to add a control point (node).

5. Continue drawing additional segments if necessary.
6. Hit **Enter** to complete the line or click on the first endpoint when placing the last endpoint.

Figure 34: Completed Line

4.5.2 Edit a Line

1. Use the Select tool and click the line that needs to be edited.
2. To resize the line, click and drag the white arrows to scale.

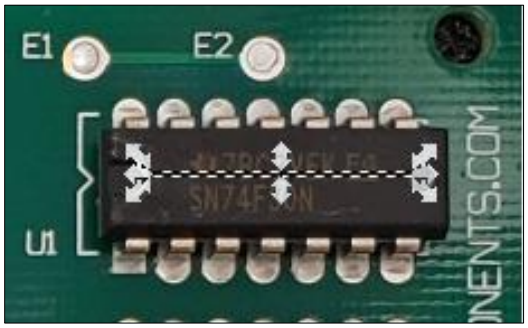


Figure 35: Resize Line

3. Use the Arrow keys to move the last node created while drawing a path. **Shift+Arrow** moves the node by ten times the normal step,
4. To delete the last node drawn, use the **Backspace** key or Delete key.
5. To delete an unfinished path, use **Esc** or **Ctrl+Z**.
6. To extend a previously drawn path, select the path, then click or click-drag on an end point.

4.5.3 Create a Circle

Circles are used to represent dispense dots. If a full circle is drawn, the center point of the circle is where the valve will dispense.

1. Select the **Circle tool** .
2. Click and hold at the start point of the circle. Drag to create the circle.

Figure 36: Create Circle

Note: To create a perfect circle, hold Ctrl as you click and drag the circle.

4.5.4 Edit a Circle

1. Using the Select tool, click on the circle that needs to be edited.
2. Use the arrows to resize the circle.
3. To move the circle, click and drag the circle to a new location.

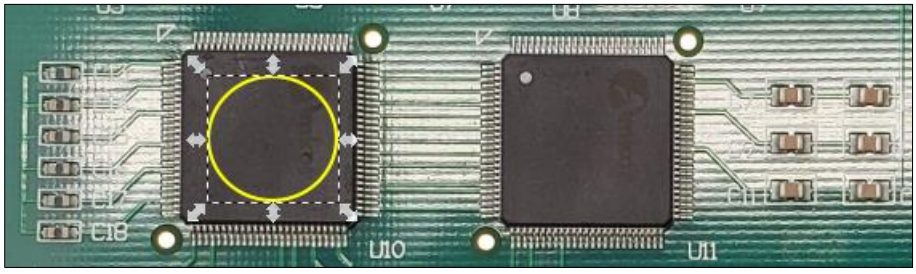


Figure 37: Resize Circle

4.5.5 Create an Arc

If an arc is drawn, the path will follow the start point of the arc to the end point.

1. Use the Select tool to select the circle that should be changed to an arc.
2. Once the circle is selected, select the Node Editing tool .
3. Click and drag the white node to create a start and end point.

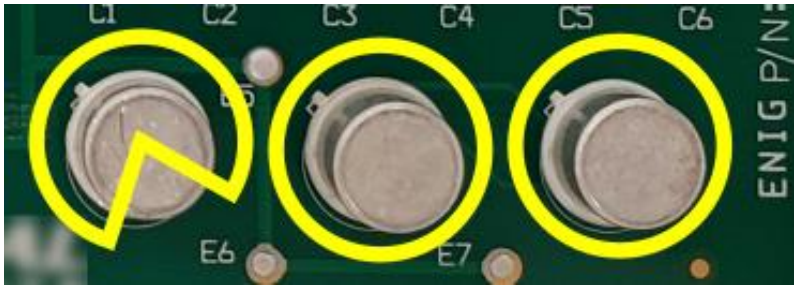
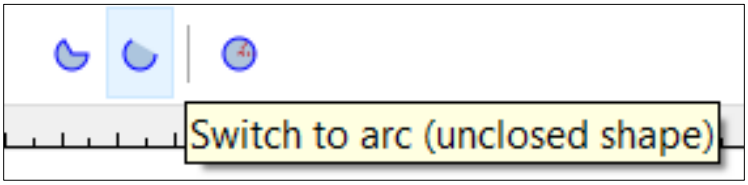


Figure 38: Create Arc

4. Select the Circle tool and the Switch to Arc command.



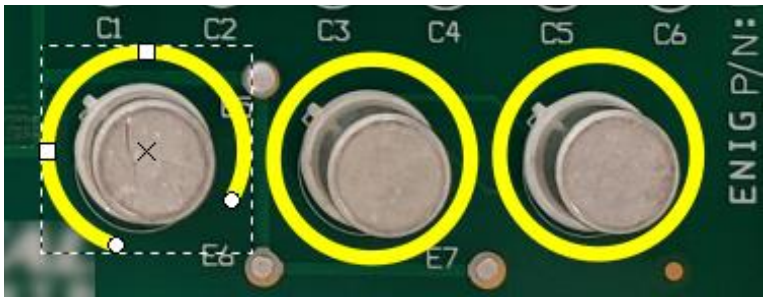


Figure 39: Switch to Arc Command

4.5.6 Edit an Arc

1. Use the Select tool and select the arc that needs to be edited.
2. To resize the arc, use the white arrows.

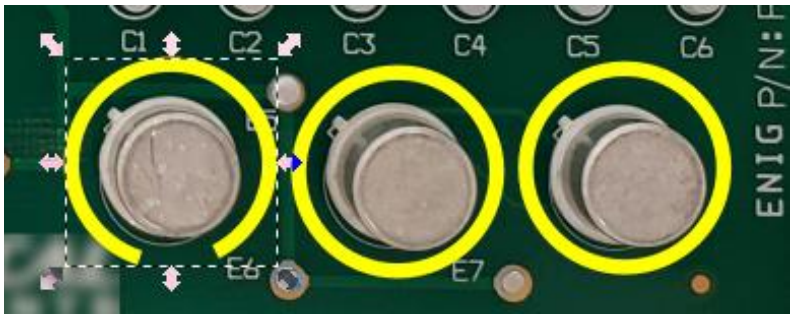


Figure 40: Resize Arc

3. To move the arc, click and drag.
4. To edit the starting point, use the Node Editing tool. Click and drag the white circle to move the start and end points.

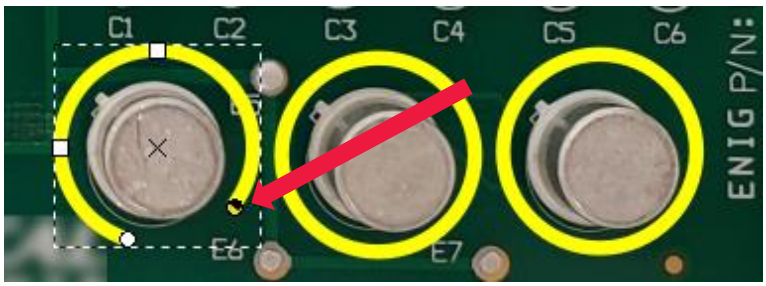


Figure 41: Edit Arc Starting Points

4.5.7 Node Tool

Dispense paths can be edited using the Node Tool. This flexible tool enables the addition, deletion, and movement of nodes.

1. Select the **Node Tool** by clicking on the icon.
2. Select the object that needs to be edited. Once selected, the nodes will appear on the object.
3. Use the icons in the Tool Controls bar to edit the node. See table on next page.

Insert new nodes into selected segments. Clicking on the path will select the nearest node on both sides of the point where the path was clicked. Double-clicking on the path will also insert a node.

Delete selected nodes.

Join (merge) selected endnodes.

Break path at selected nodes. Each selected node is converted into two end nodes.

Join selected endnodes with a new segment.

Delete segment between two non-endpoint nodes.

Figure 42: Node Tool Icons

4.5.8 Set Fill and Stroke

The fill and strike of lines, circles, and arcs can easily be edited for more visibility while you are working. There are four ways to change the fill and stroke:

1. Select Object → **Fill and Stroke**.

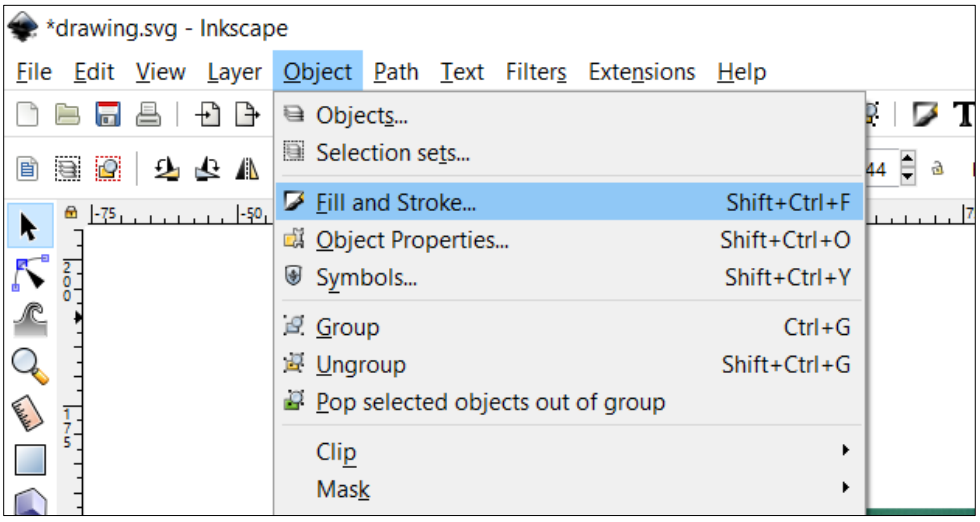


Figure 43: Fill and Stroke Option 1

2. Use **Shift + Ctrl + F**.

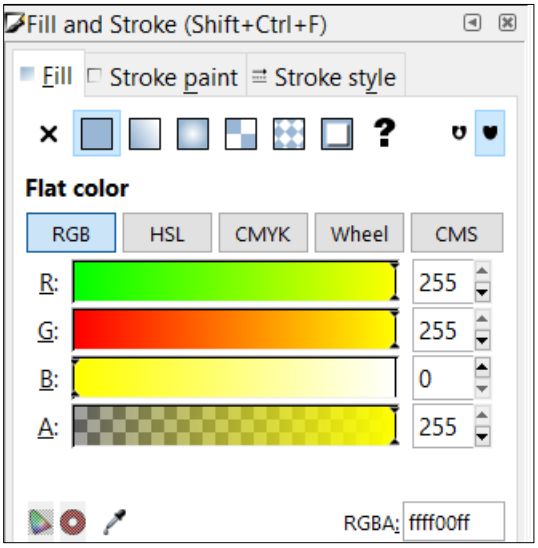


Figure 44: Fill and Stroke Option 2

3. Navigate to the fill and stroke area on the bottom left of the screen.

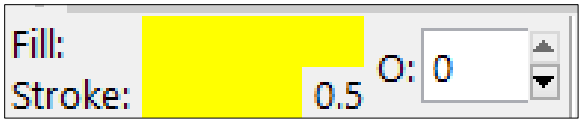


Figure 45: Fill and Stroke Option 3

4. Use the color toolbar on the bottom of the screen.

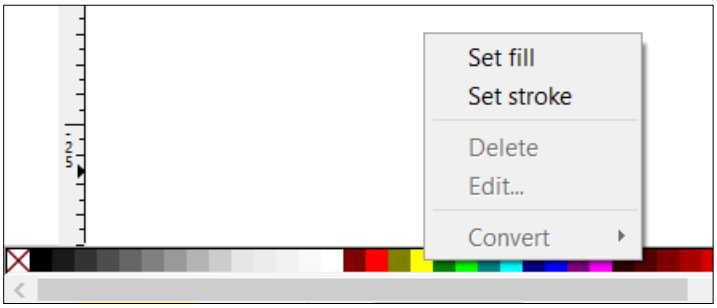


Figure 46: Fill and Stroke Option 4

4.6 Edit Path Order

By default, the G-code will follow the order in which the dispense path was created. It will be generated from the upper most layer to the bottom layer. In the event that an application requires certain areas to be coated first or you need to reduce cycle time, the layers and path objects can be viewed and modified via the Objects window.

Select an object or layer and use the icons below to arrange them in the desired order.

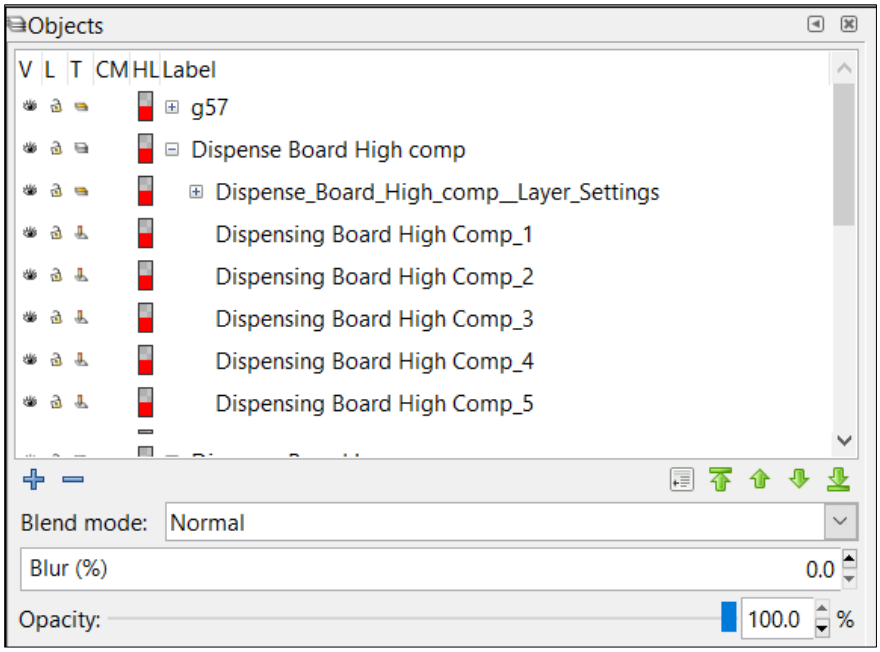


Figure 47: Edit Path Order

Collapse/Expand All

Move to Top

Move Up

Move Down

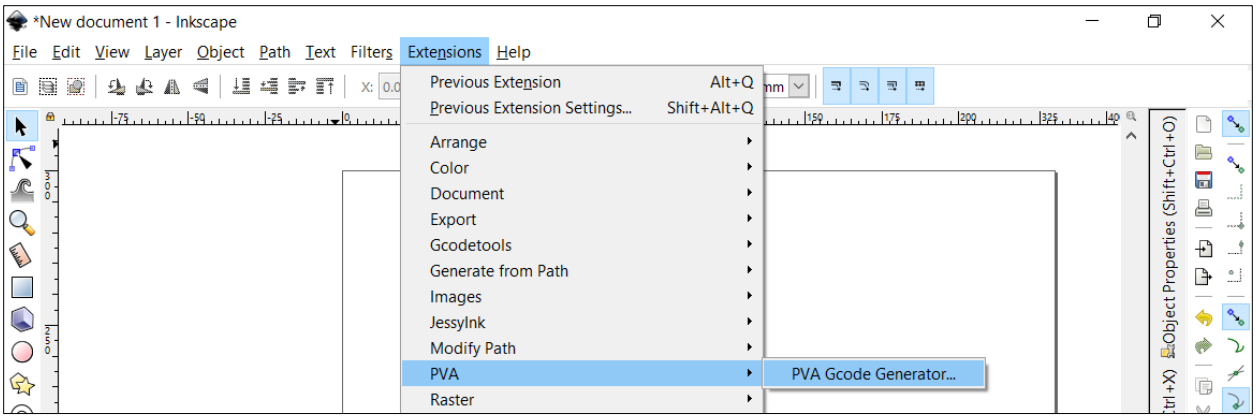
Move to Bottom

Figure 48: Path Order Icons

5. PVA G-code Generator

The PVA G-code Generator is an extension that will create a G-code based on what is drawn in Inkscape.

1. To open PVA G-code Generator, select **Extensions → PVA → PVA G-code Generator**.



PVA Gcode Generator Window will display.

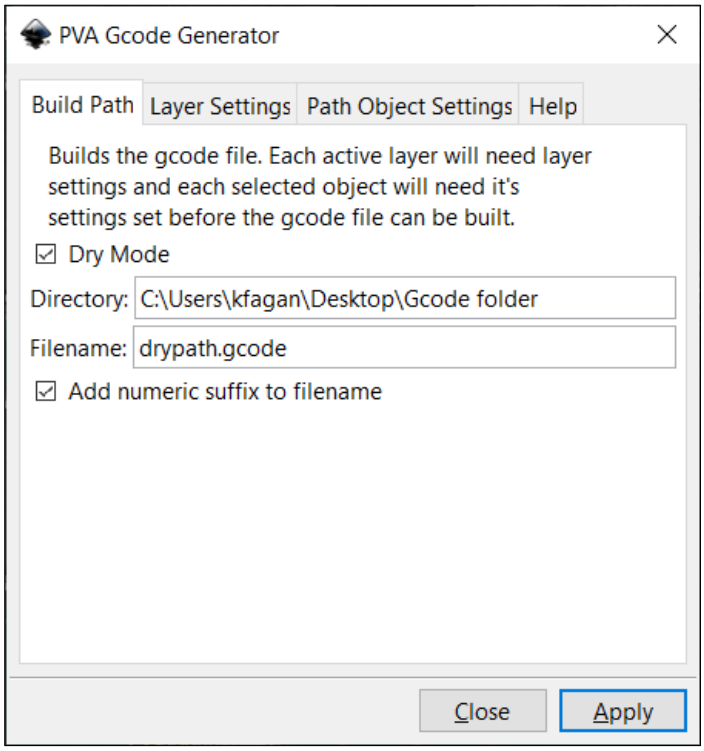


Figure 49: PVA Gcode Generator

5.1 Build Path

The Build Path tab builds the G-code file. Each active layer will need layer settings and each selected object will need settings applied before the G-code file can be built.

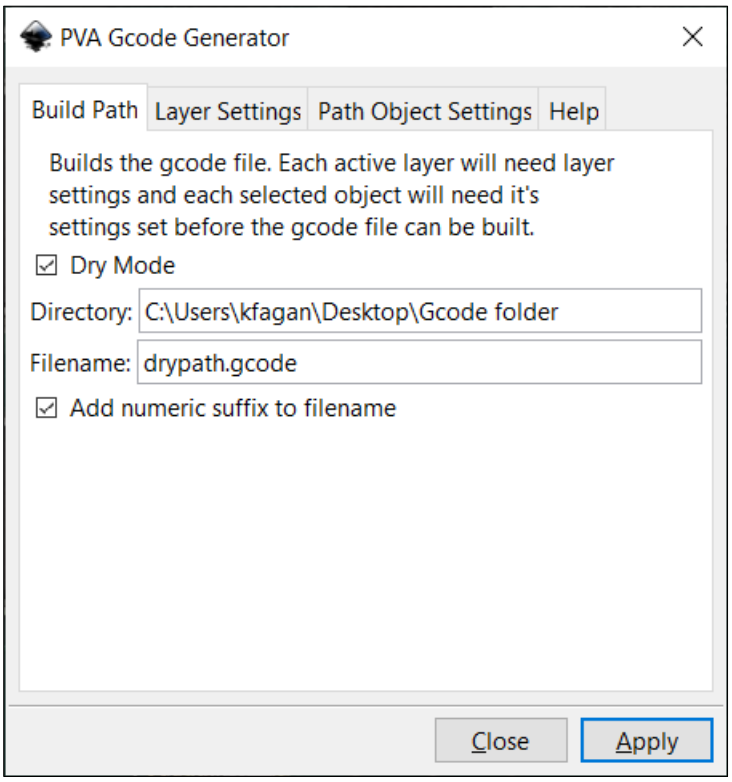


Figure 50: Build Path Tab

5.1.1 Dry Mode

The Dry Mode option will remove the tool on commands from the G-code so the path can be run without opening the valve. This will allow the user to test the dispense path without dispensing any material.

5.1.2 Directory

The Directory field is where the G-code file will be saved on the computer. There is no browse option; the address must be manually entered. Once a directory address is entered, it will be retained until it is changed.

5.1.3 File Name

The Filename field is where the G-code file name will be entered. To add a numeric suffix to the filename, select the checkbox below. This will assign a new file number to the end of the filename each time a file is created.

5.2 Layer Settings

The Layer Settings tab applies the following settings to the selected layer. Any settings entered will not be applied until Apply is selected.

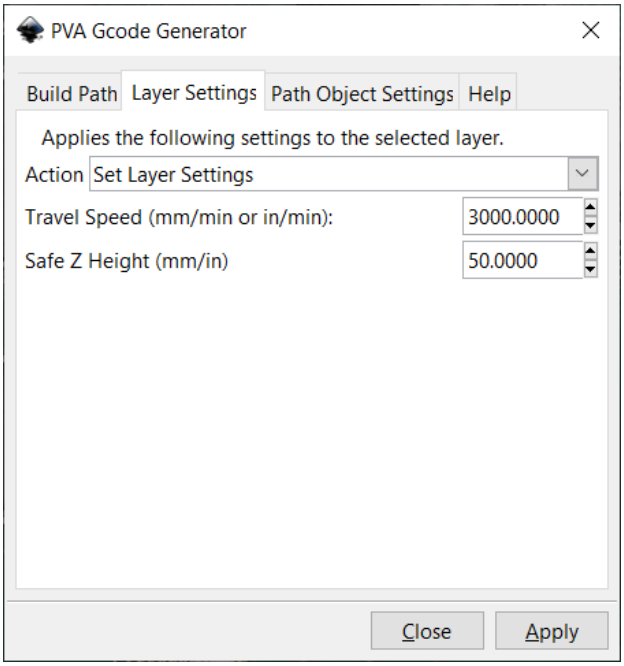


Figure 51: Layer Settings

5.2.1 Action

- **Set Layer Settings**: This action will apply settings to the active layer.
- **Display Layer Settings**: This action will display all settings for the active layer in a text box.
- **Hide Layer Settings**: This action will hide the text box settings for the active layer.
- **Import Layer Settings from Displayed**: This action will load the settings from the active layer.

5.2.2 Viewing and Editing Layer Settings

Prior to generating the G-code file, you can view layer settings to make any changes.

1. Select the desired layer and select **Extensions** → **PVA** → **PVA Gcode Generator**.
2. Navigate to **Layer Settings**. Under the **Action** dropdown, select **Display Layer Settings**.
3. Perform this action for all layers that you would like to view settings for.

The Layer settings will display next to the workspace.

4. Right-click to adjust the fill and stroke of the layer settings for visibility.

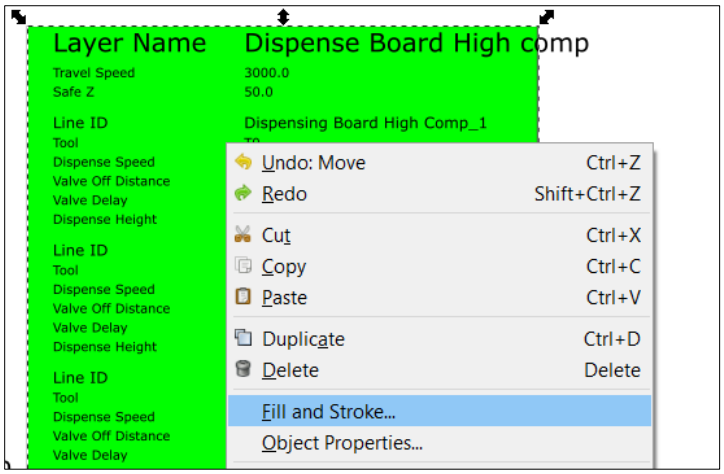


Figure 52: Layer Settings Fill and Stroke

5. To edit any of the layer settings, select the **Text** tool A.

6. Select the parameter that needs to be edited and make the necessary edit(s).

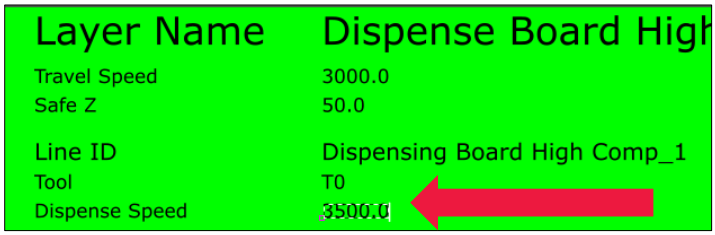


Figure 53: Edit Layer Settings

7. Open the **PVA Gcode Generator** and navigate to **Layer Settings**.

8. Under the **Action** dropdown, select **Import Layer Settings from Displayed**.

The Layer Settings will update.

5.2.3 Travel Speed

Enter a Travel Speed that the robot will travel while it is not dispensing.

5.2.4 Safe Z Height

After each dispense segment, the robot will move to a configured Safe Z Height before moving to the next dispense location. Enter a Safe Z Height for that layer.

5.3 Path Object Settings

The Path Object settings applies the settings below to the selected path object(s). Leaving the ID Blank will apply the settings and leave the ID unchanged.

Note: To select an object, the layer must be unlocked.

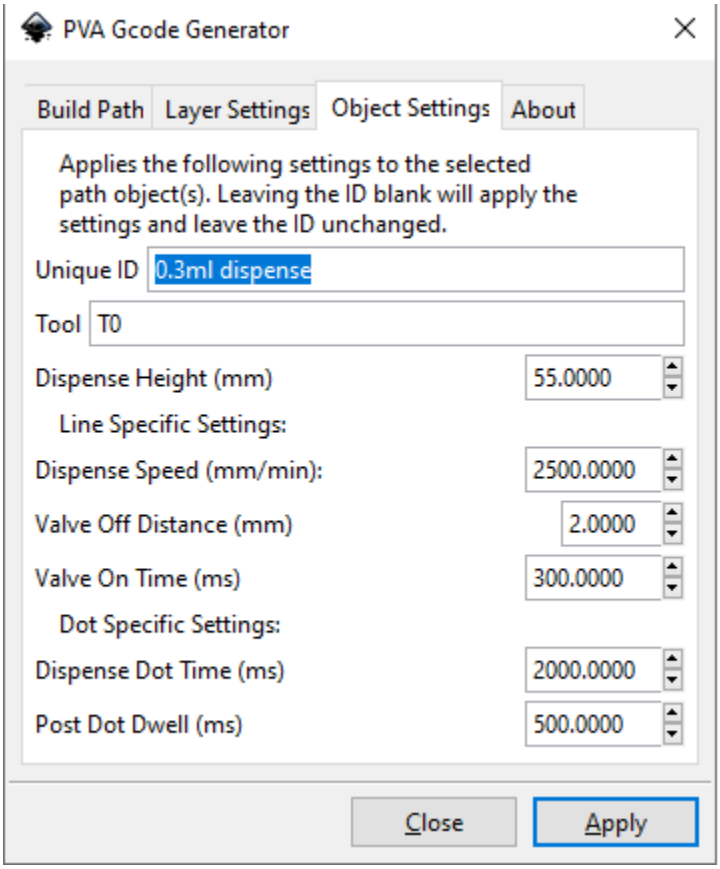


Figure 54: Path Object Settings Tab

5.3.1 Unique ID

Designates a specific name for the objects that are selected.

5.3.2 Tool

Assigns a tool to the objects that are selected. If there are two tools on Sigma, the left tool is T0 and the right tool is T1.

5.3.3 Dispense Height

Enter a Z height used for the selected objects i.e. if the circuit board is 5 mm and the desired dispense height is 2 mm, enter 7 mm.

5.3.4 Line Specific Settings

- **Dispense Speed (mm):** The dispense speed for the selected objects.
- **Valve Off Distance**: The distance that the valve should be closed before the end of the selected line.
- **Valve On Time**: The amount of time the valve will be opened before the dispense line starts.

5.3.5 Dot Specific Settings

- **Dispense Dot Time**: The time in milliseconds that the valve will dispense onto the center point of the circle.
- **Post Dot Dwell**: The time in milliseconds that the valve will wait after dispensing before it continues to the next dispense point.

6. Operation

6.1 Generate G-code

1. Once the G-code is ready to be generated, open the **PVA Gcode Generator**.
2. Navigate to the **Build Path** tab.
3. Enter the **Directory** information.
4. Enter a **File Name**.
5. Select **Dry Mode** and/or **Enable Logging** if necessary.
6. Select **Apply**. The G-code will be saved in the designated directory folder.

6.2 Sigma Wireless Connection Setup

Sigma has 2.4GHz wireless network connection capability that allows Sigma to be operated remotely with a computer. For the initial setup of Sigma, you will need to use this feature.

1. Turn on Sigma using the on/off switch located near the power cord connection.
2. The control screen will start up on its own.
3. Connect to the network matching the serial number. The serial number is listed on the label located on the upper right corner of the back panel on Sigma.
4. The network password is "**PVA12345**".

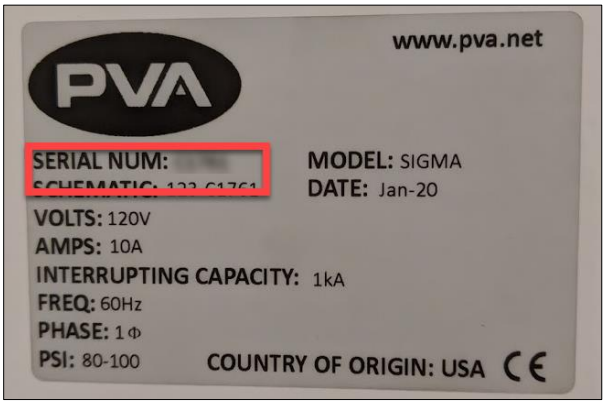


Figure 55: Sigma Serial Number Wi-Fi Network

5. Once connected to the network, access the computer interface by typing the machine IP address "**11.22.33.44**" into your Firefox or Chrome browser.

The web interface will display.

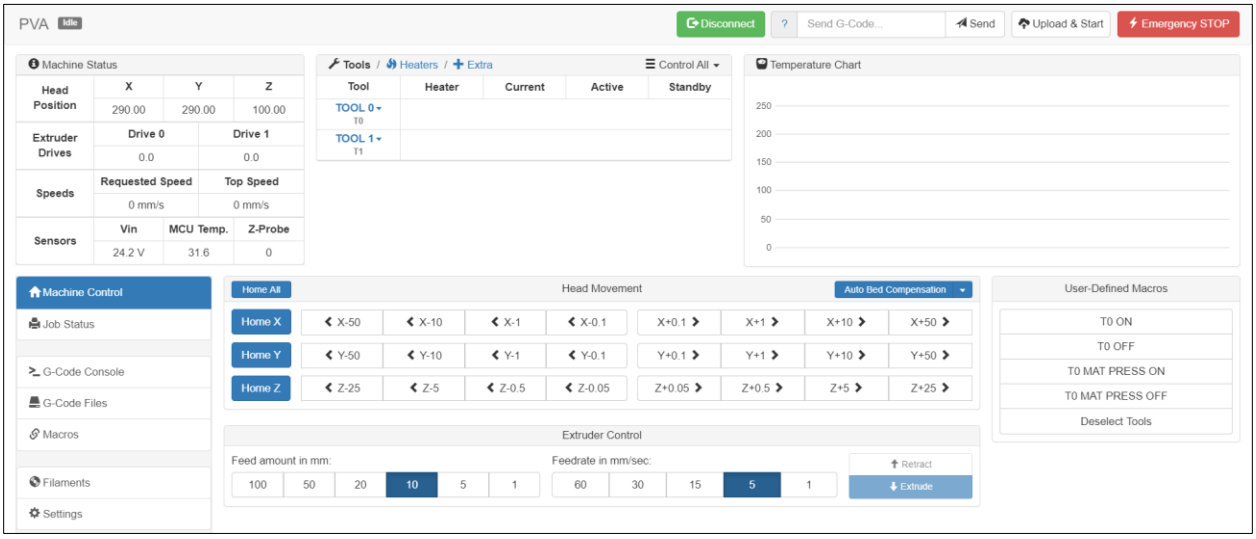


Figure 56: Sigma Web Interface Home Screen

6.3 Connect Web Interface to Existing Network

There is an option to connect an existing 2.4 GHz WiFi network to the web interface.

Note: This option is not compatible with 5 GHz networks.

1. Use the steps outlined in Sigma Wireless Connection Setup to connect to Sigma's WiFi network.
2. Once connected, access the web interface.
3. Navigate to the G-Code Console.

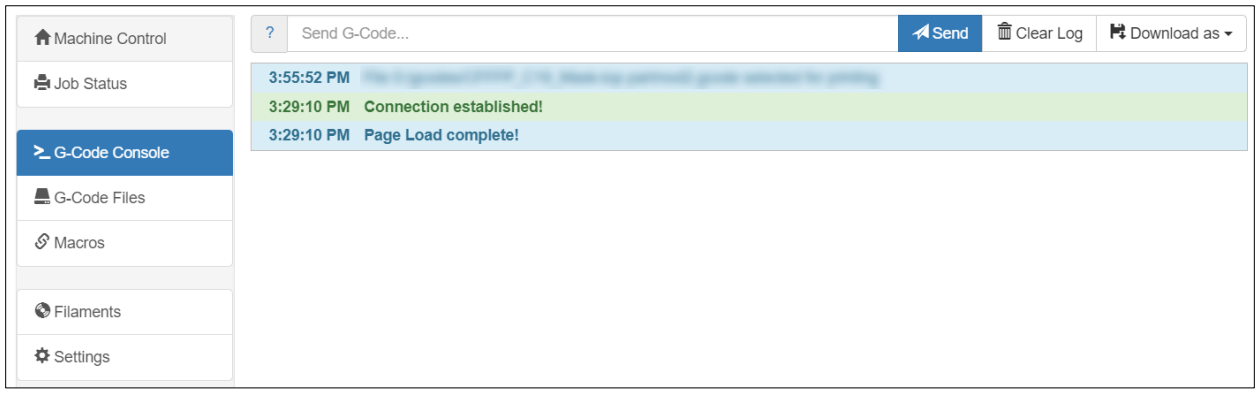


Figure 57: G-code Console

6.3.1 M587 Command

The M587 command will be used to send your desired network information to the web interface's G-code console. The M587 command must include three components.

1. **S**: Network SSID
   - Must be enclosed in quotation marks
   - Case-sensitive
2. **P**: Network Password
   - Must be enclosed in quotation marks
   - Case-sensitive
3. **I**: IP address to use when connected to this network (optional).
   - If zero is entered or not specified, an IP address will be acquired via DHCP.

The M587 command must be written in the following format:

M587 S"WIFI_NETWORK_NAME" **P**"PASSWORD" **I**x.xxx.xx.xxx

Example:

Network SSID	TEST_Network
Network Password	Testing123
IP Address	1.160.10.240

Using the credentials listed above, the M587 command would be as follows:

M587 S"TEST_Network" **P**"Testing123" **I**1.160.10.240

1. In the **Send G-code field**, enter the full M587 command.
2. Click **Send**. A connection established message will appear.

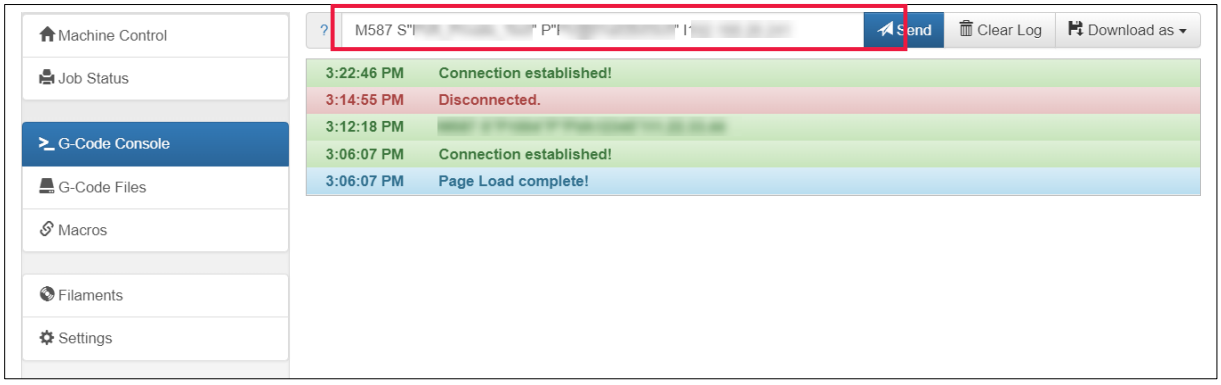


Figure 58: Enter M587 Command

Additional Commands:

- To view stored networks, enter **M587**
- To see the current network connection and IP, enter **M552**
- To remove the network from memory, enter **M588 S"NETWORK_NAME"**
- To remove all networks from memory, enter **M588 S"*"**

6.3.2 Change Web Interface to Client Mode

1. To switch the web interface network from host mode to client mode, select **Settings**.

2. Select **System Editor**.

3. Navigate to the **config.g** file and right click. From the menu, select **Edit**.

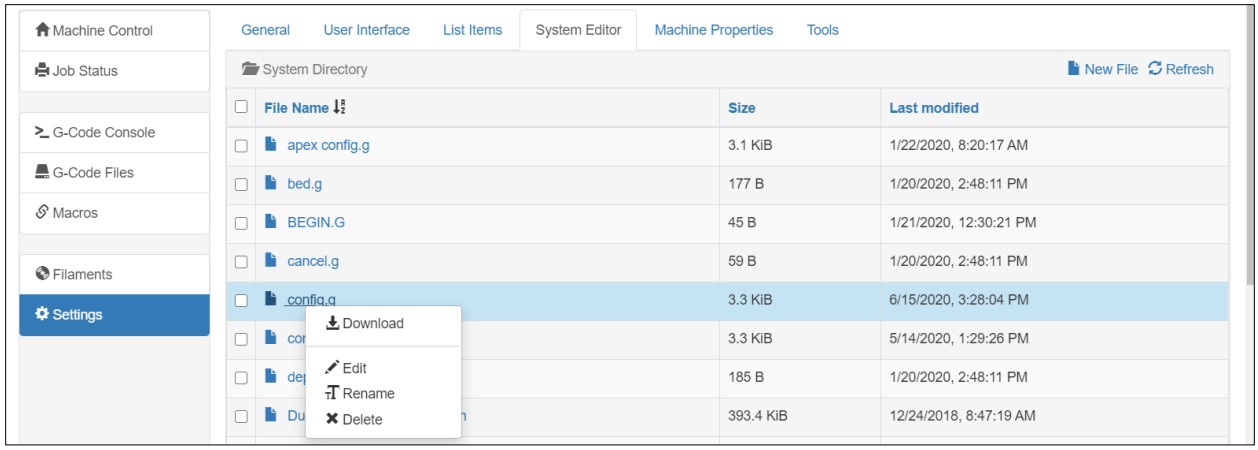


Figure 59: Access System Editor

4. The file will open. Navigate to the **Network** section.

5. To select a network, a semicolon must be placed in front of the network and removed from the other networks.

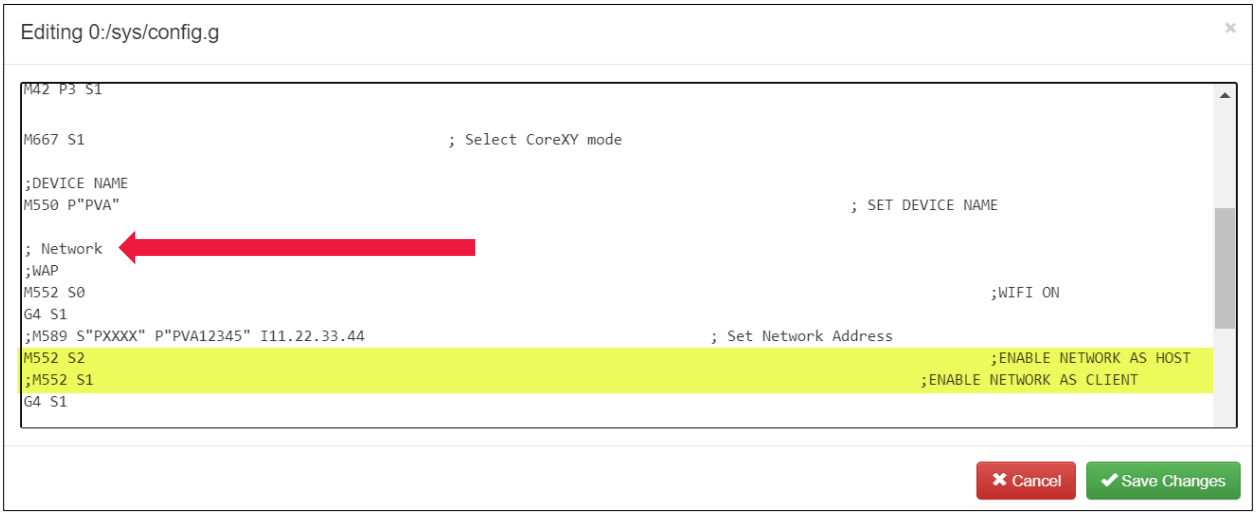


Figure 60: Edit Config.g File

6. Delete the semicolon (**;**) from M552 S1.

7. Add a semicolon (**;**) to M552 S2 to select the network.

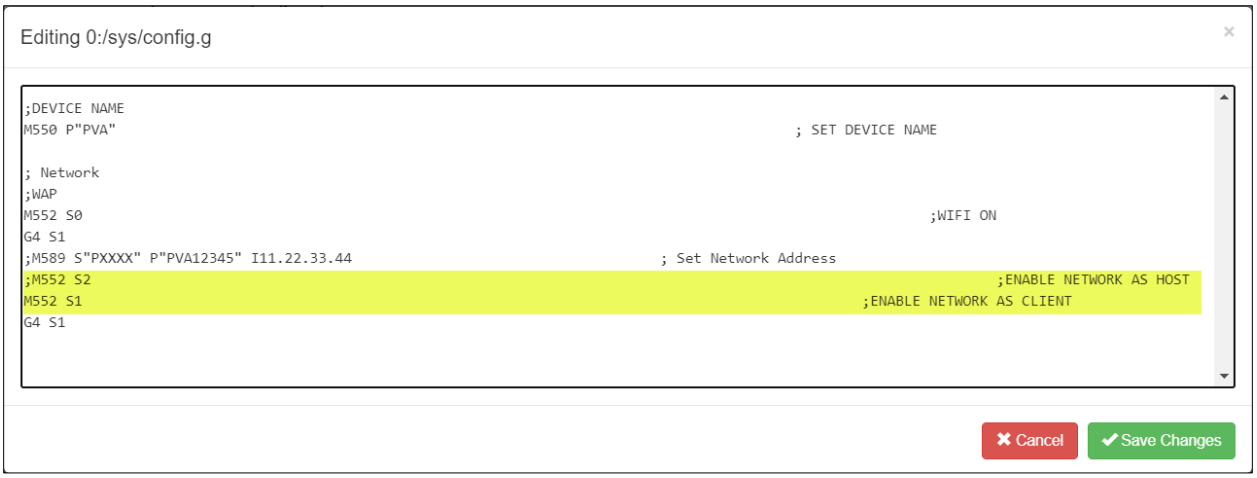


Figure 61: Change Network

8. Click **Save Changes**.

Note: The web interface must be rebooted after changes to the network have been made.

9. Click **Yes** to reboot the web interface.

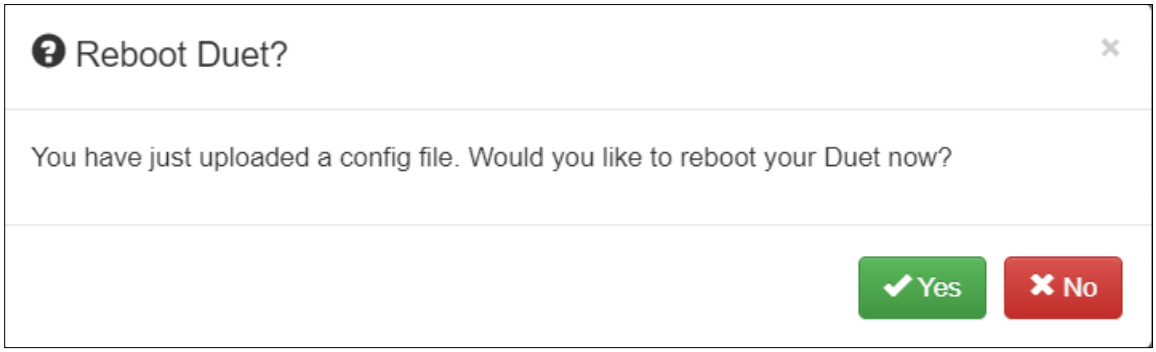


Figure 62: Reboot Confirmation

The web interface will confirm the file was successfully updated.

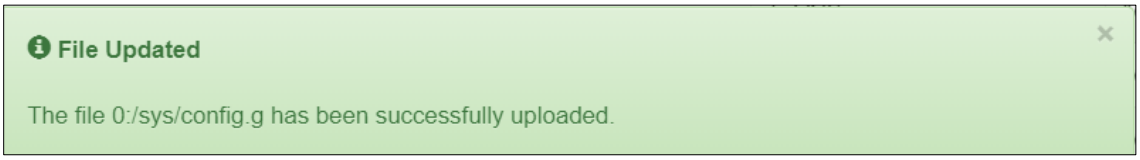
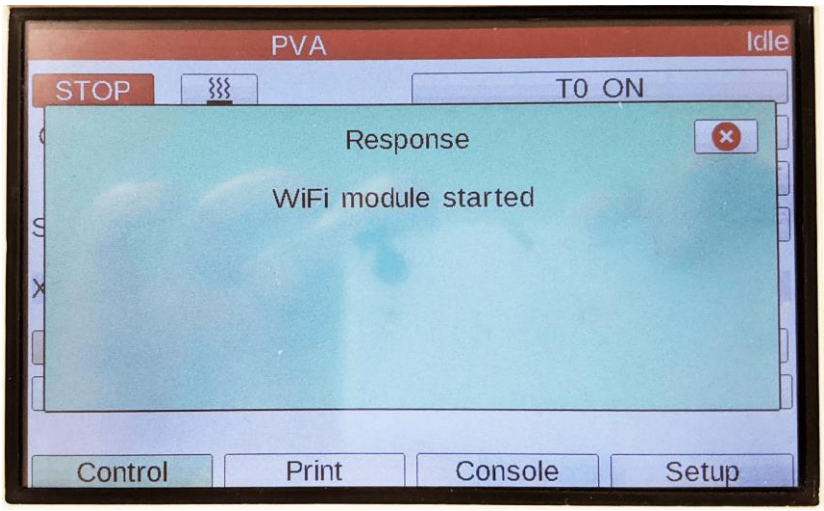


Figure 63: File Updated

The control screen on Sigma will confirm that the machine is connected to the network.



The network and IP address will appear on the control screen as the console tab of the web interface. The green popup will disappear after 10 seconds.

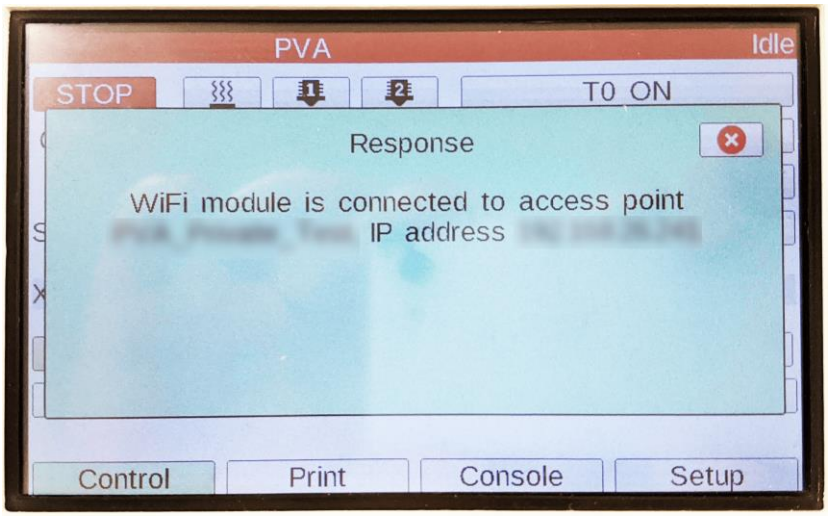


Figure 64: Sigma Control Screen WiFi Confirmation

Note: Sigma can also be powered down so the SD card storing the config.g file can be removed from the controller. Within the system file of the SD card is the Config.g file. This file can opened and modified with a program editor such as Notepad.

6.4 Uploading G-code to Sigma

1. Connect to the Sigma network using the directions from Sigma Wireless Connection Setup.
2. From the Sigma web interface, select **Upload & Start**.
3. Choose the desired G-code file. Once uploaded, Sigma will run the dispense path.

More detailed information regarding how to use the Web Interface and Control Screen are provided in the next sections.

6.5 Web Interface Overview

6.5.1 Header Bar

The Header bar allows you to view machine status, connect and disconnect the machine, quickly enter a G-code, upload a G-code to run, and stop the machine.

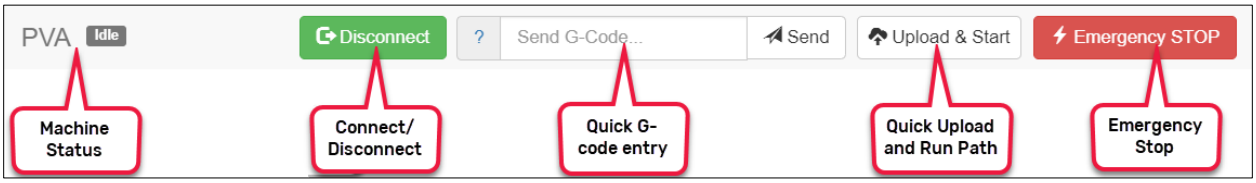


Figure 65: Header Overview

6.5.2 Machine Control

Machine Control allows you to home the X, Y, and Z axis and jog individual axis. You can also quickly run user-defined macros such as turning tools on and off, turning material pressure on and off, and deselecting tools.

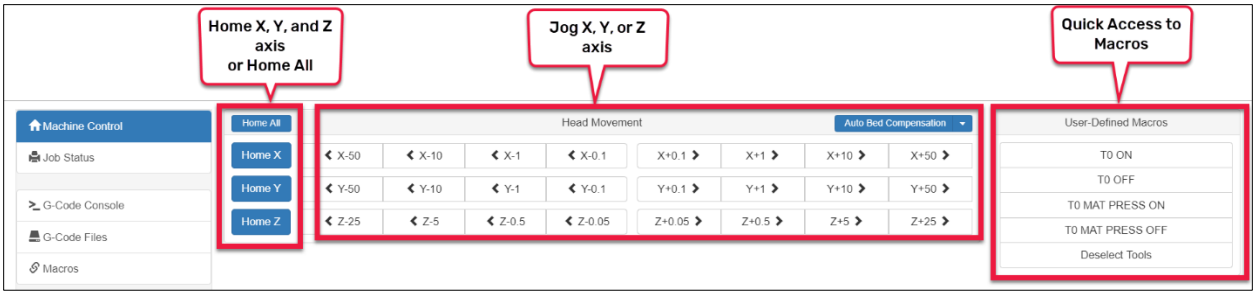


Figure 66: Machine Control Overview

6.5.3 Job Status

Job Status will display the progress of the current path. You can also change speed, pause the job, or start another job when the path is complete.

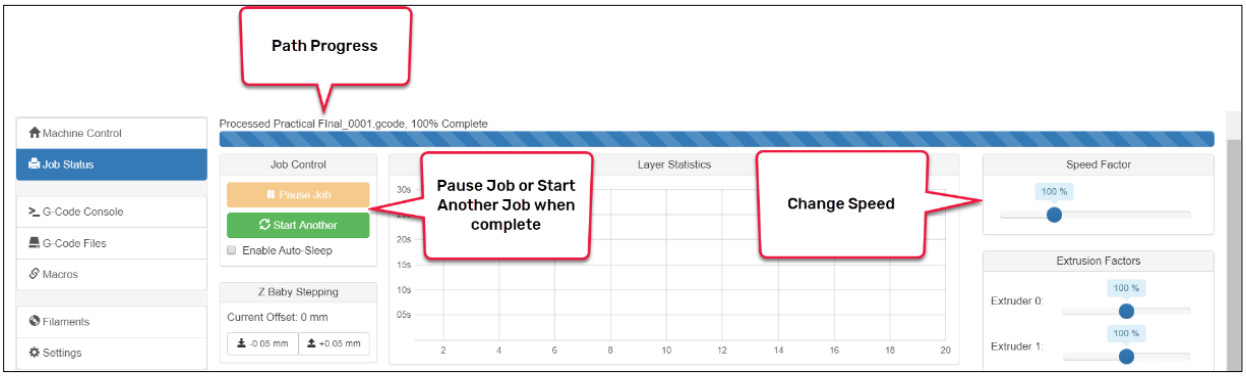


Figure 67: Job Status Overview

6.5.4 G-code Console

The G-Code Console provides a log of G-Codes entered, responses and errors, warnings, and notifications received since the browser was last refreshed. The console output can be downloaded as a plain text or CSV file.

6.5.5 G-code Files

G-Code Files allows for G-code files to be uploaded, downloaded, deleted and sorted into sub directories.

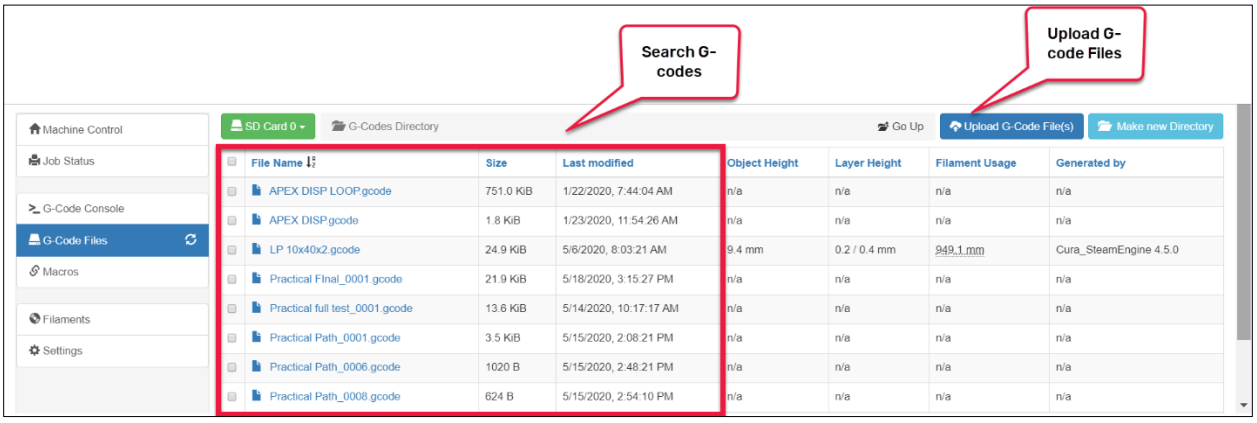


Figure 68: G-code Files

Files can be uploaded by browsing for them or dropping them onto the **Upload G Code Files(s)** button. The file upload functionality cannot be used during while the machine is running.

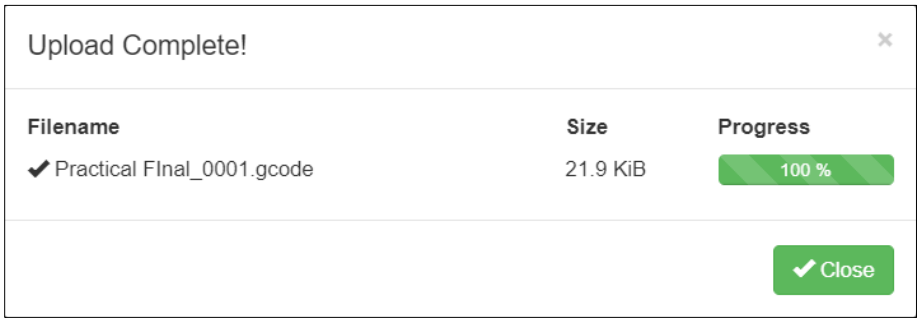


Figure 69: Upload G-Code File

Right-click on a G-code file to display a list of options. From here, you can run the dispense part (**Print File**), estimate the dispense path time (**Simulate File**), or download the G-code file (**Download**). You can also rename or delete the file, as well as manually edit the G-code.

Figure 70: G-code Right Click Options

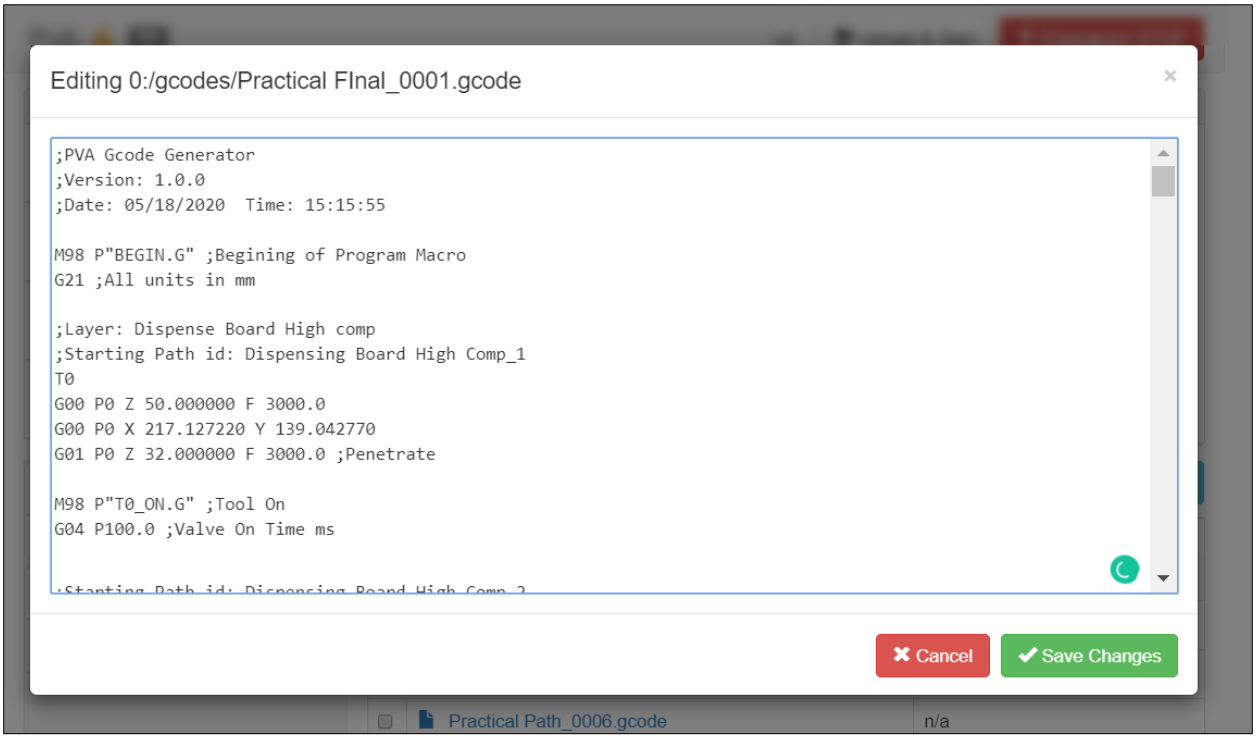


Figure 71: Edit G-Code

6.5.6 Macros

Macros allows you to upload and edit user-defined macros.

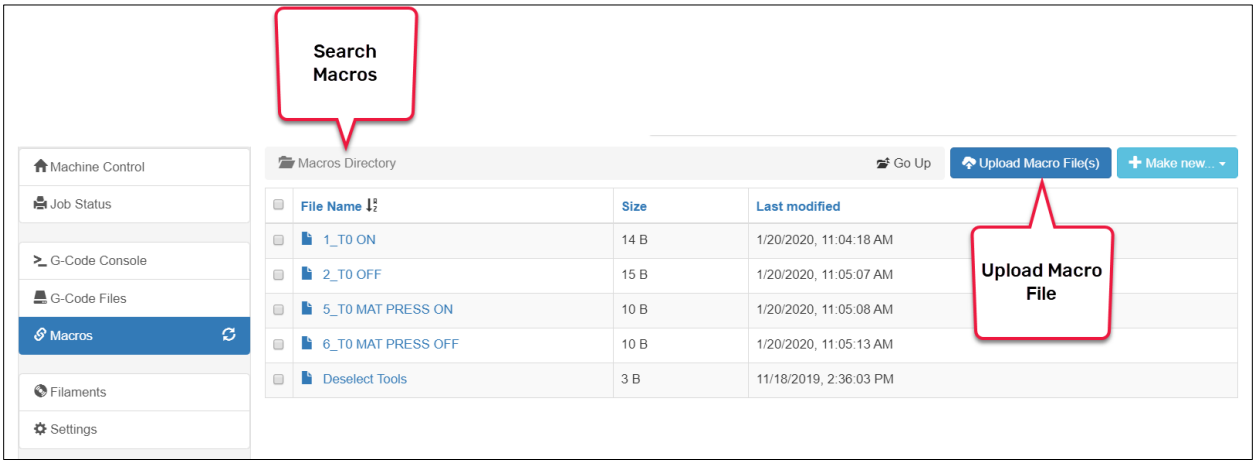


Figure 72: Macros

6.6 Control Screen Overview

The control screen on Sigma has the same features and functionality of the web interface. The two can be used interchangeably.

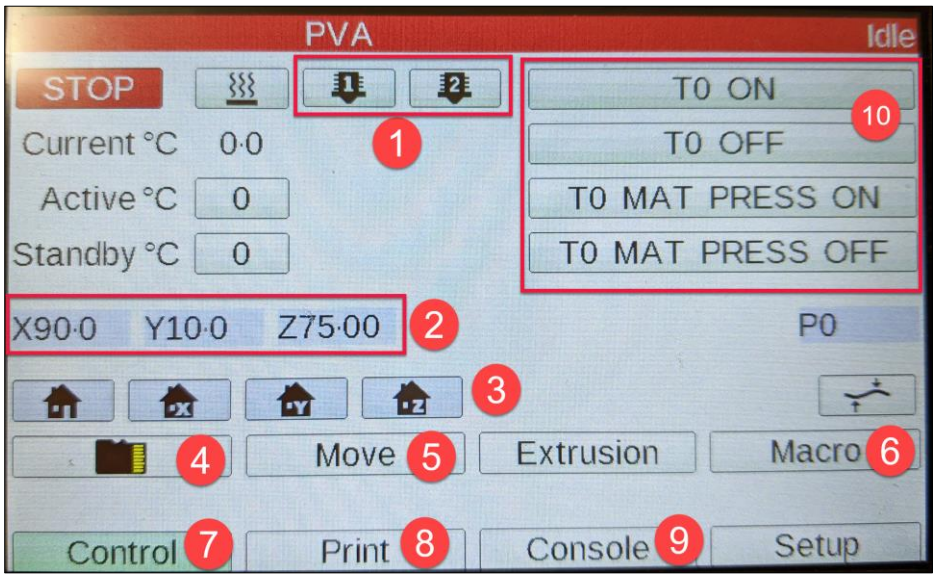


Figure 73: Control Screen

1. **Select Tools**
2. **Current Position**
3. **Home All, Home X, Home Y, Home Z**
4. **Access G-code Files**

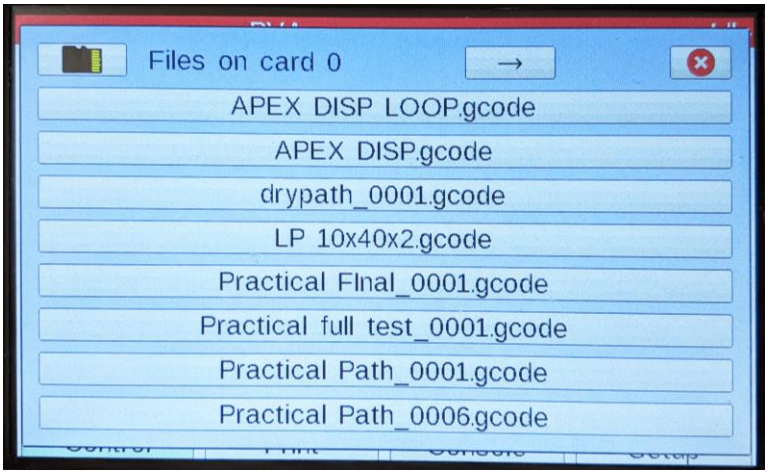


Figure 74: Access G-code Files (Control)

5 Move Individual Axis

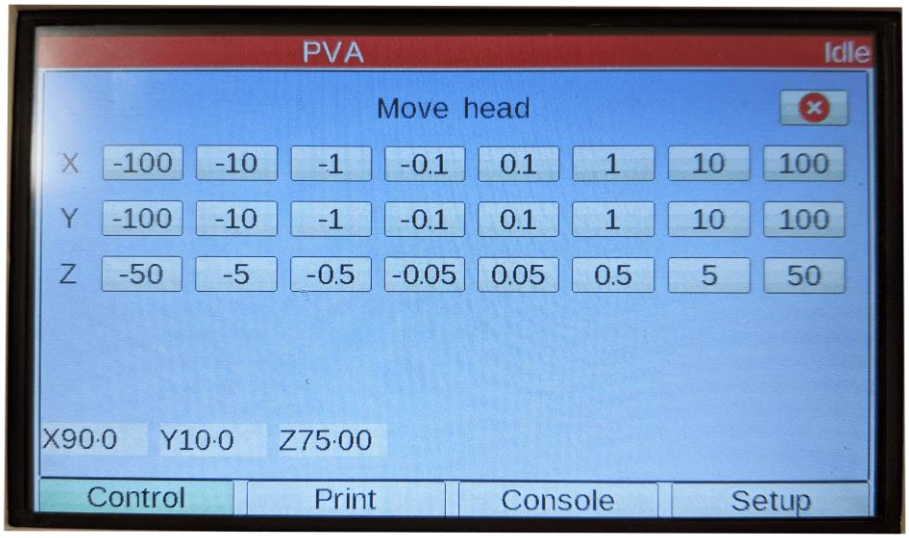


Figure 75: Move Axis (Control)

6 Access Macro Files

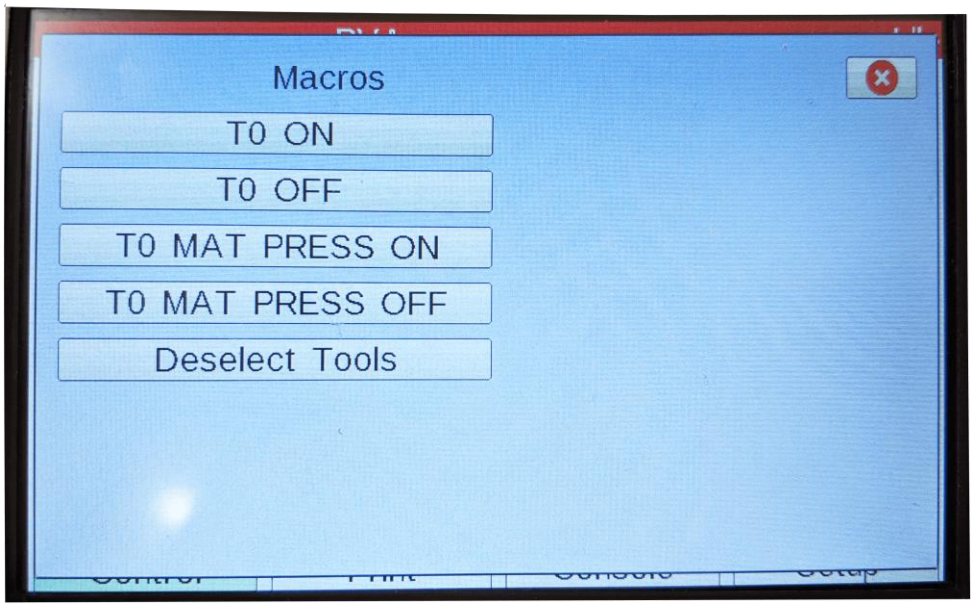


Figure 76: Access Macro Files (Control)

7 Control Screen (Current Screen)

8 Print Screen

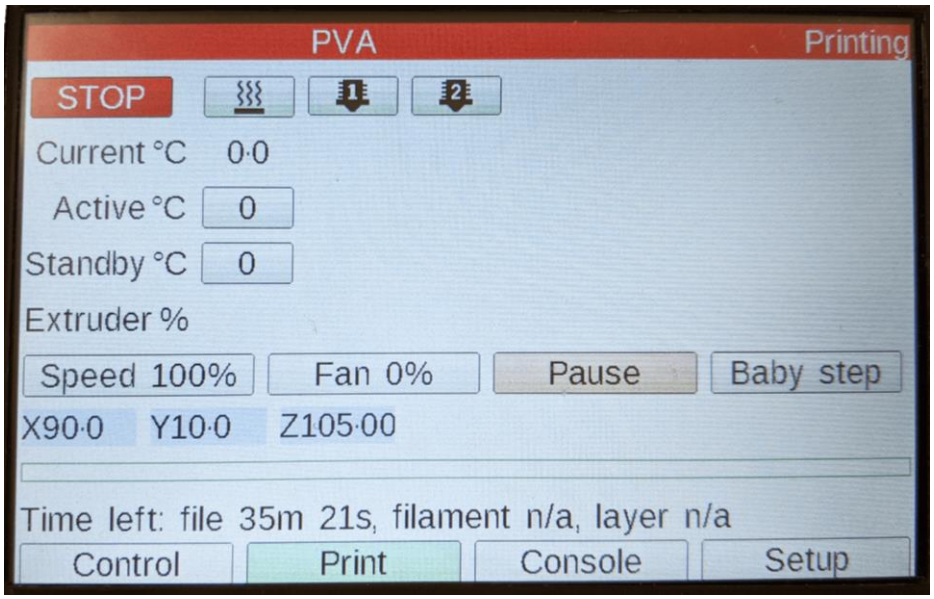


Figure 77: Print Screen

9 G-code Console

10 Quick Access Macros

7. Maintenance

Perform the preventative maintenance as shown in the table below to increase the life of the workcell and make sure every run is high quality.

Note: Only qualified personnel should perform workcell maintenance.

Service Area	Every Shift	Weekly	Monthly	Quarterly
Dispense Equipment	Examine all fluid pressures and dispense weights	Clean material buildup on fixtures and locating surfaces. Examine for leaks around compression fittings, tighten or replace if necessary. Ensure all sealing packings are lubricated. Refer to individual component manuals for the procedure.	Examine the fluid delivery lines for excessive wear.	Examine the inline material filter for clogs
Electro-mechanical components		Examine the motors for overheating and smooth operation. Examine wires, pneumatic lines, and material lines for wear	Ensure all belts are taught.	Examine all moving cables for excessive wear. Lubricate all rails with a lithium based oil.
Pneumatics			Examine for correct operation. Drain any water from the main filter/regulator	Examine the slides for wear and smooth operation
Clean Purge Cups	Daily			
Clean Valve Tips	Daily			

8.Technical Support

8.1 Calling Technical Support

Technical Support is always available to help. The phone number is +**1** (**844**) **734**-**0209** or you can email **cs@pva.net** to create a support ticket. Before you contact PVA, have the following information:

1. Record all the information on the OIT when the error occurred, include any error messages that may appear.
2. Record the operation in progress when the module had the error (when did it have problems, what was it doing, etc.).
3. If the error was not serious, attempt to repeat the error. If the error does not repeat, the problem may have been operator generated.

8.2 Support Portal

PVA uses an automated ticketing system called Team Support. The fastest way to contact PVA for any technical support is to create a ticket. The ticketing system alerts the service department of your region and assigns a service engineer. All service engineers can see the information for each ticket for collaborate responses to more difficult problems from our global team. Each problem and response can be tracked from creation to resolution. The Support Portal also has information on common issues and possible solutions. If immediate support is necessary, call your regional office (https://pva.net/contact).

1. To access the ticketing system, click Support Portal located under the Support tab on the main menu.

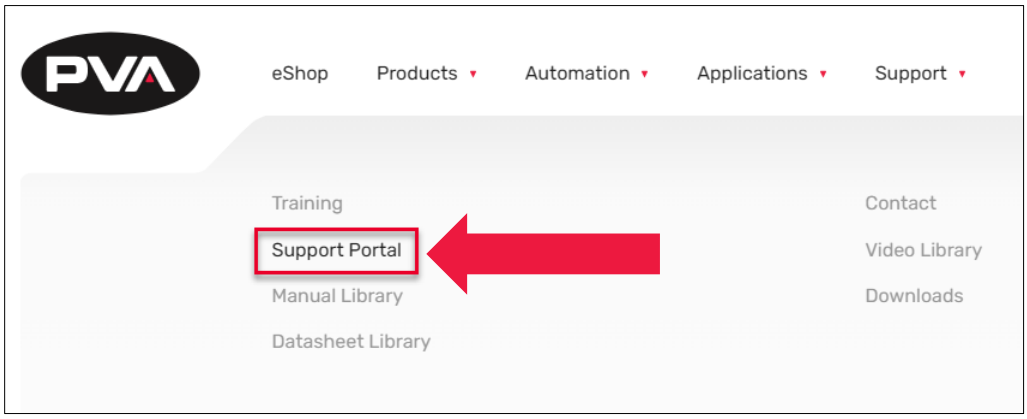


Figure 78: Support Portal

2. Select “Log In” to log in to your account or create a new one.

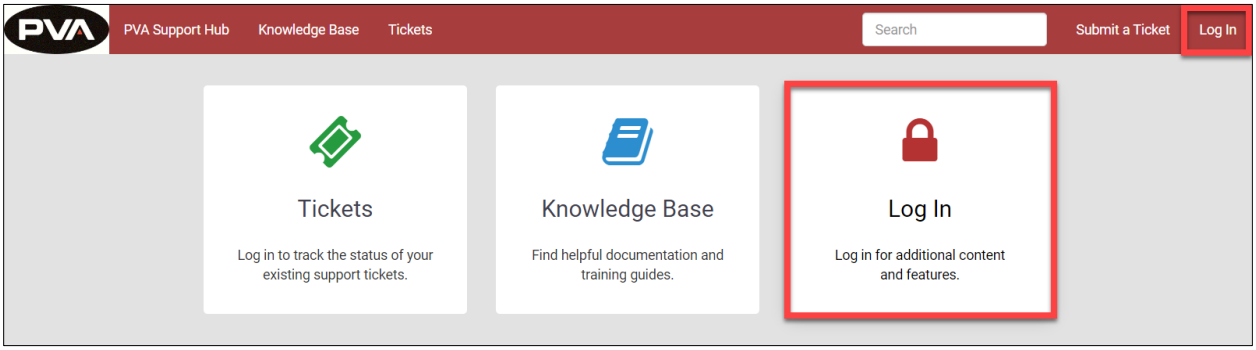


Figure 79: Log In

3. The Sign In screen will be shown. Fill in the information and select **Sign In**.

4. To register, select **Create an Account**. Fill in the information and select **Register Me**.

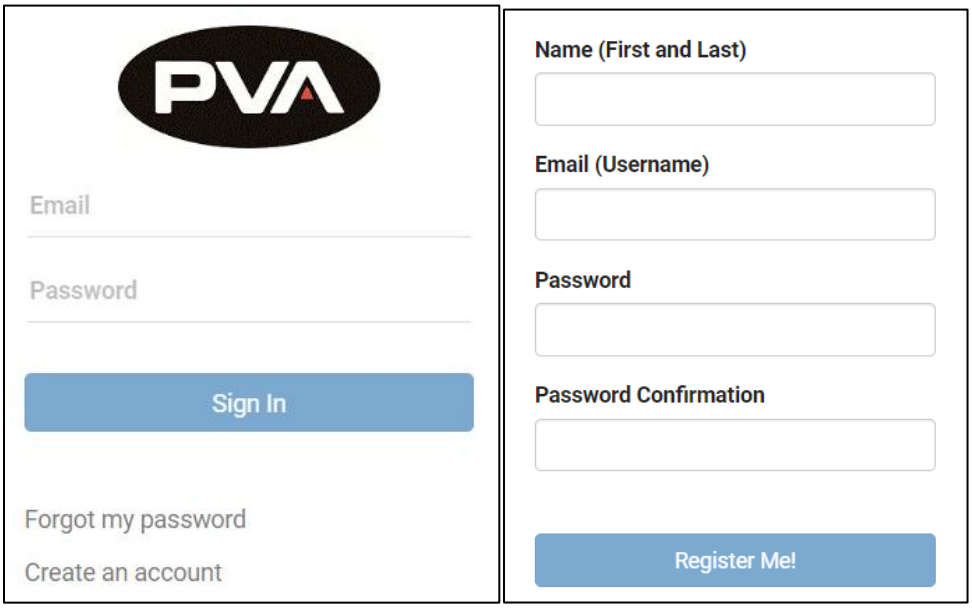


Figure 80: Sign In or Register

5. When you are signed in, select **Submit a Ticket** from the header.

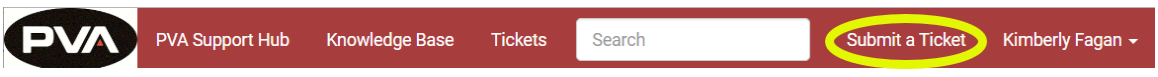


Figure 81: Submit a Ticket

6. Fill in the information requested and use as much detail as possible. Include the equipment serial number and any screenshots, photos, or videos.
7. Once complete, select **Submit Ticket**.

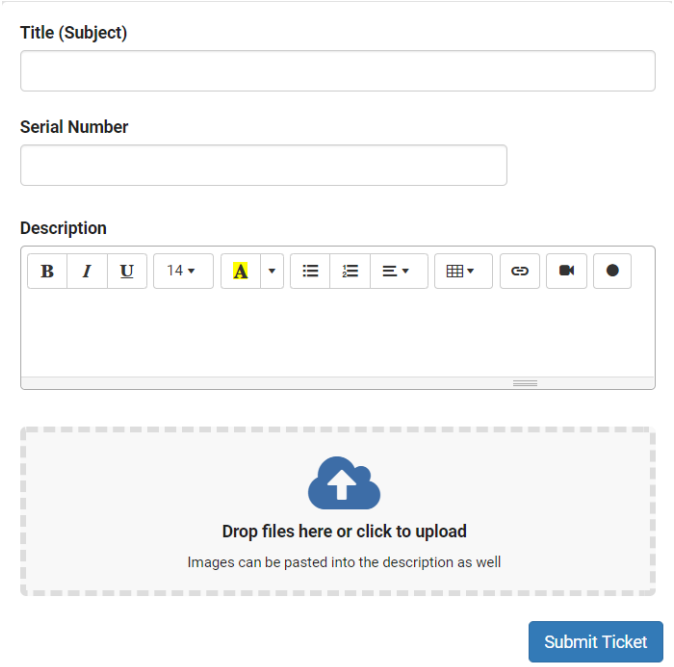


Figure 82: Complete the Ticket

8. If you cannot access the PVA Support Portal, email customer service at cs@PVA.net to create a ticket. To reply to a ticket email, select Reply (not Reply All).

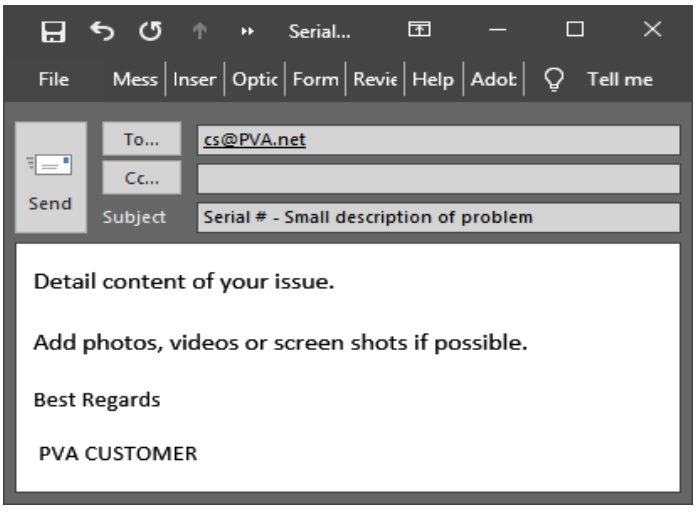


Figure 83: Example Ticket Email

9. Table of Figures

10. Notes

11. Warranty

PVA Warranty Policy

PVA warrants the enclosed product against defects in material or workmanship on all components for one year from the date of shipment.

The warranty does not extend to components damaged due to misuse, negligence, or installation and operation that are not in accordance with the recommended factory instructions. Unauthorized repair or modification of the enclosed product, and/or the use of spare parts not directly obtained from PVA (or from factory authorized dealers) will void all warranties.

All PVA warranties extend only to the original purchaser. Third party warranty claims will not be honored at any time.

Prior to returning a product for a warranty claim, a return authorization must be obtained from PVA's Technical Support department. Authorization will be issued either via the telephone, facsimile, or in writing upon your request.

To qualify as a valid warranty claim, the defective product must be returned to the factory during the warranty period. Upon return, PVA will repair (or replace) all components found to be defective in material or workmanship.

(Retain this for your records)

Product Information:

PRODUCT: _____

SERIAL NUMBER: _____

DATE OF PURCHASE: _____