

Multi-Axis Spraying Systems ExactaCoat and FlexiCoat Manual



SONO•TEK Corporation

PN 11-01-00364 V1.0

Thank you for selecting a Sono-Tek product. We are confident that this product will provide many years of reliable service in your application.

We intend to provide you with the highest level of support and service in order to assure your continued satisfaction. Our corporate philosophy in this regard is expressed best by our Mission Statement:

Sono-Tek is committed to being the world's leading supplier of ultrasonic spray technology products and related equipment. We expect to achieve sustained growth and profitability by providing quality and cost effective solutions to the global markets we serve.

Through the skills and dedication of our team, working in an environment where we can all grow and prosper, we shall maintain the highest level of product performance and customer satisfaction.

We encourage you to contact our highly qualified staff if you have questions regarding operation or service.

Call us at 845-795-2020 or e-mail us at info@sono-tek.com. In addition, extensive technical information about our products is available on our website at **www.sono-tek.com**.

EQUIPMENT STANDARDS & CODES

We pride ourselves on building the safest, best performing, and most flexible automated precision ultrasonic coating equipment possible. Since we ship machines globally, we are constantly faced with the task of complying with a variety of standards, directives and codes.

1. From a general machine safety standpoint, we use CE, OSHA guidelines. To meet specific European safety standards we design and manufacture to:

Under 2006/42/EC:

EN ISO 12100 -1+2 Basic Principles of Design
EN 60204-1 Electrical Equipment of Industrial Machines 1997

2. From an electrical and EMC emissions and immunity standpoint, we certify equipment for CE, and design and manufacture to: CE, UL, CSA and NFPA standards, but DO NOT provide certification other than CE.

CE:

Under 2006/95/EEC:

EN 60947 Low-Voltage Switch Gear and Control Gear - 1999
EN 60446 Basic and Safety Principles For Man-Machine Interface, Marking and Identification – Identification of Conductors By Colors or Numbers

Under 204/108/EEC:

EN 50081-1 Class A radiated/conducted emissions
EN 50082-1 Level 2 radiated susceptibility, Level 4 fast transient immunity, and Level 4 electrostatic discharge immunity

UL:

UL508 Industrial Control Equipment

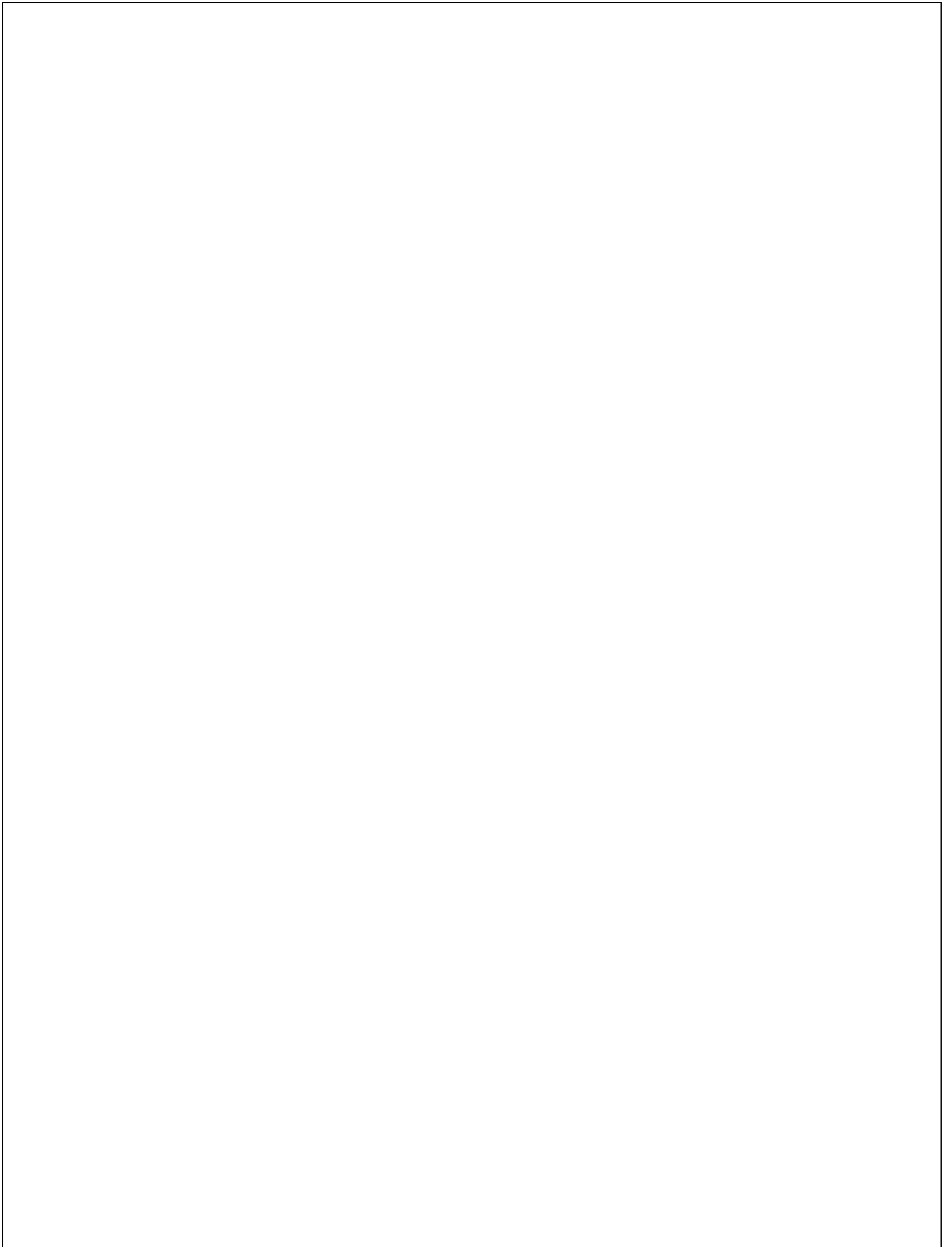
NFPA:

NFPA 70 National Electric Code – Article 670 Industrial Machinery
NFPA 79 Electrical Standard for Industrial Machinery
NFPA 33 Standard for Spray Application
NFPA 86 Standard for Ovens and Furnaces

CSA:

SPE 1000 - Compliance with the Canadian Electric Code

Sono-Tek uses only the highest quality UL, CSA, and CE approved components in all of our equipment designs. We also take measures to ensure those components are applied in a safe and proper manner. In addition to using the codes and standards listed above as guidelines for designing and manufacturing equipment, we also have procedures in place for quality control, setup, and testing of every machine produced in our factory.



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PREFACE

Why Ultrasonic Nozzles?

Ultrasonic nozzle systems are replacing pressure nozzle systems in a wide range of industrial and R&D applications. Concerns over the environment and unacceptable waste have caused scientists, engineers and designers to adopt ultrasonic spraying systems as a technology that is more precise, more controllable and friendlier to the environment.

Sono-Tek ultrasonic nozzles, with their characteristic soft spray, dramatically reduce overspray, save money and reduce process and atmospheric contamination. They also open up a broad range of new application possibilities due to the non-clogging and non-wearing nature of ultrasonic atomization. Under normal circumstances our ultrasonic nozzles will not clog or wear out. This inherent quality reduces maintenance allowing production lines to run longer between maintenance cycles.

Ultrasonic Atomization Overview

The phenomenon referred to as ultrasonic atomization has its roots in late 19th century acoustical physics, notable in the works of the ubiquitous Lord Rayleigh.

Simply stated, when a liquid film is placed on a smooth surface that is set into vibrating motion such that the direction of vibration is perpendicular to the surface, the liquid absorbs some of the vibrational energy, which is transformed into standing waves. These waves, known as capillary waves, form a rectangular grid pattern in the liquid on the surface with regularly alternating crests and troughs extending in both directions as shown in Figure 1.1.

When the amplitude of the underlying vibration is increased, the amplitude of the waves increases correspondingly; that is, the crest become taller and troughs deeper. A critical amplitude is ultimately reached at which the height of the capillary waves exceeds that required to maintain their stability. The result is that the waves collapse and tiny drops of liquid are ejected from the tops of the degenerating waves normal to the atomizing surface.

A useful analogy that helps visualize this process comes from our everyday experience. Ocean waves coming into shore go through a transition from stability on the open water to instability as they approach shore. The instability is evident as the waves form foamy breakers.

The reason for instability in this type of wave is that as it approaches shore, the bottom of the wave contacts the ocean floor and is slowed down by frictional forces. The wave top, on the other hand, continues to move ahead unimpeded. The net result is that the wave topples over. In this process of breaking up, a spray of tiny drops is ejected from the wave surface. Although the mechanisms governing the creation of a spray from capillary and ocean waves differ, the results are similar.



Figure 1.1: Photomicrograph - Capillary Waves in Liquid

Ultrasonic Spray Nozzle Overview

As their name implies, ultrasonic nozzles employ high frequency sound waves, those beyond the range of human hearing. Disc-shaped ceramic piezoelectric transducers convert electrical energy into mechanical energy. The transducers receive electrical input in the form of a high frequency signal from a power generator and convert that into vibratory motion at the same frequency. Two titanium cylinders magnify the motion and increase the vibration amplitude at the atomizing surface.

Nozzles are configured such that excitation of the piezoelectric crystals creates a transverse standing wave along the length of the nozzle. The ultrasonic energy originating from the crystals located in the large diameter of the nozzle body undergoes a step transition and amplification as the standing wave as it traverses the length of the nozzle.

Sono-Tek nozzles are manufactured in various sizes spanning the range of frequencies from 25 - 180 kHz. To give a sense of the physical size of these nozzles, one wavelength at 25 kHz is approximately 200mm [8 in.], while at 180 kHz it is 25mm [1 in.]. A 48 kHz nozzle, one of the more common types in use, is approximately 2 in. long for the half-wavelength version.

A cross-sectional view of a typical production nozzle is shown. There are several features worth noting.

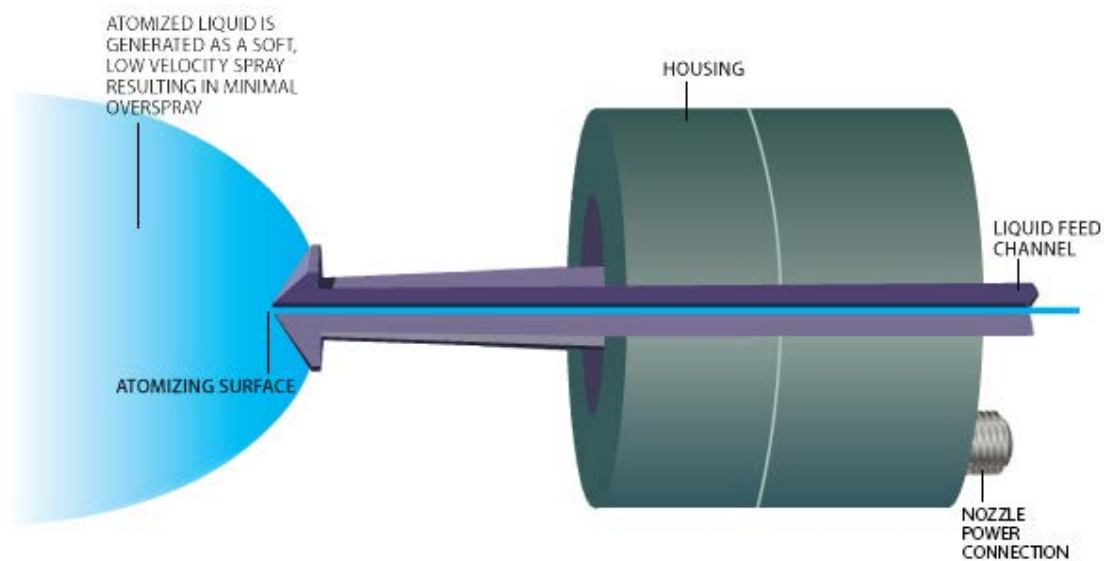


Figure 1.2: Cross Section of Production Ultrasonic Nozzle

The electrically active elements are contained within a sealed housing that protects the piezoelectric transducers, electrodes, and connecting wires from external contamination. Chemically impervious O-rings assure the integrity of the seal.

The nozzle body is fabricated from titanium because of its good acoustical properties, high tensile strength, and excellent corrosion resistance. Liquid introduced onto the atomizing surface through a large, non-clogging feed tube running the length of the nozzle absorbs some of the vibrational energy, setting up wave motion in the liquid on the surface. For the liquid to atomize, the vibrational amplitude of the atomizing surface must be carefully controlled. Below the so-called critical amplitude, the energy is insufficient to produce atomized drops. If the amplitude is excessively high, the liquid is literally ripped apart, and large "chunks" of fluid are ejected, a condition known as cavitation. Only within a narrow band of input power is the amplitude ideal for producing the nozzle characteristic fine, low velocity spray.

The fine control of input energy is what distinguishes ultrasonic atomizing nozzles from other ultrasonic devices such as welders, emulsifiers, and ultrasonic cleaners; these other devices rely on cavitation with input power of the order of hundreds to thousands of watts. For ultrasonic atomization, power levels are generally under 15 watts. Power is controlled by adjusting the output level on the power supply.

Since the atomization mechanism relies only on liquid being introduced onto the atomizing surface, the rate at which liquid is atomized depends solely on the rate at which it is delivered to the surface. Therefore, every ultrasonic nozzle has an inherently wide flow rate range. In theory, the "turn down" ratio (ratio of maximum to minimum flow rate possible) is infinite. In practice, this ratio is limited to approximately 5:1 as result of design constraints.

1.0 Introduction

Before you use your ExactaCoat or FlexiCoat system, read all operation and setup manuals and any included addendums. This will help you to become familiar with the product and ensure successful operation.

This manual gives information on common options and configurations for a standard machine. The machine related to this manual may not contain all items or may have additions. If the manual refers to an option that was not purchased, ignore that section. If there are options on the system not included in this manual, refer to the optional equipment section of the operating guide for more information.

If any questions or problems arise, contact SONO-TEK's Technical Support department.

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***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 Warnings & Symbols

Warning symbols on the machine 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. Read the entire manual for additional safety information related to the system and its components.

WARNING! The safety features should NEVER be bypassed, disabled, or tampered with. SONO-TEK is not responsible for any damages incurred, mechanical or human, because of alteration or destruction of any safety features. If the equipment is used in a manner not specified by SONO-TEK, the protection provided by the equipment may be impaired.



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



Before any repair or maintenance to the system is done, turn off power and lockout the power disconnect switch.



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



Warning notices are used to emphasize that hazardous voltages, currents, 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.



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



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



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



Pinch hazard from moving parts. Avoid contact.



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



Hot surface. Avoid contact.



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



Do not remove protective guarding.



Shear hazard from moving parts. Avoid contact.



Warning, UV light hazard. Do not look directly at UV light source.



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

1.2 Operating Safety

The system 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. Sono-Tek is not responsible for any damage, mechanical or human, caused by changes or destruction of any safety features.*

1.2.1 Safety Circuit

The main power to the system 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 relay fails or a safety switch is activated, the power contacts are opened.

1.2.2 Polycarbonate and Safety Glass Guarding

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

1.2.3 Doors

Systems with an automatic load/unload cycle will have one or two doors in the front. Each door is monitored by a non-defeatable limit switch. When a door is opened, power to the motors and pneumatics is disconnected. The DOOR BYPASS key switch is for maintenance personnel to access the work area without disconnecting power. The bypass switch can only be used in manual or calibration mode.

1.2.4 Light Curtain

Some systems have a light curtain. The light curtain is redundant and self-checking. The control signals from the light curtain are safety devices in the safety circuit.

1.2.5 Notices and Warnings

- You must wear safety glasses, gloves, and long sleeves.
- Lock-out and tag the gas and power supplies before you service or clean any part of this equipment
- Release the pressure before any hose (gas 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

1.2.6 System Description

This manual applies to FlexiCoat and ExactaCoat systems.

The dispense path and active heads are controlled by a program stored in the motion controller. The motion controller can save up to 30 programs at one time.

The operator controls the system with Sono-Tek Portal software. This includes machine setup, manual operation, program selection, and automatic operation. Machine status and error messages are shown in the program window and the light tower. The operator(s) must have read this manual, or have been trained and understand the operation of the machine.

Any uses that are not approved could result in dangerous conditions that the safety features on the system cannot prevent.

1.2.7 Personal Protective Equipment

System operation includes gas pressure, electrical power, mechanical devices, and the use of hazardous materials. Only qualified personnel can operate and service systems.

Operators must use eye protection because material contents are under pressure. Always wear gloves when handling materials and solvents. Refer to Safety Data Sheets (SDS) on the material that is used for other precautions.

1.2.8 Best Practices

- Do not wear loose clothes or jewelry when you operate the system
- 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 system 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 incompatibles tools
- Remove door interlocks or bypass safety devices
- Make custom mechanics or fluid delivery modifications
- Change material from the original design

1.3 Portal Computer Requirements

Portal requires an Intel® Core i5 processor or equivalent processor with 4 Gigabytes of RAM, 2 Gigabytes free hard drive space and Windows® 7 Operating System or newer. Your computer must also have:

- (2) Ethernet adapter
- (1) RS232 serial communications port
- 17" monitor with 1280 x 1024 resolution
- Mouse (USB)
- Keyboard (USB) with a touch pad if used with a SONO-TEK monitor mount
- Keyboard extension cable, 6'
- Mouse extension cable, 6'
- Monitor cable, 15' (Display port or DVI)
- DisplayPort or DVI video support (VGA cannot be used)
- CDROM drive

Portal may not work correctly with systems that do not meet these minimum requirements.

1.3.1 DIP SWITCH/JUMPER SETTINGS

NOTE: During normal operation there is no need to adjust the dip switch settings. If communications between the computer and the controller are not reliable, lower the baud rate on both until communication is satisfactory.

| Switch(2200) | Position | Description |
|--------------|----------|---|
| MRST | OFF | Master Reset |
| XON | OFF | Software Handshaking |
| HSHK | ON | Hardware Handshaking |
| 9600 | OFF | Baud rate selection |
| 19.2 K | ON | Baud rate selection |
| 38.4 K | OFF | Baud rate selection |
| 10B | OFF | Hardware Option |
| ENET | OFF | Use Ethernet port as default for unsolicited messages |

Table 1 – DMC-2200 Dip Switch Settings

| Jumper(4000) | Position | Description |
|--------------|------------|----------------------|
| OPT | Not Jumped | Master Reset |
| MO | OFF | Software Handshaking |
| 38.4K | ON | Hardware Handshaking |
| 19.2 K | ON | Baud rate selection |
| UPGD | OFF | Baud rate selection |
| MRST | OFF | Hardware Option |

Table 2 – DMC-4000 Jumper Connections.

NOTE: Baud rate is 9600 with both baud rate selections not jumped and 115200 with both jumped.



CAUTION: If hardware handshaking is enabled, the program uses the message command and a computer is not attached to the Main RS-232 port, the controller eventually halts. The program included does not contain any message statements.

1.3.2 Galil Controller Requirements

Galil controller minimum of DMC 2000 or newer. Controllers must be purchased from SONO-TEK.

1.3.3 Security Software

Some security software packages and firewalls can interfere with SONO-TEK system software. SONO-TEK software uses Ethernet ports 23, 60007, and 502 by default. Security software and firewalls must be configured to allow traffic on these ports.

1.4 Operator Skills

The operator must have basic computer skills and be familiar with the Windows® 7 operating system.

1.5 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 system. Refer to the Safety Data Sheets (SDS) for the dispensed material. |
| Hazards Due to Contact | The system 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 system has power. |

Table 3 – Environmental system concerns

1.6 System Location

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

1.7 Handling, Transportation, and Storage

1.7.1 Handling and Transportation

The system 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. Use a forklift to gently move the system. Make sure the forks are all the way in and that the blades reach from front to back.

1.7.2 Storage

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.

1.7.3 Temperature and Humidity

Store the system in an area that is 40°F - 105°F (4°C – 41°C) and low humidity. Do not let condensation collect on the machine.

2.0 Installation, Upgrade, and Recovery

Before you operate a tool, the system, or program a path, know the machine components and the steps to program a path. Systems from SONO-TEK will come with the current version of Portal installed. Refer to the installation guide for more information.

NOTE: Restart the computer after you install or upgrade Portal or Portal Shell.

2.1 Tools and Material Needed

The following tools and material are necessary for this procedure:

- Wrench kit
- Adjustable wrench
- Forklift
- Work gloves
- Tie wrap cutters
- Safety glasses
- 9/16 wrench
- 3 mm hex key
- 4 mm hex key
- 5 mm hex key
- Utility knife
- Level
- Small and large flat head screwdriver

2.2 Uncrate and Inspect

- Use the Utility knife to cut the straps and the shrink wrap.
- Remove the cardboard/plywood.
- Remove all packing materials and straps.
- Use a 9/16" wrench to remove the bolts that anchor the system to the floor of the crate, there are two (2) bolts in each foot (8 Total).
- Use a forklift to gently remove the system off the pallet. Lift the system from either the back or the front. Make sure the forks are all the way in and that the blades go all the way under the system (from front to back).

2.2.1 To Place the Dispense System

- Move the system to the necessary location.
- Adjust the forklift height until the system is at the necessary height.
- Loosen the lock nuts on each foot of the system, if necessary.
- 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.

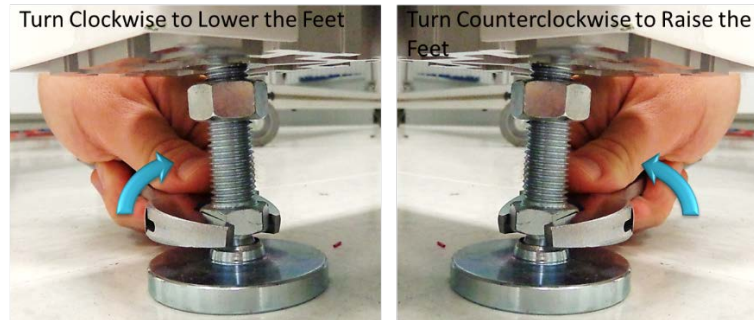


Figure 1: Adjust the Feet

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

- Gently lower the system and remove the forklift.

NOTE: It is not necessary to tighten the lock nuts at this time.

2.2.2 Inspection

- Open the doors and remove all straps, tie wraps, and sponges around the dispense heads and gantry.
- Fully examine the system for damage, loose fasteners, etc. Use your hands to move the X and Y-axis slide to the center of the work area.
- Examine all tubing connections, gauges, and regulators.
- 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.
- Make sure all cables and connections are fully and correctly installed.

2.3 Install Light Tower (If Applicable)

- Find the light tower on the top rear of the system.
- Remove all packaging and material from the light tower, this includes: wrapping paper, bubble pack, and tape.
- Find the light tower connection on the top of the system.
- There will be a nut on the top of the system and a lock nut and washer inside the system. Remove the bottom lock nut and washer.
- Align the mast to the extrusion. The power cord should go through the hole down inside the system.
- Tighten the lock nut to the bottom of the light tower mast. Use an adjustable wrench as necessary to tighten.



Figure 2: Light Tower Connection

- Connect the two ends of the light tower cables.



Figure 3: Light Tower Cable Connected

2.4 Install the Teach Pendant

- Find the teach pendant and connect the end into the 15 pin connector on the front of the system.
- Use a small flat head screwdriver to tighten the two screws on the teach pendant connector into the threads on the system.



Figure 4: Teach Pendant Connection

2.5 Connect the Computer

- Connect computer power as per steps recommended by PC manufacturer. Connect monitor, USB communication, Galil ethernet cord, keyboard, and mouse to computer.

2.6 Level the System

This is the procedure to level the system. If the system will be used as an in-line system, it needs to be leveled and aligned with the upstream and downstream systems. This document does not include procedures for upstream and downstream systems. Alignment procedures should be developed and followed by your facility.

- Put the level in the center of the front conveyor.

- Look at the position of the bubble in the level window. The bubble will be centered between the two lines when the system is level.
TIP: If the bubble is outside or closer to the right line, raise the left side of the system. If the bubble is outside or closer to the left line, raise the right side of the system.
- If necessary, loosen the locking nut on each foot with an adjustable wrench.
- Use an adjustable wrench to adjust the feet of the system. Put the wrench on the flat (unthreaded) part of the pedestal and turn in the necessary direction until the system is level from side to side.
TIP: Turn the pedestal clockwise to raise the system. Turn the pedestal counterclockwise to lower the system. Refer to Figure 1.
- Put the level along the length of the rail to check for level at both ends of the conveyor's rails.
- Look at the position of the bubble in the level window. The bubble will be centered between the two lines when the system is level. Do steps 3 and 4 to make the system level.
- Put the level across the center of the conveyor's rails, with one end on the front conveyors and one end on the back rail.
- Look at the position of the bubble in the level window. The bubble will be centered between the two lines when the system is level. Do steps 3 and 4 to make the system level.
- In each corner, put your hands on top of the system and push down. If one of the feet does not touch the ground the system will rock back and forth. Adjust the feet so that they all bear equal weight.
- After you check the corners, level the system from side to side and front to back again, if necessary.
- When the system 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 system feet counterclockwise until they are tight.

2.7 Power Up

After the accessories are installed, connect the system to compressed gas and power supplies. After the system 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.

- Plug the machine into an appropriate power source as shown on the legend plate on the rear or 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 systems shipped from the Sono-Tek 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 system to the facility power source.

- Find the main gas regulator.
- Attach the system to the facility gas supply. There is a ¼" NPT female fitting at the rear of the machine. Connect to a source of clean, dry gas. A hose of ¼" inside diameter is sufficient.
- Slowly open the facility gas valve.
- Close any access doors and engage the Emergency Stop button.
- At the rear of the machine, turn on the red gas lockout valve.



Figure 5: Example of a Red Gas Lockout Valve

- Attach the exhaust to the exhaust port. It is necessary that there is an exhaust of 90-150 CFM (check system configuration) for the system to operate.

- Turn the main power switch “On”.



Figure 6: Example of a Main Power Switch

- Open Portal and follow the on-screen instructions to perform the safety check and homing routines.
- Select Manual mode and manually (using teach pendant) move the head around the entire work area. Make sure there are no components that can be hit by the head in the work area.
- Make sure that the pneumatic and electrical cables do not decrease the head’s travel and will not be cut or snagged when moved. Please contact Technical support if there are any problems.
- Close the doors.

2.8 Machine Communications (SMEMA)

For manufacturing lines (multiple machines with conveyor systems) SMEMA cables must be connected in the correct manner for the individual modules to communicate reliably. Not all systems have SMEMA plugs.

NOTE: On the diagrams the J# refers to the label on the machine, not the label on the cable.

The Surface Mount Equipment Manufacturers Association (SMEMA) Electrical Equipment Interface Standard is used to make sure the sequence of boards is correct. If you do not have these connections, boards cannot move from one machine to another. SMEMA cables have male 14-pin, amp-type CPC connectors. The cables are straight through, so orientation does not matter. SMEMA machine plugs may be on the inside or the outside of the machine, depending on the system.

Each machine must have the same transport conveyor height from the floor to the bottom of the PC board. For equipment with an adjustable conveyor width, the front rail is not adjustable. The range of adjustment will change with the system. Two signal lines will be used: Ready and Board Available. On each module, the cable to the J1 (Previous) plug must connect to the J2 (Next) plug on the machine upstream. The J2 plug on each machine must connect to the J1 plug on the machine downstream, as shown in the following diagram:

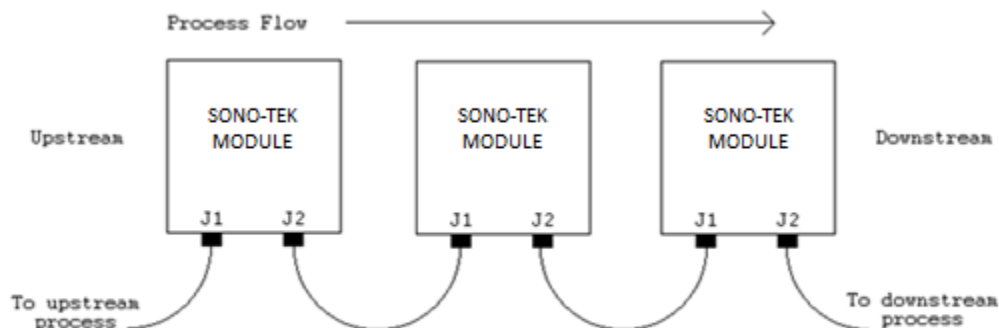


Figure 7: SMEMA Diagram

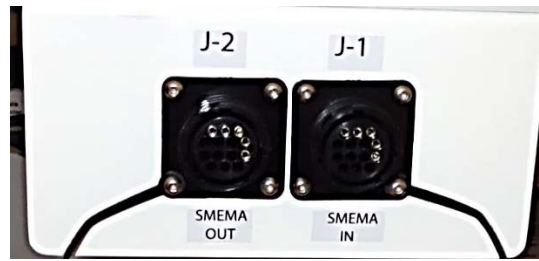


Figure 8: SMEMA Machine Plugs

NOTE: For bidirectional machines there may be J3 and J4 that follow J1 and J2 respectively.

2.9 Upgrade Portal

Upgrading Portal may include, but not is limited to, main program changes and configuration file changes. Before you upgrade Portal on any system, do the backup procedure and contact SONO-TEK for additional guidance.

2.10 Backup Portal

To backup Portal, copy and save the entire contents of the 'C:\Program Files (x86)\Portal\Config' and 'C:\Program Files\Portal\Lib' directories.

2.11 Restoring Portal

To restore Portal, do the installation process and then paste the backup 'Lib' and 'Config' folders into the 'C:\Program Files (x86)\Portal' directory.

3.0 System Overview

3.1 Software

The complete Portal software package has several components. Every operator must understand what each piece of software is and its function before operating the system.

3.1.1 Portal

Portal is the main user interface that allows the user to interact with the system. It sets the mode the system is operating in, allows the operator to monitor each device of the system, allows the operator to select different PathMaster® routines, and conveys system messages to the user.

3.1.2 PathMaster®

PathMaster® is SONO-TEK's Windows®-based programming software. It is used to create, maintain and download project files for the system. Refer to the PathMaster® manual for more information.

3.2 Teach Pendant

SONO-TEK systems come with a teach pendant. Each teach pendant has a Trackball, Teach button, Purge button, Axis selection button, and LED indicators for selected axes and Teach function.

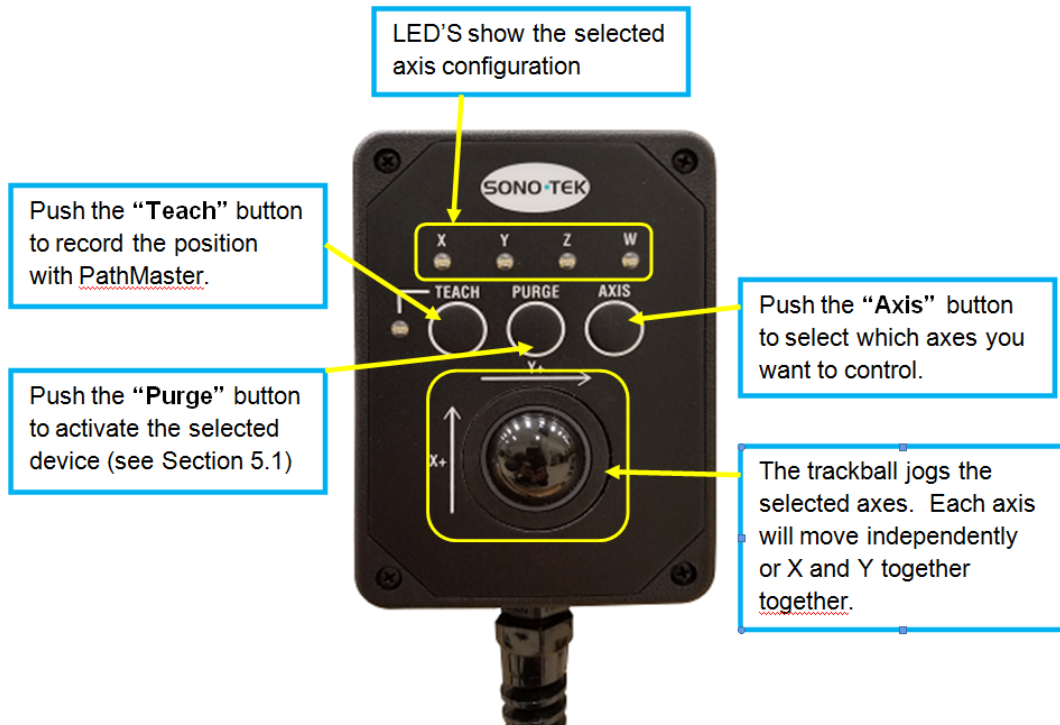


Figure 9: Teach Pendant

LED's – The X, Y, Z and W LED's show the selected axis configuration. The Teach LED shows a position was correctly recorded by PathMaster®. The light tower buzzer will "beep" when the Teach LED illuminates if the light tower is present.

NOTE: W-axis trackball control is locked if the Teach Tool is enabled, unless the PathMaster® Tool Offset window is open (Setup-> Machine Parameters-> "Tool Offsets"). This is so the operator does not accidentally teach a theta position with the teach tool.

The speed of the trackball can be changed.

1. Push and hold the "Axis" button for three seconds.
2. The red teach light will illuminate and the trackball function will move 10x slower.
3. Repeat Step 1 to change the speed back to normal.

4.0 Portal Overview

The Portal screen has several components. Understanding the sections of the Portal screen will help you to successfully navigate the Portal program.

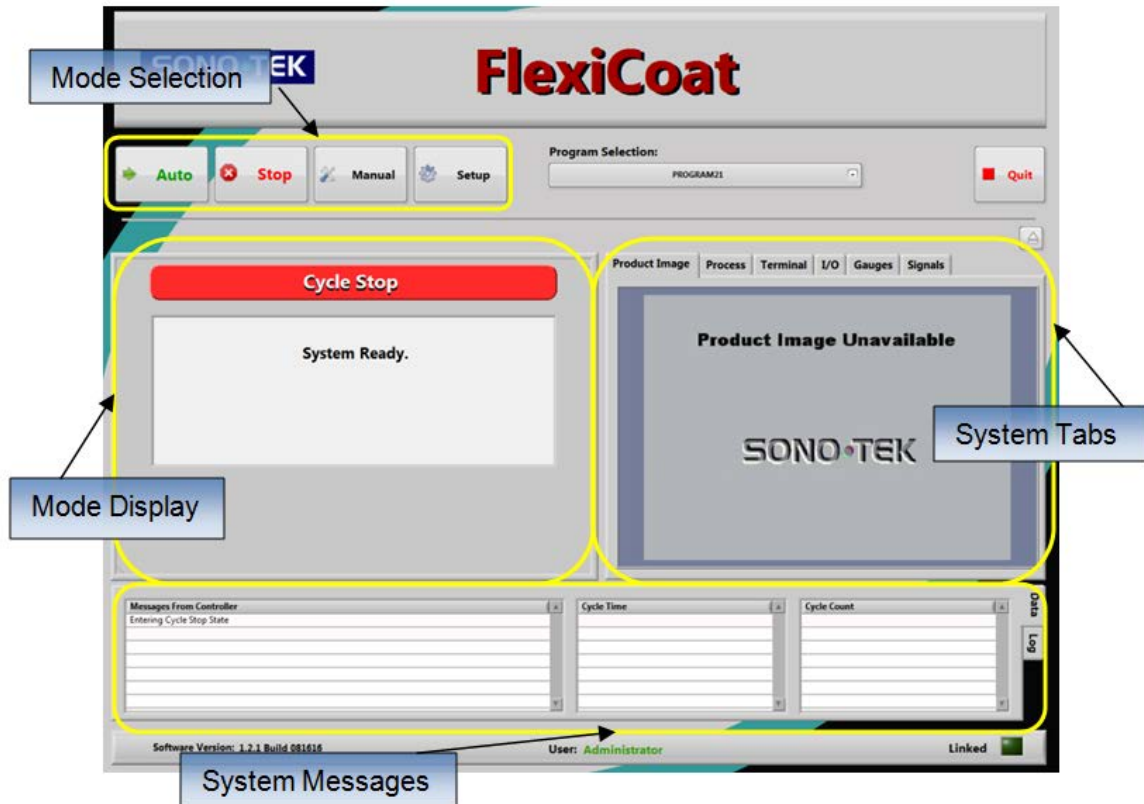


Figure 10: Portal Screen Overview

- Select the necessary Mode from the Mode Selection.

NOTE: You must be in Cycle Stop to select a new mode.

- When you select a mode, the options for that mode will be shown in the Mode Display section of the screen.
- The system tabs section of the screen remains the same no matter what mode you select. This section of the screen contains the terminal used to communicate with the controller. The terminal is used as a debug tool.

4.1 Cycle Stop Interface

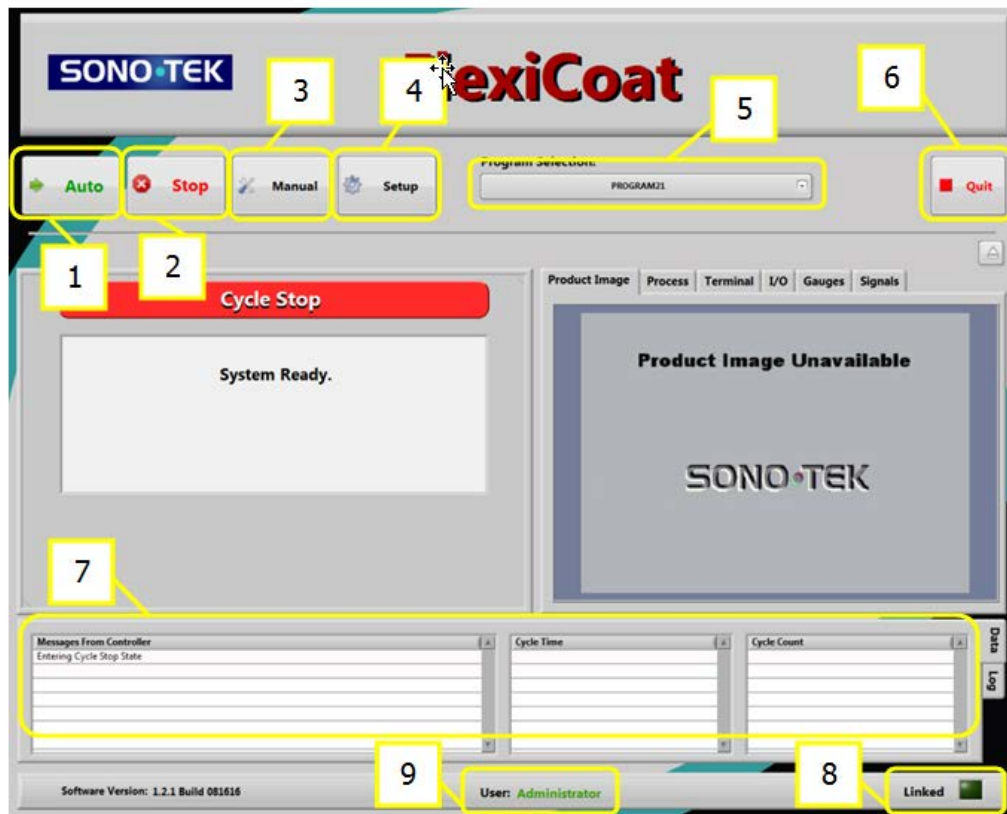


Figure 11: Cycle Stop

After you log in and select “Continue”, Portal opens in Cycle Stop mode. It is the default mode for the system. All other modes and options can be accessed from this mode with the buttons shown. You must return to Cycle Stop to access all other modes.

1. Select “**Auto**” to operate the machine in Auto Cycle. Refer to Section 6.0.
2. Select “**Stop**” to go to Cycle Stop mode from any other mode. There may be a small delay when re-entering Cycle Stop.
3. Select “**Manual**” to operate the machine manually. Refer to Section 5.0.
4. Select “**Setup**” to see or change the setup functions of the machine. Refer to Section 7.0.

NOTE: You must select “Stop” to change from one mode to another. For example to go from Manual mode to Auto Cycle you must select “Stop” and then select “Auto”.

5. Select the desired program to use in Auto Mode or Manual Mode Run Tab from the **Program Selection** dropdown menu. Refer to Section 4.2.
6. Select “**Quit**” to shutdown the program (Portal). PathMaster® must be closed before shutting down.
7. All system messages will be shown in the **Messages from Controller** window.
8. The **Linked** display shows the machine “heartbeat”. This indicator will blink while the PC is connected to the system, but NOT while the machine is in an error state.



Figure 12: Linked

9. To change the User, select Cycle Stop and select the User at the bottom of the window.

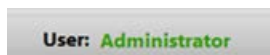


Figure 13: User

4.2 Program Selection

The active program can be changed at any time with the Program Selection drop-down menu. Path programs are downloaded to the motion controller with the PathMaster® software. Refer to the PathMaster® manual for more details on downloading path programs.

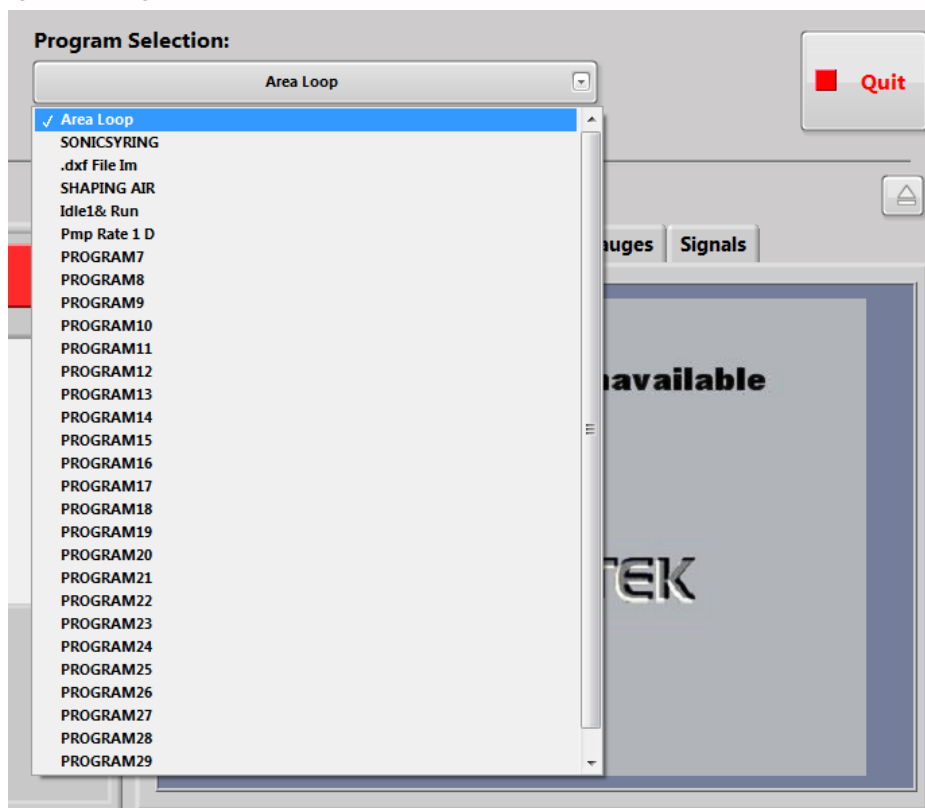


Figure 14: Program Selection

5.0 Manual Mode

The options shown in Portal depend on the system configuration. Refer to your machine specific manuals and appendices for more information.

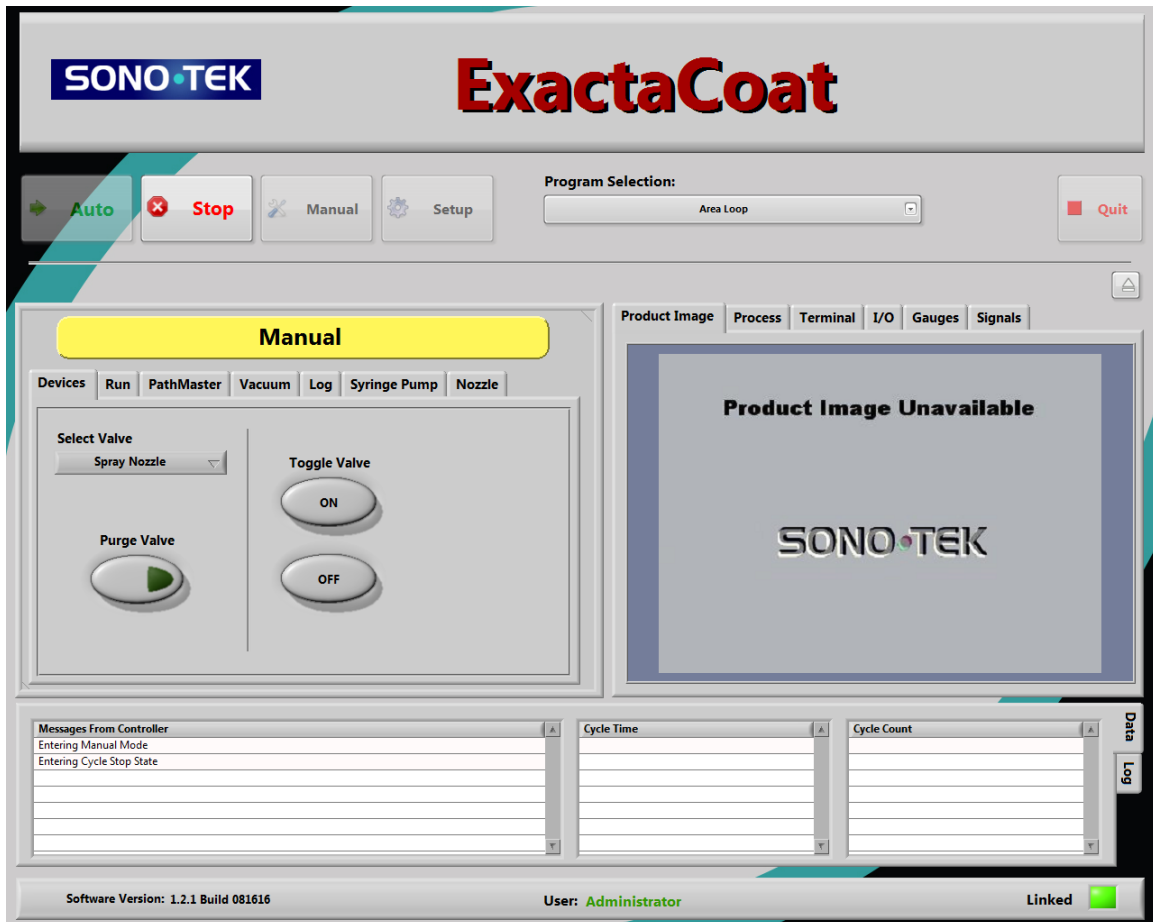


Figure 15: Manual Mode

In Manual Mode, the operator has manual control of all devices on the system. There are tabs in manual mode that are used for different Portal functions. A trackball can be used to move the axes, operate the devices, and teach positions to PathMaster®. Only qualified personnel should operate the machine in manual mode.

While in Portal, a path can be programmed with the PathMaster® software when in manual mode. For more information refer to the separate PathMaster® manual.

- Select **“Stop”** to leave Manual mode and return to Cycle Stop.

The options that most systems have are shown in the sections that follow.

5.1 Device Selection

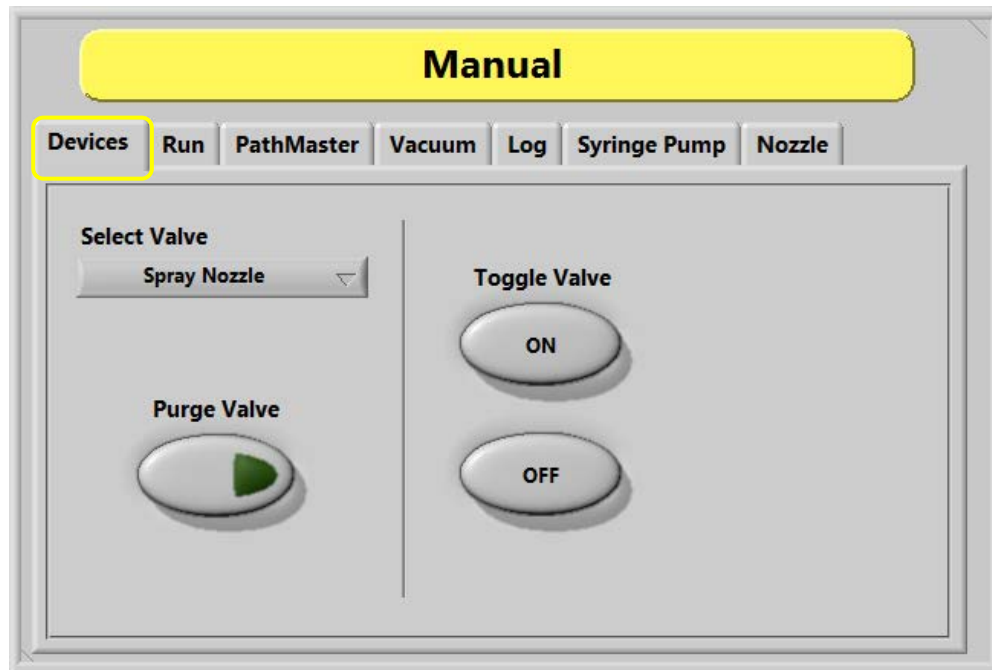


Figure 16: Device Selection, Manual Mode

Systems with devices have Device Selection mode. Select the active device from the drop-down menu under the "Devices" tab. The pneumatic Z-slide(s) and rotary(s) (if equipped) can be operated with the applicable buttons.

NOTE: When you program or operate the system, do not use the nozzle to move components or boards. SONO-TEK is not responsible for damages caused from operating the machine components incorrectly.

1. Select the "Devices" tab.
2. Select a device from the **Select Device** drop down menu.
3. Select "**Purge**" to operate the device selected. The device will run until you release the "**Purge**" button. The "**Purge**" button on the teach pendant is equivalent to this soft "**Purge**" button.

5.2 PathMaster®



Figure 17: Launch PathMaster® from Manual Mode

This tab contains a button that launches the included PathMaster® software.

1. Select the PathMaster® tab.
2. Select **"Run PathMaster"** to open the PathMaster®. The PathMaster® window will open below the Portal screen.

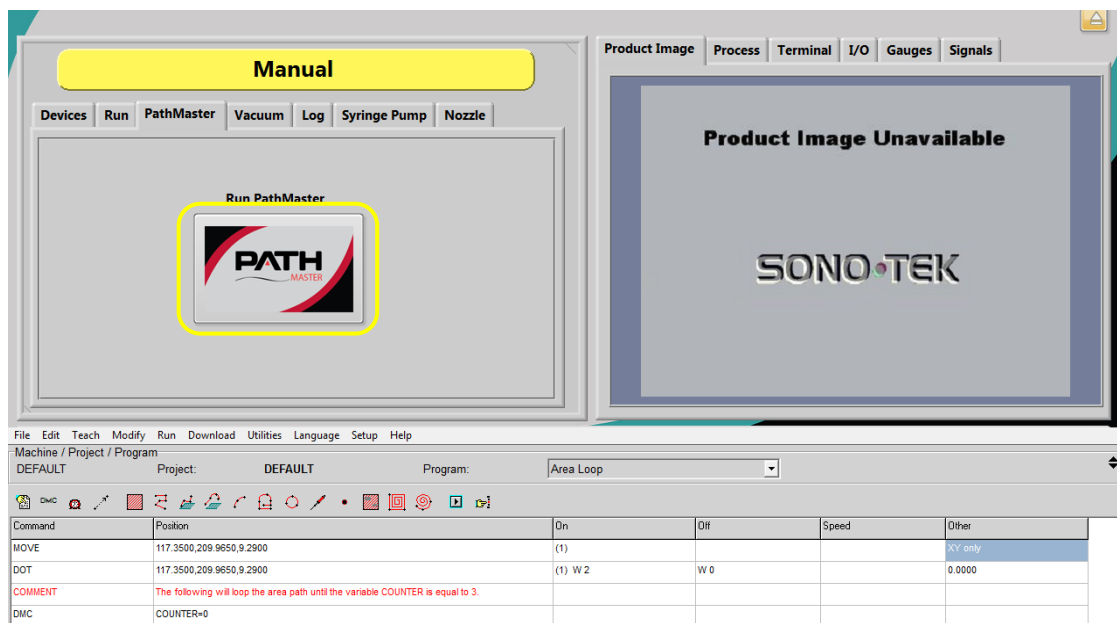


Figure 18: PathMaster® Open in Manual Mode of Portal

5.3 Additional Software Tabs (for Optional or Custom Configurations)

5.3.1 Vacuum: Switch to Vacuum Control

Allows user to turn the four different vacuum zones on and off in any combination.

Will only work if vacuum switch is engaged on the outside of the machine.

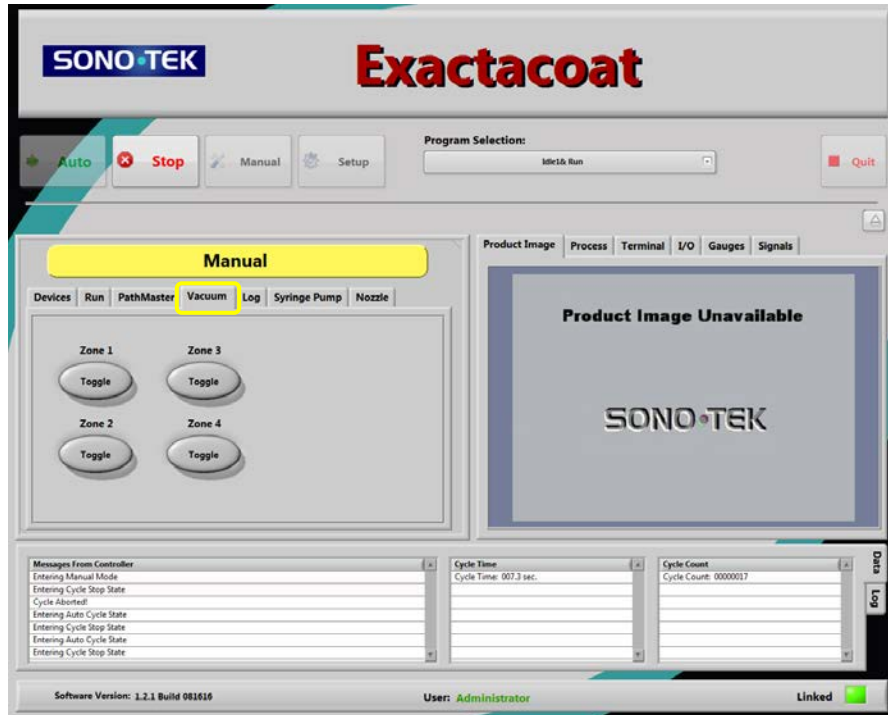


Figure 19 - Vacuum Plate Manual Control Switches

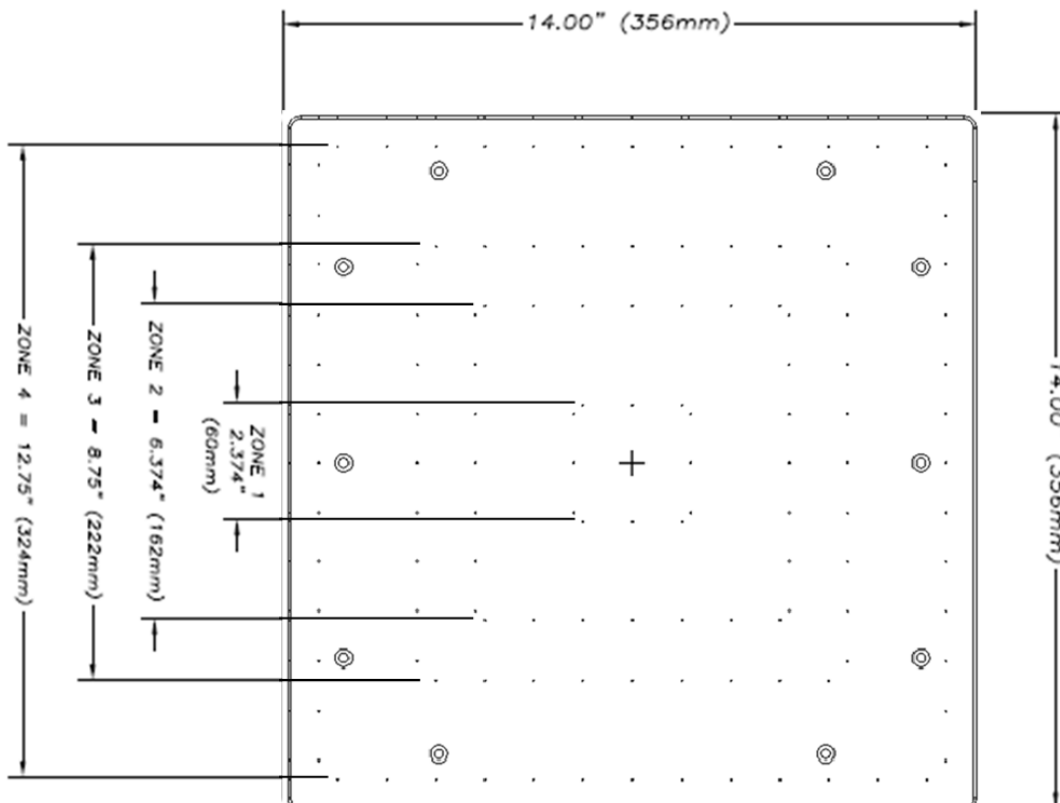


Figure 20 - Standard Vacuum Plate Zone Layout

5.3.2 Nozzles: Generator Control

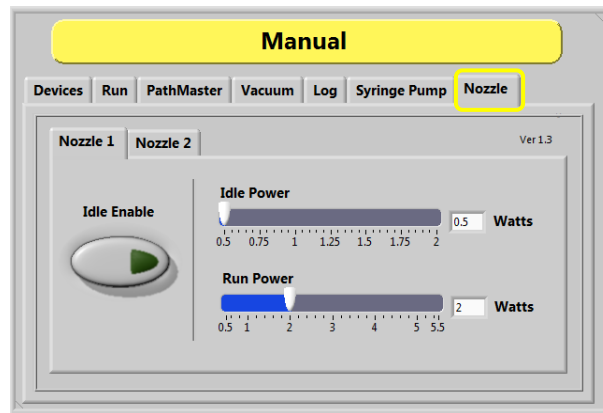
It is important to note the following:

- The set points in Manual Mode for the generator and pump will apply to Auto Mode.
- DMC Commands entered into the Program which set generator and pump values will OVERRIDE the set points that are present in the Manual Mode tab. This way the Program remains constant. These DMC Commands are detailed in the PathMaster[®] manual and example Programs are provided inside the Default Project.

1. Idle Enable: Allows user to enable or disable the idle power function of the nozzle(s).

Idle Power: Allows the nozzle(s) to run at a decreased power when it is not spraying. This allows the nozzle(s) to maintain a lock on its frequency so there is a smoother transition to the desired run power. This functionality can also help to keep the tip of the nozzle(s) clear of any un-atomized liquid. This power level is user adjustable, but should never be above two Watts.

Run Power: Allows the user to adjust what power the nozzle(s) will run at during operation.



5.3.3 Syringe Pump: Pump Control

This tab will allow the user to adjust flow rate of each pump. The flowrate control knob is used only with pumps equipped with analog control (Syringe pump TI or Microflow Pump). *Pumps that don't have analog control capabilities require separate control software.

Pump Configuration: This button is a shortcut to open the system's pump software, separate from the Portal[®] software. This allows the user to adjust the pump settings by bringing up the pump control program. There are several different types of pumps and related control software that are available. Some examples are as follows.

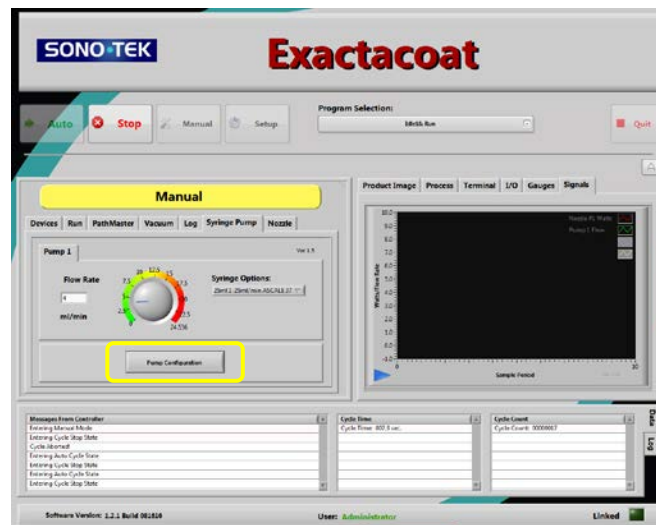


Figure 21 - Pump Configuration Button

Common pump software is shown here:

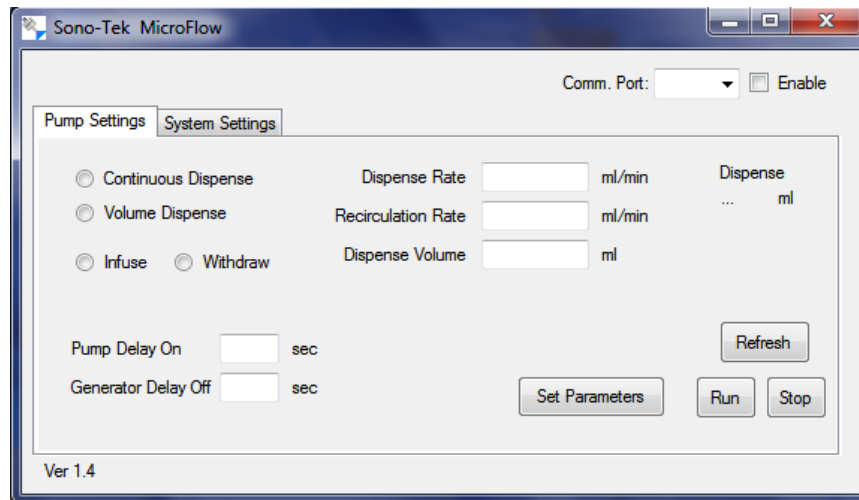


Figure 22 - MicroFlow Pump Software

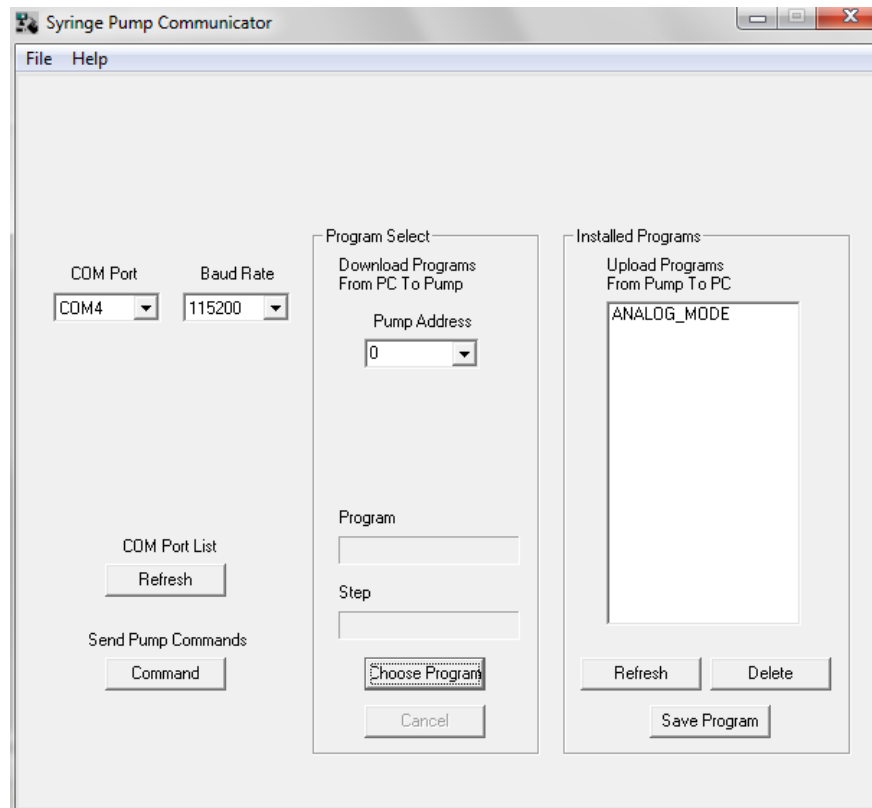


Figure 23 - Syringe Pump Communicator screen for Syringe Pump TI. Used to send commands (such as ASCALE) to the Syringe Pump TI.

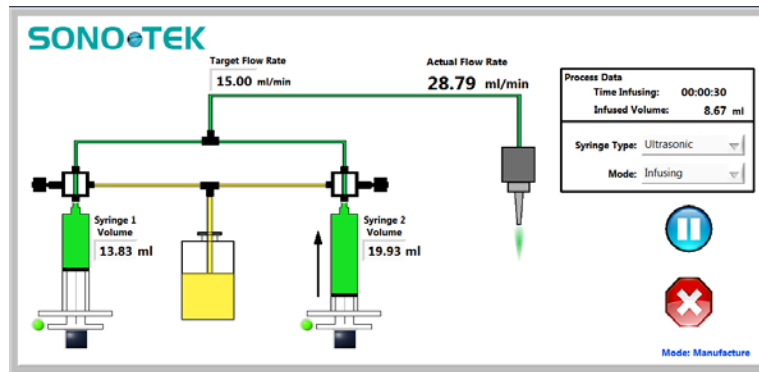


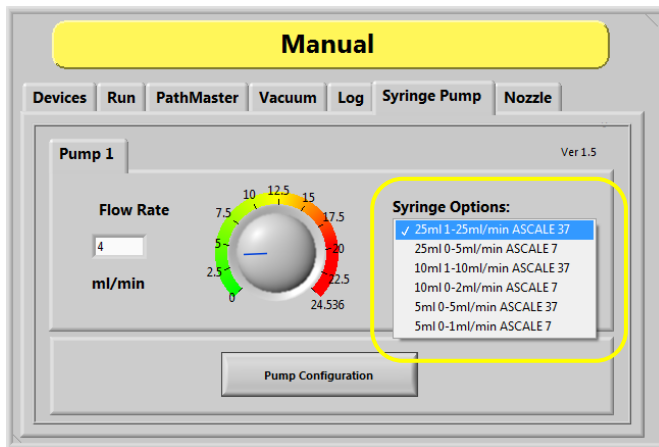
Figure 24 - SonoFlow Fusion Pump Software

Changing Syringe Type

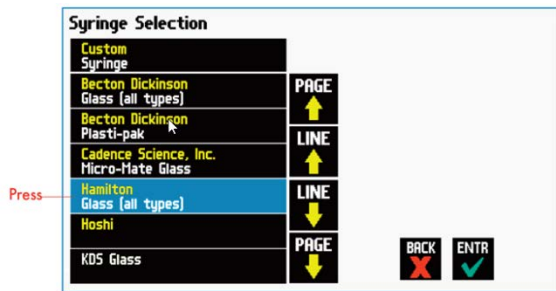
The following describes the order of operations necessary to change syringe type or syringe pump resolution on a Sono-Tek System*. This is provided as an example:

*This sequence of steps can also be found in the Syringe Pump TI manual.

Step 1: Select the appropriate syringe type through Portal Syringe Pump dropdown menu.



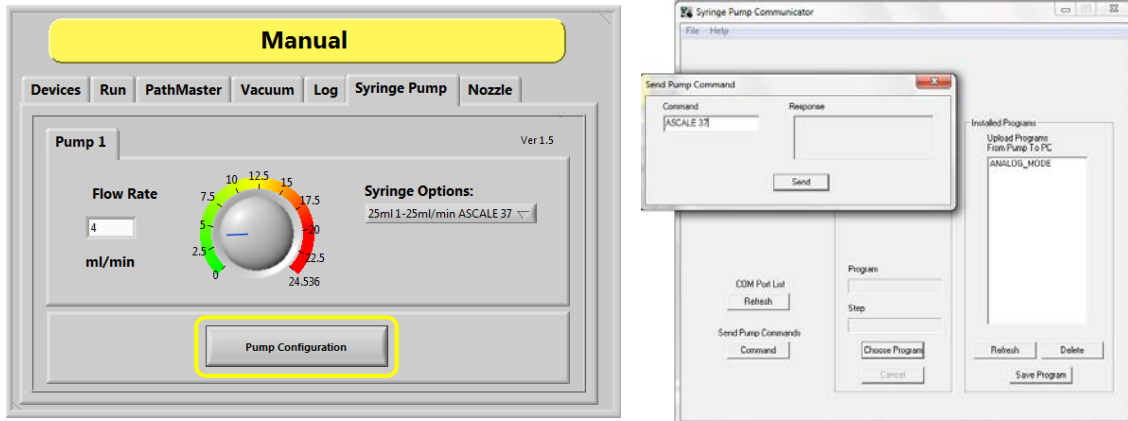
Step 2: Select corresponding syringe type on Syringe Pump TI touch screen (if applicable)



Step 3: Establish communication with Syringe Pump T1 through Syringe Pump Communicator by either clicking the Pump Configuration button in Portal or the Syringe Pump Communicator icon on the desktop.

Step 4: Press **"COMMAND"** and set desired ASCALE value and send to Syringe Pump T1 .

NOTE: ASCALE is used to adjust the resolution of the syringe pump in analog mode. Written in with a space between ASCALE and 37 i.e. ASCALE 37. To change the rate of the refill, use FSCALE 100, where the number in place of 100 is the percentage of full speed.



5.4 Conveyor Control

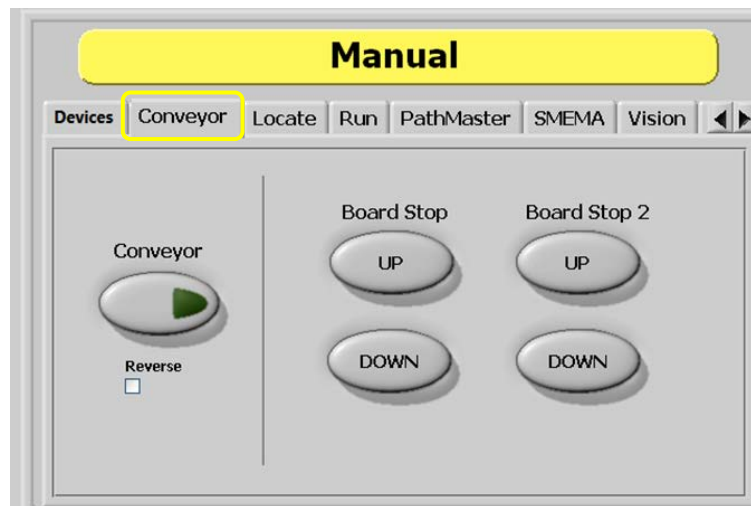


Figure 25: Conveyor Control, Manual Mode

The conveyor and the board stops are controlled under the **"Conveyor"** tab so the operator can adjust the position of boards in the system. Only systems with conveyors will have this option.

1. Select the **"Conveyor"** tab.
2. Select the **"Conveyor"** button to toggle the conveyor on or off.
3. Select the **"Reverse"** (Bi-directional systems ONLY) checkbox to reverse conveyor direction.
4. Select **Board Stop "UP"** to turn the board stops off.
5. Select **Board Stop "DOWN"** to turn the board stops on.
6. **Board Stop 2** operates the upstream board stops for bi-directional systems. Do steps 4 and 5 for **Board Stop 2** to operate the upstream board stop. Could also be for any additional stops like a buffer, queue zone, or conveyor.

5.5 Run Mode

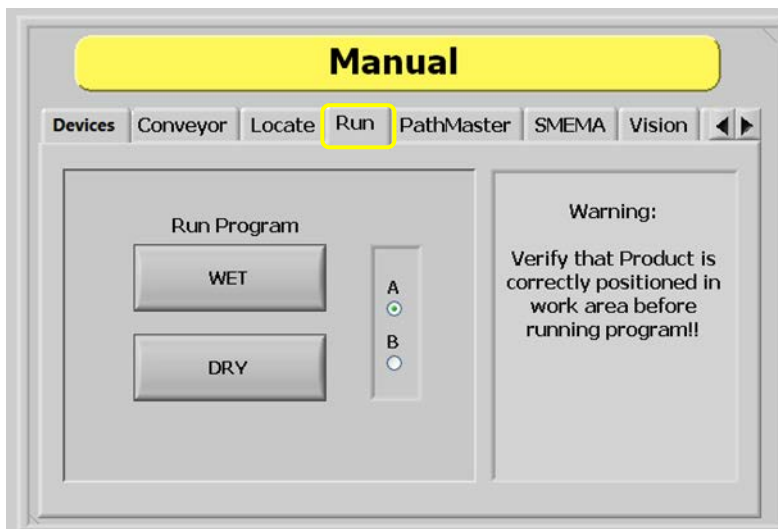


Figure 26: Run Mode, Manual Mode

Within the Run Tab, you can test a downloaded path program for a single cycle. You can run the path as “WET” or “DRY”. Make sure that the part is in the correct position inside the system before the path is run or the results will not be accurate and could damage the system.

1. Select the “Run” tab.
2. Select “A” or “B” (if necessary) to select which side will run. Select “A” for the left side Program Select drop down or B for right side Program Select drop down.
3. Select “WET” to run the selected program with the nozzle on.
4. Select “DRY” to run the selected program with the nozzle off (nozzle will move but will not dispense).

NOTE: Make sure the correct program is selected from the Program Selection drop down menu. Make sure the part is correctly installed and all board stops and locators are in the correct position to prevent a crash.

5.6 SMEMA Status

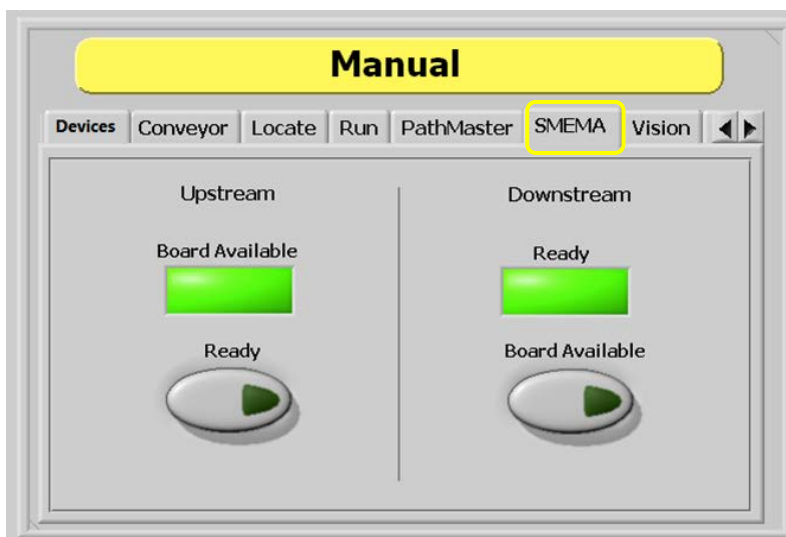


Figure 27: SMEMA Status, Manual Mode

When the system is put in-line with other equipment, SMEMA signals communicate with upstream and downstream machines. You can check the inputs to the system and change the Upstream Ready and Downstream Board Available output signals under the "SMEMA" tab.

1. Select the "SMEMA" tab.
 - a. The Upstream "Board Available" signal turns on when the upstream machine sends a board available signal.
2. Select Upstream "Ready" to toggle the Ready output to the upstream machine on or off. When on, the system can receive parts.
 - a. The Downstream "Ready" signal turns on when the downstream machine sends a ready signal.
3. Select Downstream "Board Available" to toggle the Board Available output to the downstream machine on or off. When on, the system can send parts.

5.7 Optional Heat Plate Control

Turn on the Heat Plate with the On/Off switch

Select temperature using the Up ▲ /Down ▼ keys

5.7.1 Heat Plate Offset



CAUTION: If the following steps are done incorrectly, or other menu options are changed, the temperature controller will have to be sent back to SONO-TEK for reprogramming. This is ONLY to be done if the displayed temperature is different than the measured temperature on the surface of the heat plate

To change the factory calibrated heat plate offset, hold the ▲ and Down ▼ keys for three seconds. The menu that is prompted is seen below.



Press the advance button  until the following option appears



Press Up ▲ and Down ▼ keys to change the temperature offset

Negative values raise the temperature of the heat plate to offset a cooling factor

Positive values lower the temperature of the heat plate to offset over heating

Press the Reset, or Infinity  button repeatedly to back out of each menu

5.7.2 Temperature Monitoring

If the temperature is greater than 5°C outside of the setpoint, 'Heater Not at Temperature' alarm will display. The heat plate will then need time to heat up or cool down.

6.0 Auto Mode



Figure 28: Auto Cycle

In this mode, the system automatically processes parts as they are available. The door bypass switch must be in the **OFF** position to enable running in Auto. If it is on when entering Auto mode, a message will prompt the operator to turn it off. If the door bypass is turned on while the system is already in Auto Mode, the machine will E-Stop and the operator will be prompted to Continue into Cycle Stop. Several configurations exist for delivering parts to the process chamber in Auto Mode. The three most common setups are:

- Conveyor equipped
- Stand-alone with a door
- Stand-alone with a light curtain

For systems with a conveyor, the part is put on the conveyor by an operator or through an upstream process. The part is sensed at the entrance of the system and is sent to the stop. When the part is against the stop, it is sensed and the PathMaster® program will begin. When the PathMaster® program is finished, the board is sent to the end of the conveyor for the next step. When the part is released or removed, the procedure starts again.

For systems without a conveyor, all parts must be loaded into the machine manually. The message shown in Figure 28 will be displayed upon entering Auto Mode. The operator is unable to start a cycle until the door has been opened and closed, to allow placement of the part. Once a part is placed, the soft Cycle Start button or the physical Cycle Start button on the exterior of the machine will run the program selected from the Program Selection dropdown menu. Optional part-in-place sensors sense when a part is present. If a part is not sensed, a “Waiting for Product” message is shown. When the system is ready to operate, use the hand switches to produce parts. Remove all finished parts before the next cycle starts.

If the system has a light curtain, the light curtain can be used to initiate cycles.

7.0 Setup Mode

The options shown in Portal depend on the system's configuration. Refer to your machine specific manuals and appendices for more information.

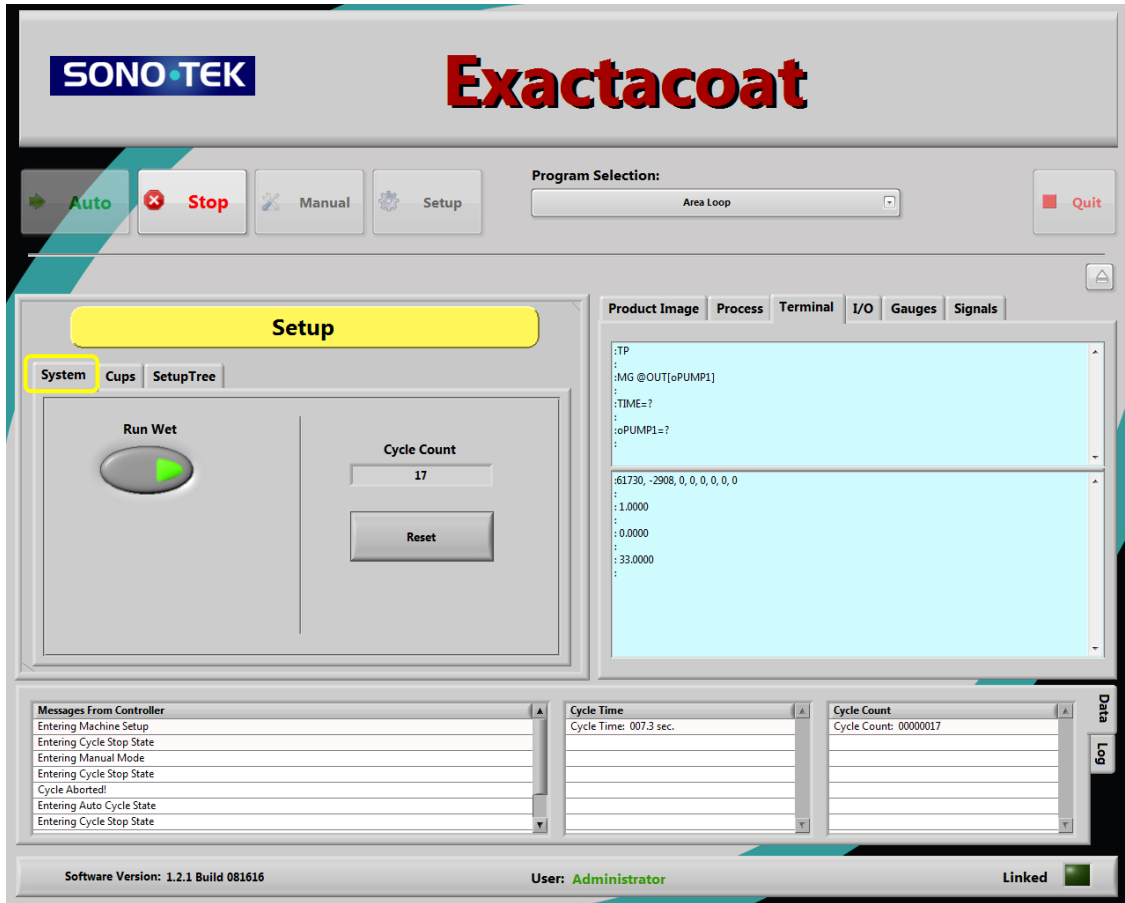


Figure 29: Setup Mode

In Setup mode you can control basic system functions. Auto Cycle parameters and some machine specific settings are either enabled/disabled or adjusted in Setup Mode. Each system will have a unique **SETUP TREE**.

7.1 System

1. Select the **"System"** tab.
2. Select **"Run Wet"** to toggle it on or off. When the Run Wet is set to off, the nozzle will not spray in Auto Cycle. This does NOT affect the run option in the Manual mode. There is a separate option in Manual mode to select **"Wet"** or **"Dry"**.
3. Select **"RESET"** to reset the cycle count to zero.
4. Select **"Stop"** to leave Setup mode and go to Cycle Stop.

7.2 Auto Purge/Solvent Cups Setup

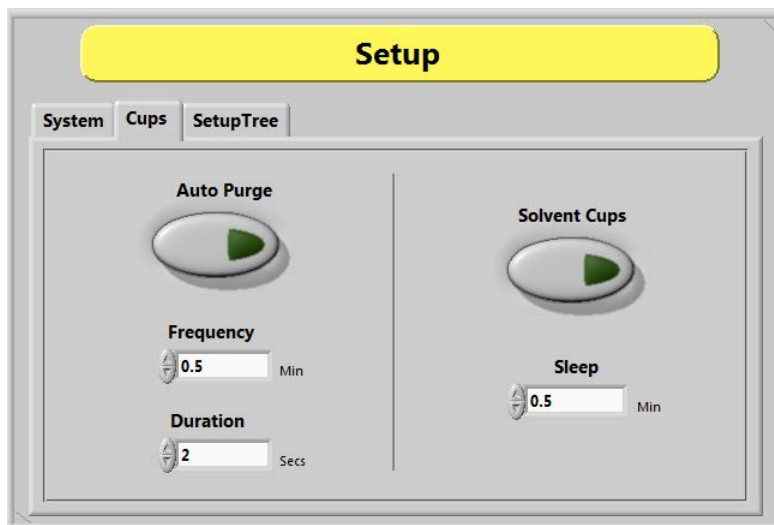


Figure 30: Auto Purge and Solvent Cups Setup

With the Cups Tab, you can set the purge and/or solvent cup features. Auto Purge sprays material from the nozzle at specific intervals to prevent them from clogging. For systems with multiple nozzles, a Setup Tree item will allow operators to select which nozzle(s) to purge. The solvent cups feature allows the nozzle tip to park in a solvent reservoir when the machine is inactive. This can help prevent solidification of material on the nozzle tip. The default setting depends on the material used. The system only auto purges when in Auto Cycle or Cycle Stop. The system does not auto purge in other modes but will immediately auto purge when returned to Cycle Stop or Auto Cycle, if necessary.

NOTE: *If the system has solvent cups, the solvent cup routine overrides the auto purge settings. The system will only purge when necessary with the solvent cup sequence. The location of the cups is different for every machine.*

1. Select the **"Cups"** tab.
2. Select **"Auto Purge"** to set the function to on or off. Solvent cups must be off for the auto purge function to work.
3. Use the up and down arrows to set the **Frequency** in minutes of how often the nozzle will purge. Or, type the necessary value in the box.
4. Use the up and down arrows to set the **Duration** in seconds for the time the nozzle will purge for (applies to both auto purge and solvent options). Or, type the necessary value in the box.
5. Select **"Solvent Cups"** to turn the solvent cups on or off. When the solvent cups are on, the auto purge function is overridden. The nozzle will purge any time they move out of the solvent position (not in manual mode).
6. Use the up and down arrows to set the **"Sleep"** value in minutes. Or, type the necessary value in the box. The sleep value is duration of inactivity during auto cycle before the heads move to the solvent cups.

NOTE: *The location of the cups is specific to each machine's particular nozzle configuration. Impact nozzles cannot utilize the solvent cups functionality.*

7.3 Setup Tree

Each machine has a unique set of items in the Setup Tree tab. One example is shown below in Figure 28. Common items include alarm set points and enable/disable of system options.

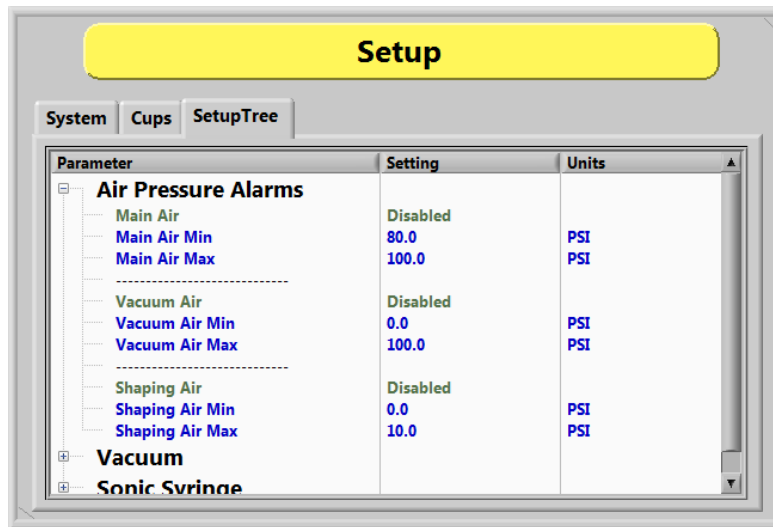


Figure 31 - Common Setup Tree air pressure alarms

8.0 System Tabs

There are six standard system tabs: Product Image, Process, Terminal, I/O, Gauges, and Signals. The options shown in Portal depend on the system configuration. Refer to your machine specific manuals and appendices for more information.

8.1 Product Image

The product image tab will show an imported image or the sample image shown below.

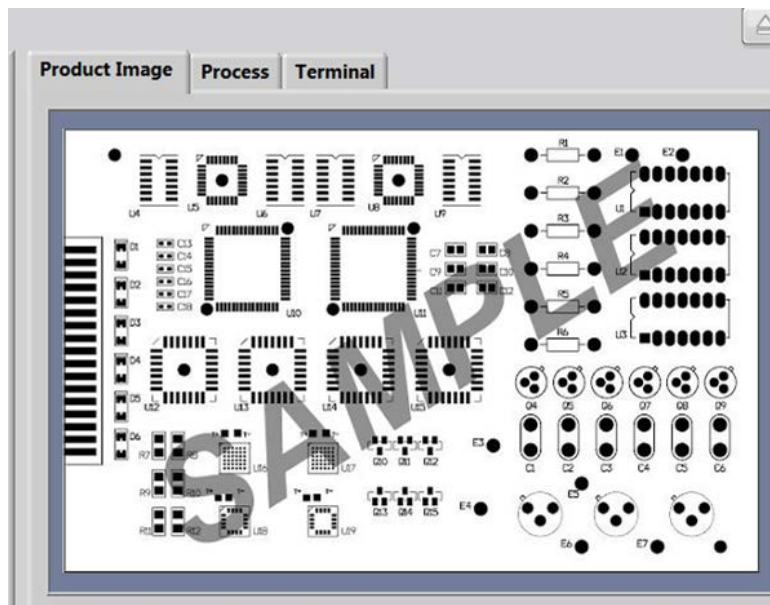


Figure 32: Product Image Tab

If the file name does not match the Program name or there are no images associated with a program, the following image will be displayed:



Figure 33: Product Image Unavailable

8.1.1 Adding Product Images

1. Copy and Paste the Product Image to the following Directory:
C:\Program Files\Portal\Images (32-Bit) or C:\Program Files (x86)\Portal\Images (64-Bit)
Note: The images must be JPEG/JPG file type.
2. Rename the file to match the PathMaster® Program Name.

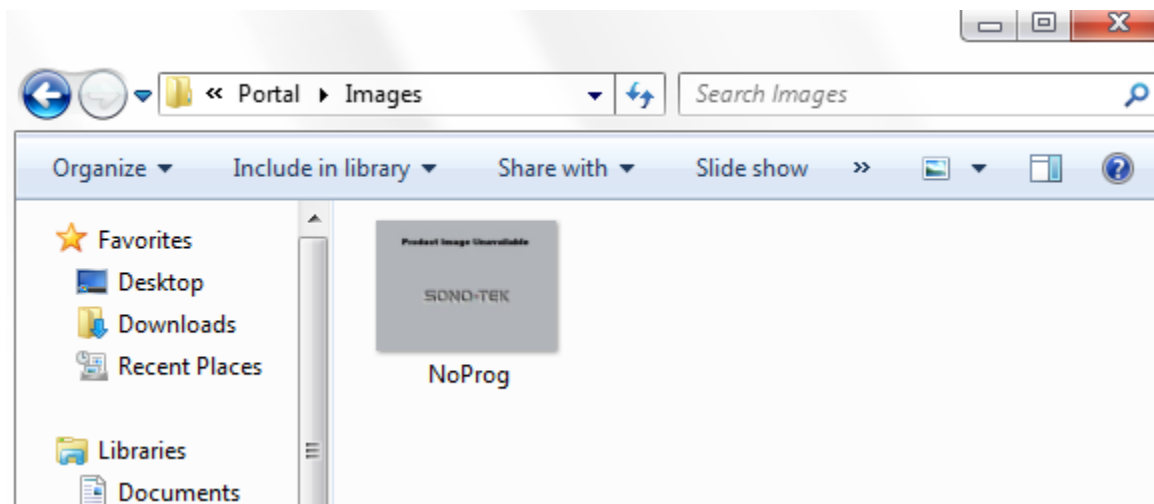


Figure 34: Product Image Directory

8.2 Process

8.2.1 Process Product

The **Product** tab is on the right hand side of the System Tabs section under the **Process** tab. This screen shows cycle count and cycle time. The data is updated after every run.

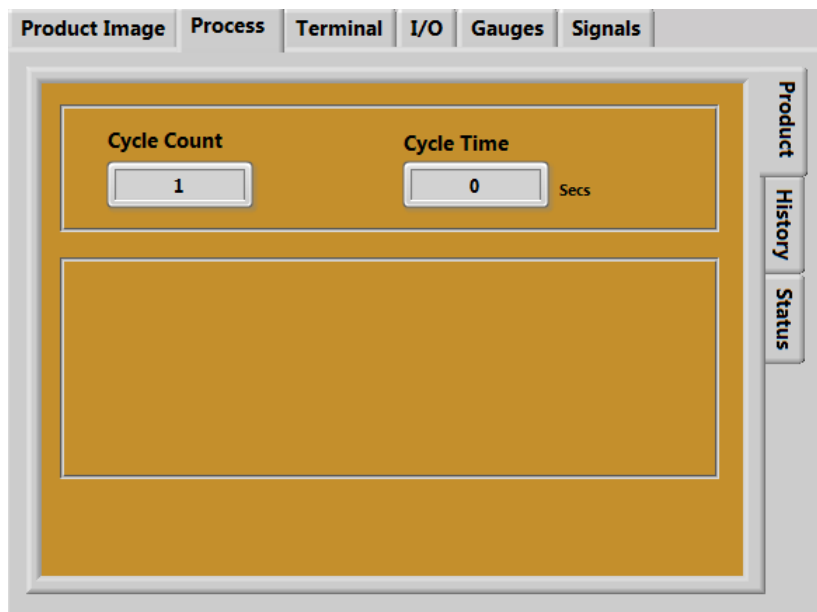


Figure 35: Process Product Tab

8.2.2 Process History

The **History** tab is on the right side of the system tabs screens under the **Process** tab. This screen shows the volume of material sprayed over the lifetime of the pump (Total Volume) and over the previous run cycle (Cycle Volume). Additionally, there is a cycle counter for Auto Mode only, and a runtime indicator of all cycles ran in Auto Mode.

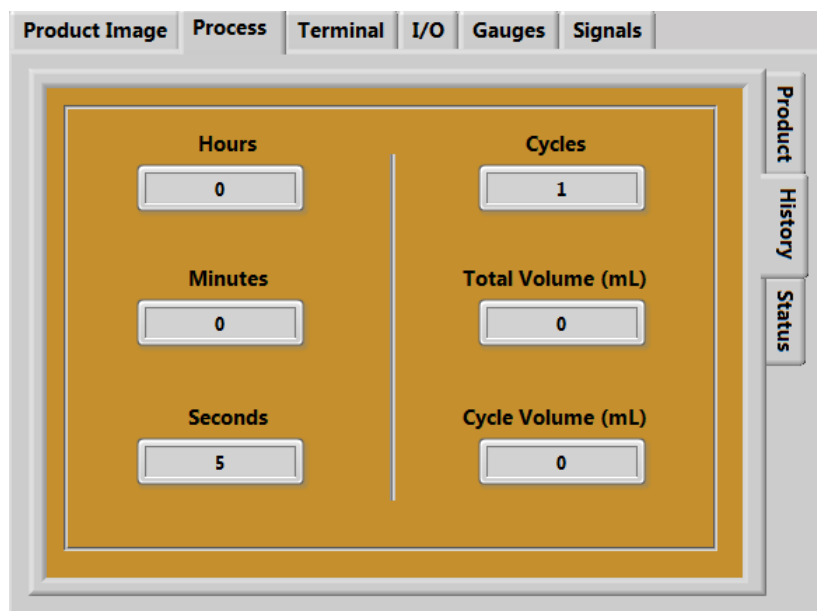


Figure 36: Process History Tab

8.2.3 Process Status

The **Status** tab shows the operator preconfigured system faults and warnings. If multiple nozzles or other tooling options can be interchanged on the system, the Status tab will indicate which nozzle or tooling is selected in the associated Setup Tree selector. The nozzle of tooling indicated in the Process tab must always match the current configuration of the machine to ensure proper operation and avoid danger of crashing any components.

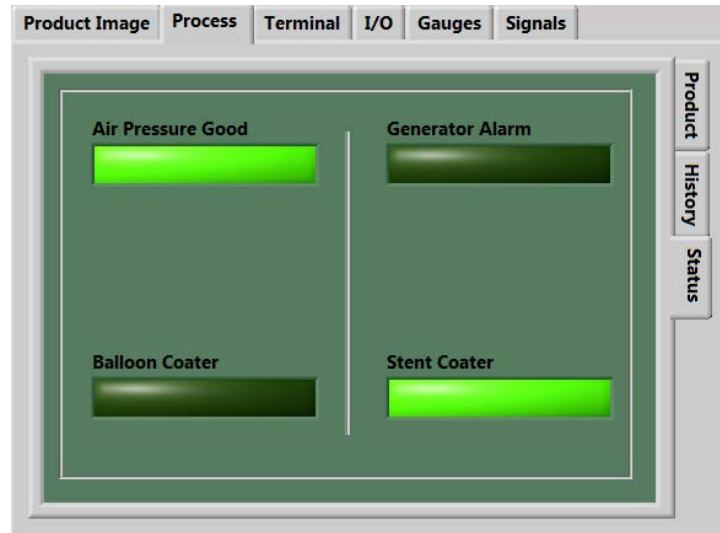


Figure 37: Process Status Tab

8.3 Terminal

The Terminal is as is used as a debugging tool to communicate with the controller. Many DMC commands can be issued through the Terminal (Refer to the Galil Command Reference for details on all DMC commands, including which can and cannot be used through terminal). Additionally, system variables, I/O states, and logical expressions can be queried and/or assigned through terminal. Usage of the terminal should be restricted to individuals trained in the DMC programming language and highly knowledgeable of the machine's operation, or under direct instruction from Sono-Tek.



Figure 38: Terminal

8.4 I/O

The outputs can be toggled on and off and inputs can be verified in this window. Refer to the electrical schematics for I/O designation.



Figure 39: I/O Screen

8.5 Gauges

The gauges tab is used as a digital display for the machine operator to reference.

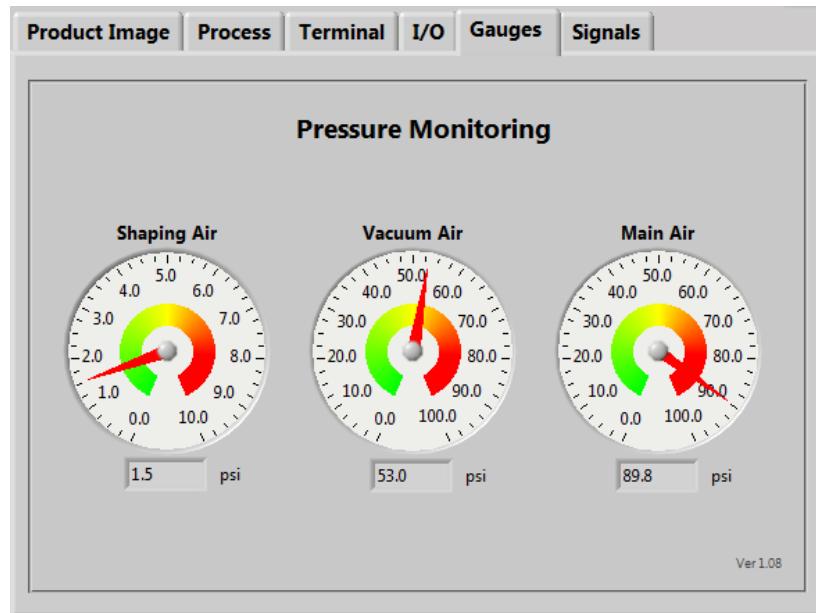


Figure 40 – Gauges

8.6 Signals

The signals tab is used to reference the current running status of the system. Options that can be viewed can include liquid flow rate and nozzle power.

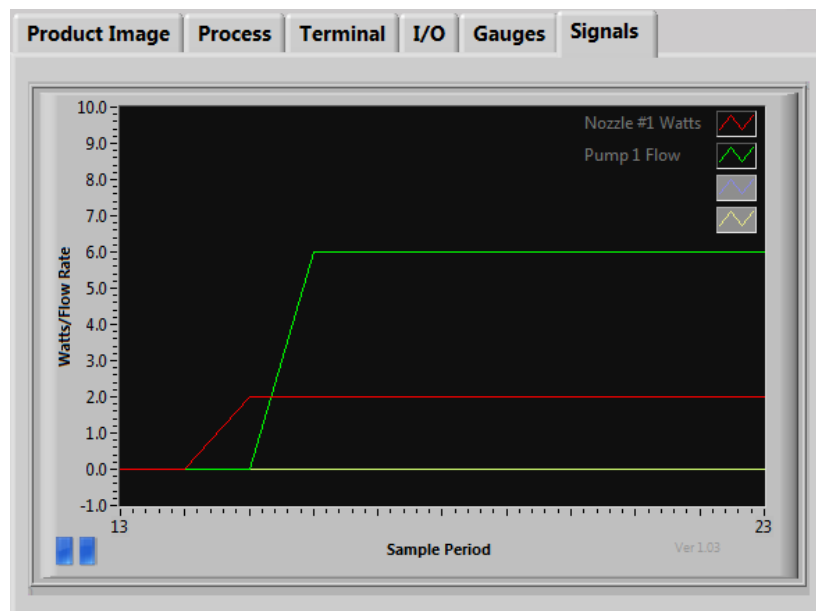


Figure 41 - Signals

9.0 Operation

NOTE: You must have administrator privileges to setup and correctly configure the system. Windows® User Account Control must be turned off.

9.1 Startup Procedure

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

1. Turn the main power switch "On".



Figure 42: Example of a Main Power Switch

2. Make sure the fluid and gas pressures are in the correct pressure range.
3. Close all the doors.
4. Turn the DOOR BYPASS key switch to the "OFF" position (If applicable).
5. Engage the "Emergency Stop" button.

9.1.1 Login to Portal

1. Login to the SONO-TEK Portal Software. Select the correct user and enter the password. Push the “**Enter**” button on the keyboard.
2. SONO-TEK configures the default password as blank. Refer to Portal Permissions for more information.



Figure 43: User Selection

9.2 Exhaust Verification

Once the system has initialized, it will do a test of the exhaust flow rate. The exhaust flow rate is monitored with the on board pressure differential switch. If initialization fails, contact the Sono-Tek service team and follow their direction.

The system must exhaust at a rate no less than 90-150 Cubic Feet per Minute (CFM) (4000 Liters per Minute (LPM)), depending on the machine configuration, otherwise a critical fault will occur and stop the motors. The test will also help to evacuate any vapors that are in the work area. Each machine verifies the exhaust for 60 seconds. The screen below will be shown:

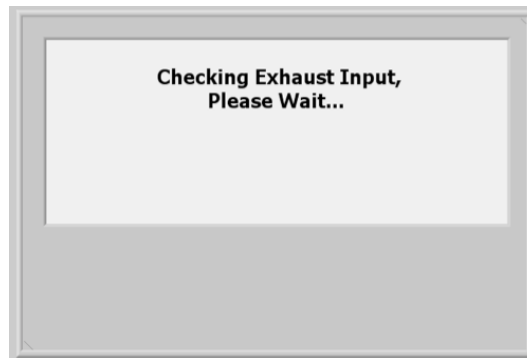


Figure 44: Exhaust Input Screen

9.3 Machine Safety Check

Once initialization and exhaust verification is complete, the operator interface shows the message below

The machine safety check makes sure the system safety devices (Emergency Stop, door interlocks, light curtain, etc.) operate correctly. During startup, the operator must start the safety check and complete it successfully, or the machine stops all operations.

1. Select "**Continue**".

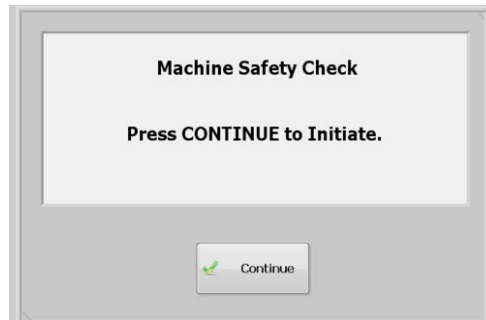


Figure 45: Machine Safety Check

2. You must activate and deactivate the safety devices when shown on the screen. All events in this procedure are timed. If an action is not done in 8 seconds an error screen will be shown.

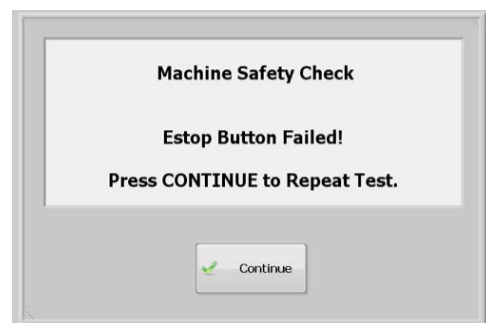


Figure 46: Safety Check, EStop Fail

3. Select "**Continue**" to repeat the test.

After a second failure, the system stops and must be restarted (turn the system power off and on again). The second failure does not have to be for the same device. An Emergency Stop failure followed by a door interlock failure stops the program.

NOTE: If the safety check fails, a qualified person must examine the full system before the machine is operated again. Contact the Sono-Tek service department and follow their instructions.

9.4 Homing the Axes

After the safety check is complete, the screen below is shown.

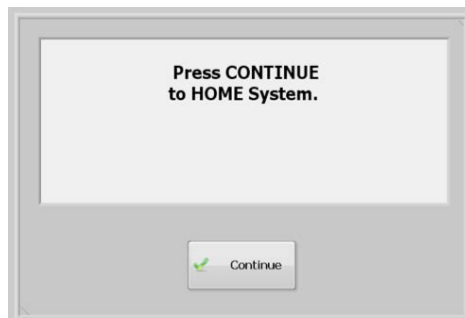


Figure 47: Home the System

1. Select "**Continue**" to home the system.
2. The axes home in the following order: Z, W (if installed), then X & Y simultaneously.

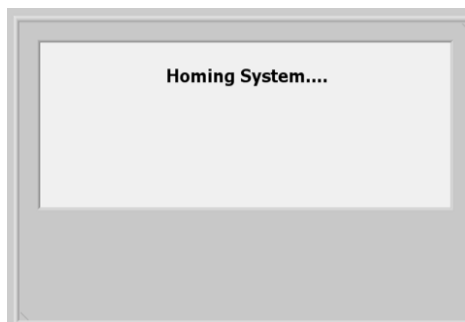


Figure 48: System Homing Screen

9.5 Standby Position

The end effector will move to the standby position when the homing sequence is complete, all calibration procedures are complete, a part is finished being processed, or if the machine is waiting for parts but it is not necessary to move to solvent or auto purge. The standby position is a defined location, different from the home position. Usually, the standby position is in the back left corner. The system always goes back to the standby position in Cycle Stop. If the standby position needs to be changed, contact SONO-TEK.

1. When Portal opens select "**Continue**" to return the heads to standby and go to Cycle Stop mode.



Figure 49: Press Continue Portal Screen

9.6 Shut Down Procedure

If the machine is in cycle, wait for the cycle to finish. The software can then be shut down from any mode.

NOTE: *If your system needs to be flushed before it is shutdown, you must flush the system before you shutdown Portal. Without Portal open, devices cannot be triggered.*

1. If you are in auto cycle wait for the cycle to finish.
2. Select the **"Stop"** button.
3. Close PathMaster®.
4. Select **"Quit"** on the Portal interface, on the right side of the window.
5. The screen below will be shown, select **"Yes"**.

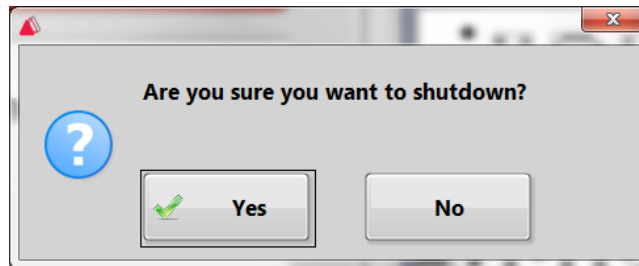


Figure 50: Portal Shutdown Question

A screen will show that Portal is shutting down.



Figure 51: Portal Shutdown Screen

NOTE: *Make sure that the software has been correctly shutdown BEFORE you stop power to the system!*

10.0 Portal Permissions

Each user must have a password and user name. After any changes are made you must log out and log back in for any changes to be seen. To add a user or make changes to the password or user permissions, perform the following steps:

1. Select Portal Permissions from the computer Desktop.



Figure 52: Portal Permissions

2. The administrator must login.

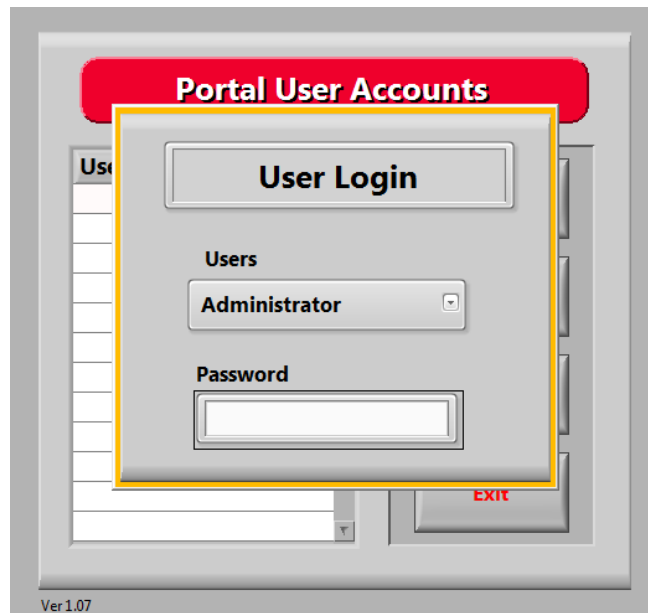


Figure 53: Administrator Login

3. When the administrator is logged in, you have access to portal user accounts and can select the permissions for each user.

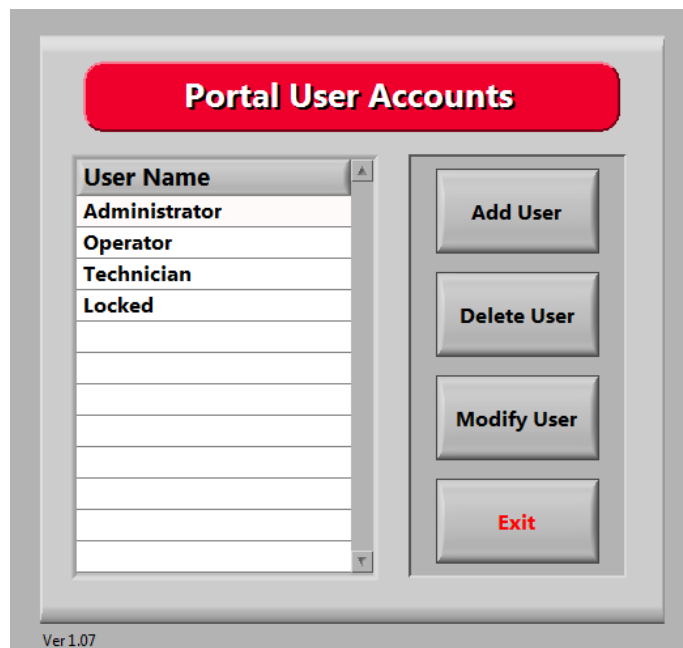


Figure 54: User Accounts

10.1 To Add a User Account

1. Select "Add User".

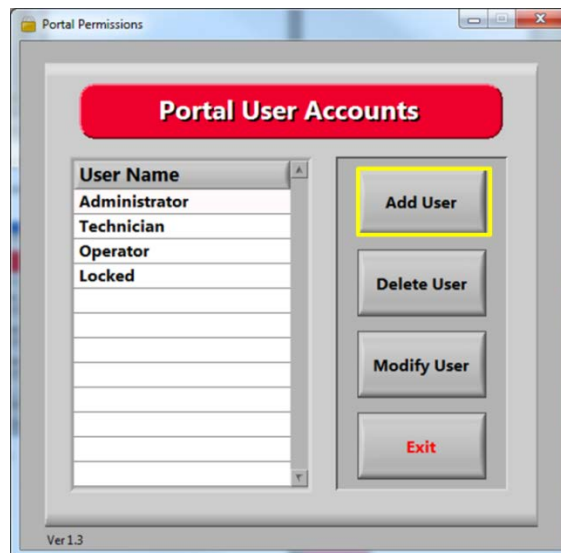


Figure 55: Select "Add User"

2. Under **User Login**, type the User Name, Password, and ReEnter Password.
3. Select the correct Permissions for the user, click on the related permissions boxes. When selected, the boxes will be bright green.

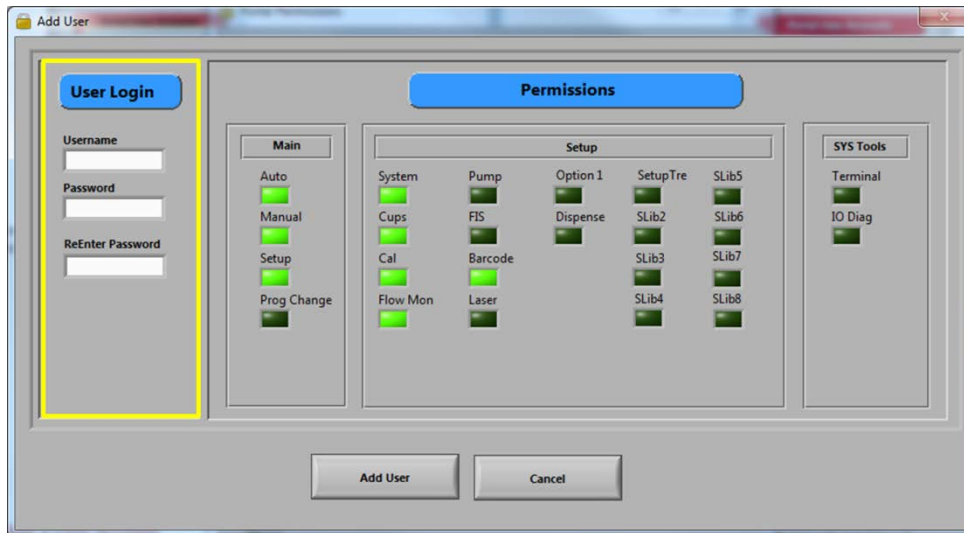


Figure 56: Add User and Permissions

4. Select **"Add User"**.
5. Do steps 1-4 as many times as necessary to set up all users.
6. Select **"Exit"** to save and close portal user accounts.

10.2 To Modify User Accounts

1. Select the User Name you want to change.

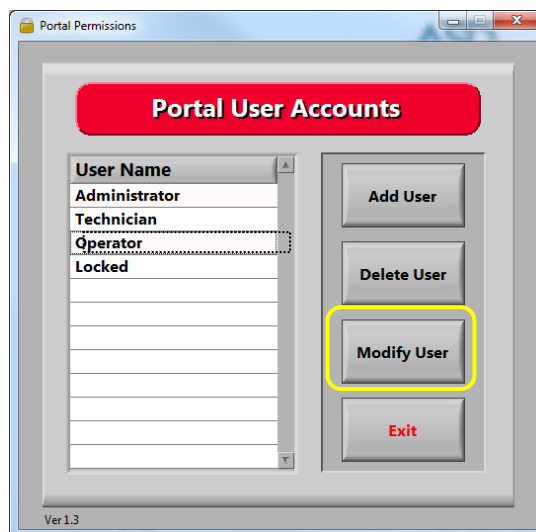


Figure 57: Select a User

2. Select **"Modify User"**.

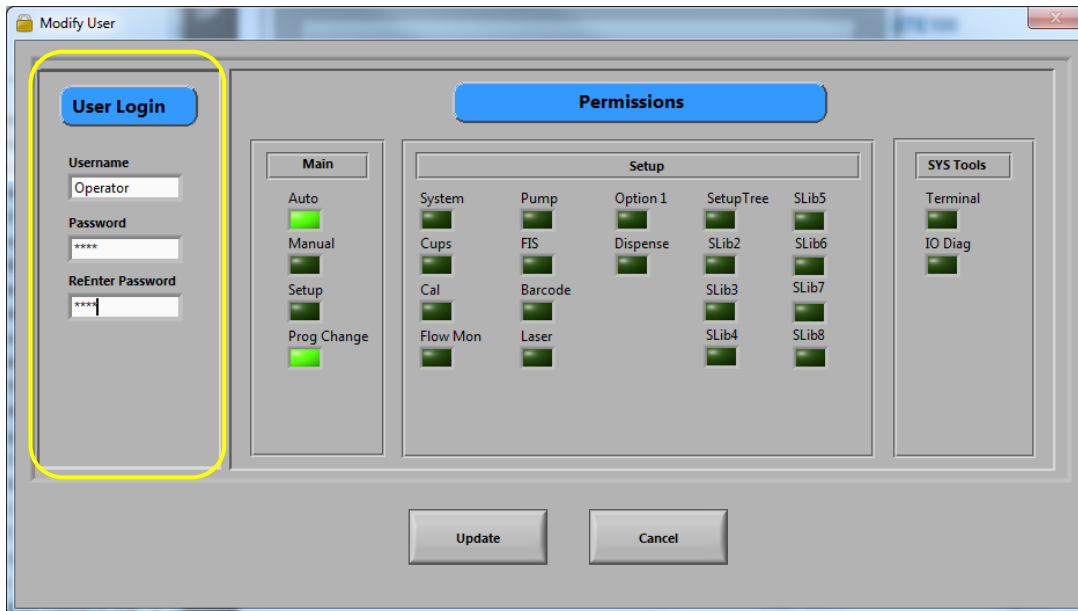


Figure 58: Modify User

3. Change the user settings. Select new permissions, or change the user password.
4. Select **“Update”** to save.

11.0 DataView

The Portal DataView application can run as a standalone application or as an embedded version within Portal. The standalone version can be resized, maximized or minimized. The embedded version in the Log tab on the main Portal screen and has a fixed dimension that is sized accordingly. Additional configuration of each version of the DataView app is handled in the Portal Sysconfig.ini file. Refer to the ini configuration parameters listed below for more information.

| Date | Time | User | Event |
|------------|-------------|---------------|---------------------------------------|
| 10/18/2016 | 11:48:54 AM | Administrator | Entering Manual Mode |
| 10/18/2016 | 11:48:28 AM | Administrator | Entering Cycle Stop State |
| 10/18/2016 | 11:47:59 AM | Administrator | Nozzle Power During Cycle: 1 W |
| 10/18/2016 | 11:47:58 AM | Administrator | Cycle End -- X: 61733 Y: -2911 Z: 0 |
| 10/18/2016 | 11:47:57 AM | Administrator | Cycle complete. 05 |
| 10/18/2016 | 11:47:57 AM | Administrator | Cycle Volume: 00.36 Total Volume: |
| 10/18/2016 | 11:47:54 AM | Administrator | Cycle Aborted! |
| 10/18/2016 | 11:47:50 AM | Administrator | Cycle Start -- X: 61730 Y: -2908 Z: 0 |
| 10/18/2016 | 11:46:09 AM | Administrator | Entering Auto Cycle State |
| 10/18/2016 | 11:46:04 AM | Administrator | Entering Cycle Stop State |
| 10/18/2016 | 11:44:57 AM | Administrator | Entering Auto Cycle State |

Figure 59: Log File

11.1 Startup Log File

Portal can write data to any of 10 different log files, however, DataView can only Display the content of one log file at a time. On startup, the default log file is loaded into DataView.

The default log is configured by setting the 'InitialLogFile' key in the [DataView] section of the configuration files.

To load a log file other than the initial log file:

1. For the embedded version, press and hold the 'CTRL' key while 'double clicking' the data grid to select a log file to view. The Standalone version can be launched from within Portal by pressing and holding the 'ALT' key while 'double clicking' the data grid.

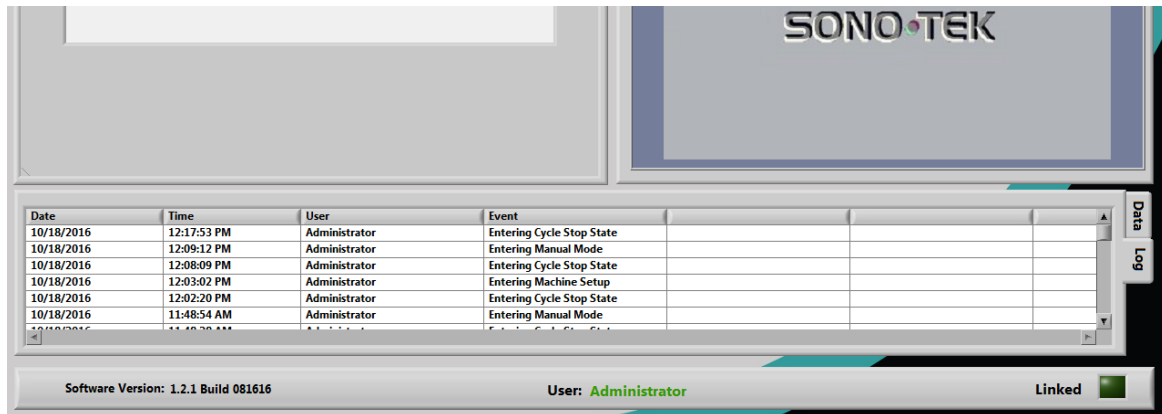


Figure 60: Embedded DataView

2. With DataView running in the standalone version, select the *File* -> *Open File* on the menu bar.

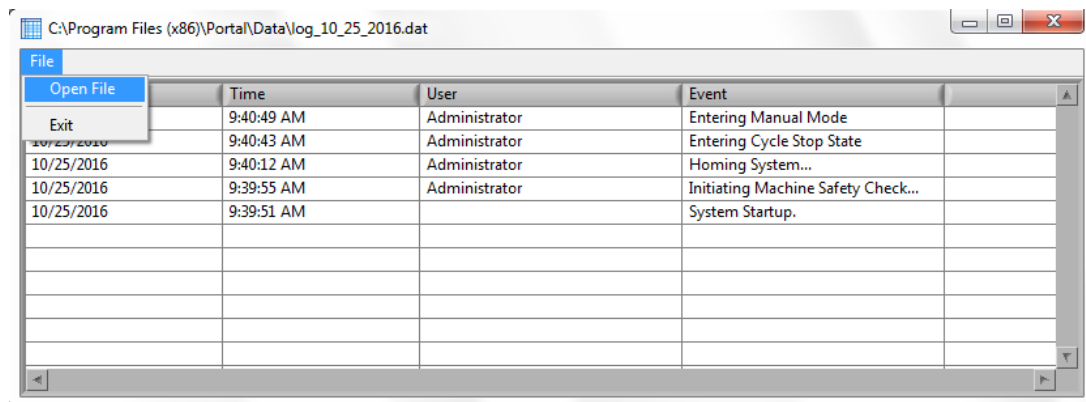


Figure 61 - Open File from Standalone DataView

3. Select the log file to view

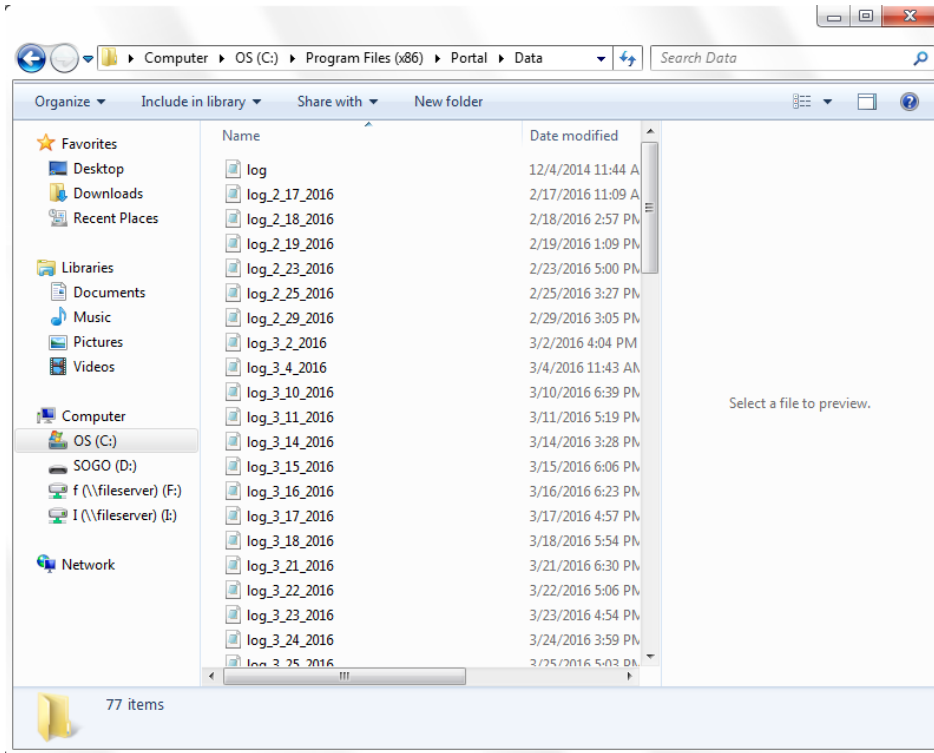


Figure 62: Log File Selection

12.0 Fault Recovery

12.1 Recovering From Emergency Stop and Other Machine Errors

If the Emergency Stop button is engaged or the machine encounters a system error, do this procedure to return the machine to normal operation.

WARNING! *If the Emergency Stop was engaged because of system failure, DO NOT disengage the Emergency Stop button. Shutdown the system and have qualified personnel repair the machine.*

Do not operate the system again until the cause of the failure has been repaired.

1. Open the front doors and remove all parts from the work area.
2. Close the doors and disengage the “**Emergency Stop**” button if it was not engaged because of a system failure.
3. Press “**Continue**” to return the head to the standby position. The screen returns to Cycle Stop.

NOTE: *All functions are stopped until the “Emergency Stop” button is disengaged.*

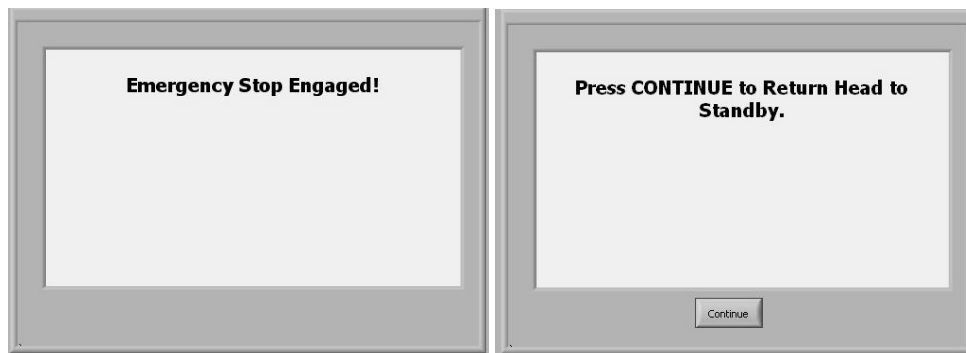


Figure 63: Emergency Stop

If a door is open while the DOOR BYPASS switch is in the OFF position, or any machine state besides manual mode or calibration, it will cause a door error. Recovery from a door error is like the recovery from an Emergency Stop.

Other system errors can occur, such as: low gas pressure, low or empty material, or insufficient exhaust air flow. You must correct these errors first, and then do the startup procedure to continue. Refer to the section that relates to your error.

Examples of the other possible error screens:

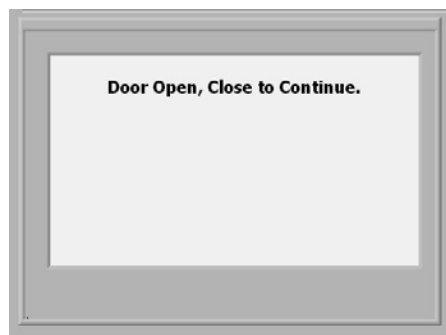


Figure 64: Door Open Error

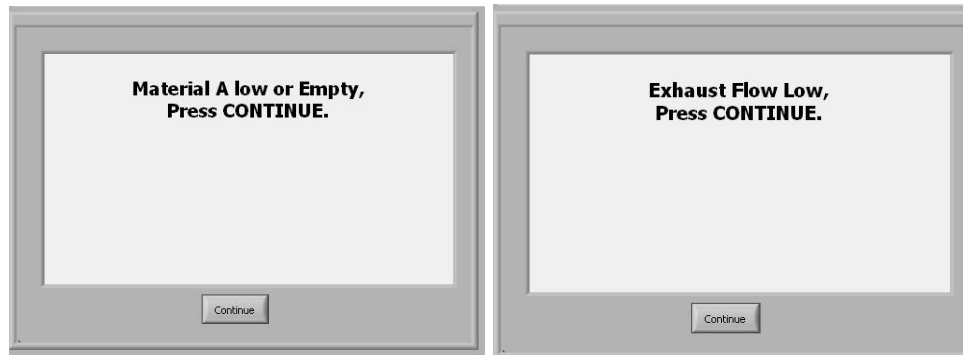


Figure 65: Low Material Level and Low Exhaust Flow

12.2 Run-Time Error Recovery Procedure

Run-time errors are generated during the operation of a program. This type of failure should not occur during normal operation. The error type and program line number will be displayed in the system messages window.

1. Find your error type.
2. Find the program line number.
3. Record info (error and line shown in the system messages window) and contact SONO-TEK Technical support and proceed as directed.

NOTE: For more on error codes please refer to the *Troubleshooting guide*. For more information on programming paths, refer to your *PathMaster®* manual.



Figure 66: Command Error Example

12.3 Position Error Recovery Procedure

A position error occurs when the difference between the commanded position and the current position is more than the maximum allowable error limit for an axis.

You can get an error limit if the dispense/spray head hits a hard stop in Manual mode, if the speed or acceleration is set too high, or if the axes drives are not powered. Make sure the "**Emergency Stop**" button is not engaged. The motor stop codes are shown in the system messages window.

NOTE: Refer to *Appendix E* for more information on stop codes.



Figure 67: Position Error

To correct the position error, do the steps that follow:

1. Engage the **"Emergency Stop"** button.
2. Open the access door.
3. Move the dispense head to the center of the work area. The Z-axis has a brake. Turn the Z-axis motor coupling by hand to move the dispense head as necessary.
4. Close the access door.
5. Disengage the **"Emergency Stop"** button.
6. Select **"Continue"** to clear the error.
7. Do the startup procedure.

12.4 Limit Error Recovery Procedure

The machine encounters a limit error when the gantry exceeds the software or hardware limits. The stop codes are shown in the system messages window.



Figure 68: Limit Error

1. Engage the **"Emergency Stop"** button.
2. Open the access door.
3. Move the dispense head to the center of the work area. The Z-axis has a brake. Turn the motor coupling by hand to move the dispense head as necessary.
4. Close the access door.
5. Disengage the **"Emergency Stop"** button.
6. Select **"Continue"** to clear the error.
7. Do the startup procedure.

12.5 Request the Motion Controller Version

Do the procedure below to request the motion controller firmware version. Refer to the PathMaster® Manual.

1. Select the **Terminal** tab on the right side of the portal window.
2. In the terminal window type '^R^V'.

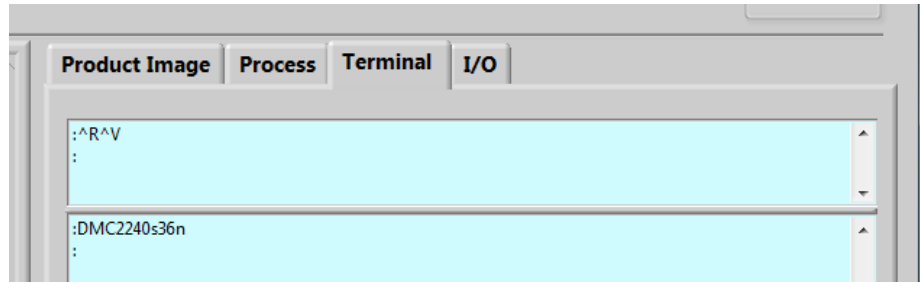


Figure 69: Portal Terminal Window

3. Press "Enter".

The motion controller model and firmware version are shown in the terminal window.

13.0 Maintenance Procedures

13.1 Ball Screw Slides

The slides should be greased via the fitting on the carriage every 100KM or approximately once a month.

Clean any buildup on the ball screw and seals. The manufacturer recommends using lithium type soap base grease (JIS Type 2). Not all models have slide with grease fitting. If a slide does not have a grease fitting, simply apply a small amount of grease to the slide, and then work the slide back and forth.

13.2 Inspection

The cables in the flexible cable carrier should be checked for excessive wear. Any worn cables should be replaced. Check for loose screws in the top frame and end effector.

13.3 Conveyor Belt Replacement

- 1) Lockout the power and gas supplies.
- 2) Remove the dust cover plate. The dust cover plate is located near the conveyor motor on the inside of the conveyor.
- 3) Remove the old conveyor belt from the pulley wheels.
- 4) Clean the conveyor rails where the belt rides.
- 5) Install the new conveyor belt. Start by placing the belt on the pulley wheels farthest from the motor.
NOTE: Make sure that there are no twists in the belt.
- 6) Place the belt around the large pulley wheel, then around the remaining wheels.
- 7) Rotate the pulley wheels several turns by hand. This ensures that the belt is correctly seated.
- 8) Replace the cover plate.

13.4 Maintenance Schedule

Table 4 – Preventive Maintenance Schedule

| TYPE OF SERVICE | | | | | |
|--------------------------------------|--|--|--|---|---------------|
| | Every Shift | Weekly | Monthly | Quarterly | Semi-Annually |
| Ultrasonic Spraying Equipment | Visual inspection of nozzle tip, looking for material buildup. | Clean the nozzles. Ensure that the system is de-energized. DO NOT immerse the nozzle in liquid. Check for any leaks around compression fittings. Retighten or replace if needed. | Inspect the fluid delivery lines for excessive wear. Run a solvent purge to thoroughly clean the valves and nozzles of any solidified chemistry buildup. | | |
| Electro-mechanical Components | | Check motors for overheating and smooth operation. Check for any chafing of wires, pneumatic lines or material lines. | Grease the ball screw slides with Lithium Grease (JIS Type 2). | Inspect all moving cables for wear. | |
| Conveyor System | | Check for material and dust buildup on the conveyor chain and sensors. | | | |
| Part-in-Place Sensors | Clean with warm water, a mild detergent (like dish soap) and a soft cloth. DO NOT use moderate or harsh solvents, such as IPA, Acetone OS120, etc. | | | | |
| Pneumatics | | Check for proper operation. Drain any accumulated water from the main Filter/Regulator. | | Check the slides for wear and smooth operation. | |

14.0 Troubleshooting

If Something Goes Wrong... Some problems encountered when using the system are easy to identify and solve. Others require more extensive help. This troubleshooting section is designed to assist an operator in solving problems before seeking additional help. It is strongly recommended the operator check this section first if a mechanical or electrical problem occurs. If you experience problems that are not listed in this section, or continue after trying different methods, please contact the Sono-Tek Service Department. Remember, not every problem can be described in this section, but this should be a good place to start.

NOTE: *If a problem occurs while running a particular path program, consult the separate PathMaster® Manual for information on debugging code problems.*

Calling Technical Support - The technical support staff is always available to help solve any problems. The phone number is (845) 795-2020. To assist in the troubleshooting process, it is best if as many of the following items are addressed before calling for help:

- 1) Record all the information on the screen when the error occurs.
- 2) Take note of the operation in progress when the machine developed trouble (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.
- 4) Use a terminal screen to communicate with the controller. Most troubleshooting necessitates issuing commands directly to the controller.
- 5) If the problem is programming related, a hard copy or e-mail of the program in question may be requested by Sono-Tek. Please be prepared to send it. The customer service representative will provide an e-mail address or fax number.

Records - Any service or replaced components should be recorded in maintenance records and any other pertinent data for future reference.

Fault Diagnostic - New machines use a closed loop servo drive system were as some older models use an open loop stepper drive system. Listed on the following page is a general fault diagnostic table for each type of system.

14.1 CLOSED LOOP SERVO SYSTEMS

Table 5 – Closed Loop Servo Drive Systems Fault Diagnosis

| Operation | Other Symptoms | Possible Cause | Corrective Action |
|---|---|--|---|
| Turn the machine ON. The operator interface does not have power. | | Cables are loose or not connected. | Check the cable connections. Correct any loose connections. |
| | The electrical enclosure does not have power. | The electrical enclosure is open, so the electrical enclosure safety switch is in the open position. | Close the electrical enclosure. |
| | | Blown fuse. | Check FU-1 which is located inside the electrical enclosure. Replace if necessary. |
| Homing the axes. The end effector moves past the home sensor and hits the hard stop. | | Home sensor is out of position or too far away from the homing tab. | Depress the EMERGENCY STOP button. Move the axis by hand until the homing tab moves into the home sensor. The sensor should be ON. Loosen the lock nut on the sensor and readjust to 0.20" gap. |
| | | Sensor cable is loose or not connected. | Check the cable connections. Correct any loose connections. |
| Homing the axes. The Z axis does not move. | End effector can be moved freely when the power is on. | The EMERGENCY STOP button is depressed. | Release the EMERGENCY STOP button. |
| | SSR-1 is not ON when the Z axis drive is enabled. | The Z axis brake is not disengaging when the drive is enabled. | Check the SSR-1 wiring. It should be on when the Z axis drive is enabled. |
| | SSR-1 is ON when the Z axis drive is enabled. | The fuse for SSR-1 is blown or SSR-1 is damaged. | Check the fuse using an OHM meter. Replace component if necessary. |
| Axis does not have ANY motion. | Encoder works according to the Encoder Feedback Test. Refer to Section 14.6 | The axis speed or acceleration has been set to zero. | Set the speed and acceleration to a positive, non-zero value using the SP and AC commands. |
| | Axis drive light is RED. | Axis drive is not enabled. | Enable the drive using the SH command. |
| | | The axis cables are loose or not connected. | Check the cable connections. Correct any loose connections. |
| | | The EMERGENCY STOP button is depressed. | Release the EMERGENCY STOP button. |
| | | Hall effect sensors are not correctly connected. | Check the cable connections for the axis. Correct any loose connections. Check the hall effect sensor phasing using the electrical drawings. |
| | The axis amplifier is bad. | Replace the amplifier. | |

| Operation | Other Symptoms | Possible Cause | Corrective Action |
|-------------------------------|-------------------------------|---|--|
| | | Doors are open. | Close doors firmly. |
| Axis runs away. | | Motor power connections are wired incorrectly. | Check the phasing using the electrical drawings. |
| | Z axis encoder does not work. | Z axis encoder/brake cable is loose or not connected. | Check the cable connections. Correct any loose connections. |
| | | The axis amplifier is bad. | Replace the amplifier. |
| Pneumatic actuator failure. | Pneumatics work slowly. | Gas lockout valve on the rear of the machine is in the OFF position. | Turn the lockout valve to the ON position. |
| | | Insufficient gas pressure. | Check and adjust the system pressures to the correct values. Refer to the Machine Specific information for particular pressure settings. |
| | | Restricted gas line. | Correct any tight bends or restrictions in the gas lines. |
| | | Loose fitting or tubing connection. | Tighten connection. |
| | | Frayed or damaged gas line. | Replace the damaged gas line(s). |
| | | Sensor is not positioned correctly. | Adjust the sensor location. |
| Part in place sensor failure. | | Cable is loose or not connected. | Check the cable connections. Correct any loose connections. |
| Conveyor does not run. | | Conveyor belt stuck to rails. | Clean or replace belt. |
| | No power to conveyor motor. | Control relay not energized or Power On Light not illuminated (certain models). | Check voltages and connections. Check conveyor power fuse. |
| Exhaust check fails. | No air flow. | Exhaust is off or clogged. | Check exhaust. |
| | Low air flow. | Insufficient air flow capacity in the factory ducting. | Upgrade the ducting to allow for more air flow. |
| | | Insufficient exhaust system. | Upgrade exhaust system or add a dedicated blower to the system. Minimum air flow requirement is 150 cfm. |

14.2 IP Configuration

When performing a master reset to the Galil controller on a machine with Portal it is necessary to reassign the IP address of the controller before any communication can be established. Contact the Sono-Tek service department for detailed instructions on how to complete a master reset.

After resetting the machine Portal will not be able to establish communication with the Galil controller and will automatically shut down.

From the Windows START menu on the desktop go to Programs, PathMaster® to run PathMaster® - **THIS IS THE ONLY TIME IT IS ACCEPTABLE TO RUN PathMaster® OUTSIDE OF PORTAL.**

Any other time you must execute PathMaster® through the Portal interface to ensure all the communication settings remain configured correctly. After Starting, PathMaster® selects the machine you are currently using and any project you would like.

Because there is no communication after you select the project to open, PathMaster® will try to communicate.

This will take anywhere from 30 seconds to a minute during which time PathMaster® will be unresponsive.

After the main screen loads, at the top of your screen click on Setup, Machine Parameters. In the dialog box that opens in the bottom left click on Edit Controller. In the box that opens there, click on the Edit Controller Properties button. This will bring up the following window:

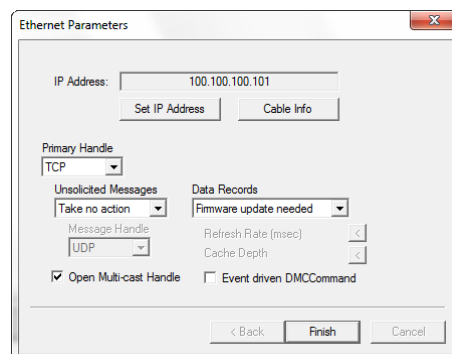


Figure 70 - IP Configuration

- The IP address that is highlighted blue is the address that will need to be reset.
- Write this address down for later.
- Now click on the Set IP Address button. In the box that opens just click close in the lower right hand corner.
- This will bring the same box shown at the right back up except the IP address will be 0.0.0.0.
- Now click Set IP Address again which will bring up the box shown below.

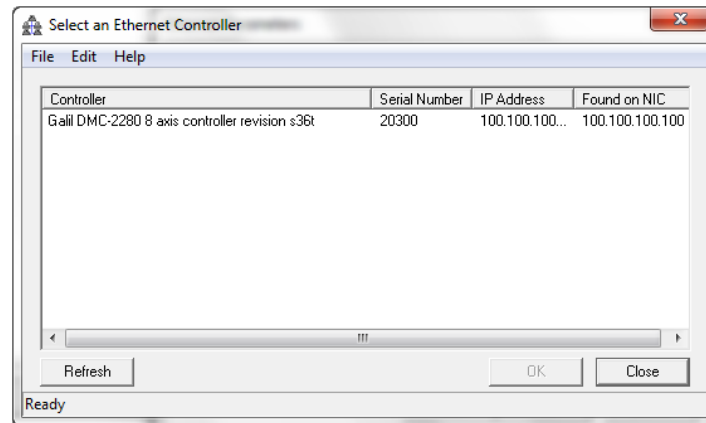


Figure 71 - IP Controller Address

In the window labeled **Possible Controller Address** enter the IP address you recorded earlier.

Typical Address Setup:

Computer: 100.100.100.100

Galil Motion Controller: 100:100:100:101

After entering this address click the Test Address button to ensure the address is not in use anywhere else on the network.

If the address appears to be available, as shown above, then click Assign Address.

Finally before closing the window check that the **NIC IP Address** matches the IP address of the computer, and that the **NIC Subnet Mask** is 255.255.255.0, then close the window.

PathMaster® will then acknowledge the changes that were made, click okay, now close the edit controller window, and click save and close in the Machine Parameters window. Now you should have communication with your machine in PathMaster®.

If that is not the case then repeat the previous steps making sure that you are assigning the correct IP address for your controller as well as for the NIC card, or contact the Sono-Tek service department.

If you have communication then you are ready to download your main file. In PathMaster® select the Download menu from the top of your screen and select Main. Now select the main file from your computer and click ok or save to download. When that is complete exit completely out of PathMaster®. Next Power the machine down. If you do not cycle power to the machine you will not have any system messages displayed in Portal.

Be sure to shut down the PC first if it is powered by the system or if there is no UPS on the machine to avoid losing any work not saved. Next turn the machine back on and if necessary start the Portal software on the PC. You will see a **System Initialization** message followed by a **Variable Error**.

The machine will restart and display the **System Initialization** message again and will continue on to the exhaust and safety check. You are now ready to run.

14.3 Flexible coupling

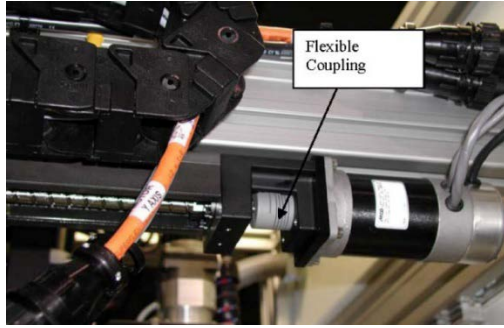


Figure 72 - Flexible Coupling

Servo couplings are compensating couplings with a backlash free and conformal torque transfer providing high torsional stiffness and a low moment of inertia. Check periodically if a shifting is suspected.

14.4 Power Check

If the expected voltages are not present in the following tests **TURN THE MACHINE OFF IMMEDIATELY**. Permanent damage to the components may occur.

- 1) Remove all of the fuses in the enclosure, except for FU-1.
- 2) Disable the enclosure power safety switch.
- 3) Turn the machine ON.
- 4) Use a DMM (Digital Multi Meter) to check the AC power in the machine. There should be 110-120 VAC between the 100 and 101 terminals. If not, turn off the power and check that FU-1 is installed and operational.
- 5) Turn the machine OFF.
- 6) Install all of the fuses in the enclosure.
- 7) Push the EMERGENCY STOP push button in.
- 8) Turn the machine ON.
- 9) CRM-1 and CRM-2 should be DISENGAGED.
- 10) Check for 5 VDC between 304 (+) and 303 (-).
- 11) Check for 24 VDC between 306 (+) and 302 (-).
- 12) Check for 0 VDC between 307 (+) and 302 (-).
- 13) Pull the EMERGENCY STOP push button out.
- 14) Put a jumper wire between terminal 3 on the 5 V Monitor relay SSR-5 relay and any 304 terminal block (this will engage the SSR-5 relay). If the SSR-5 relay LED is not on, there may be a problem with the SSR-5 relay or the wiring on the coil side.
- 15) CRM-1 and CRM-2 should be ENGAGED. If not, check the next section (Door Interlock Check) for machines equipped with doors.
- 16) Check for 24 VDC between 307 (+) and 302 (-).

14.5 Door Interlock Check

- 1) Engage the Door Bypass switch. If CRM-1 engages when the Door Bypass switch is engaged, there may be a failure in the left door interlock switch, the right door interlock switch, or their wiring.
- 2) Check for a red indicator light on the 5 V Monitor relay SSR-5. If the indicator is not lit, there may be a failure in the 5V monitor relay or its wiring.
- 3) Check for 24 VDC between 504 (+) and 302 (-). If 24 VDC is not present, there may be a failure in the 5V Monitor relay, the EMERGENCY STOP push button PB-1, or their wiring.
- 4) Check for 24 VDC between 505 (+) and 302 (-). If 24 VDC is not present, there may be a failure in the left door interlock switch or its wiring.
- 5) Check for 24 VDC between 506 (+) and 302 (-). If 24 VDC is not present, there may be a failure in the right door interlock switch or its wiring.
- 6) If 24 VDC is present between 506 (+) and 302 (-), there may be a failure in the coil of CRM-1 or a short in its associated diode D-1, or there may be a failure in the coil of CRM-2 or a short in its associated diode D-2.

14.6 Encoder Feedback Test

Use this procedure to test the encoder feedback for all of the axes. If a problem is found with any of the encoders, contact the Sono-Tek service department.

Most encoders used with the system generate 5080 counts/inch. Check to make sure that the position feedback is reasonable. $(500 * 4 \text{ counts/rev}) * (1 \text{ rev/cm}) * (2.54 \text{ cm/in}) = 5080 \text{ counts/inch}$.

14.6.1 No Z-Axis Brake

- 1.) Open a terminal program and establish communication with the DMC controller
- 2.) Turn the machine OFF
- 3.) Move all of the axes to the center of travel position
- 4.) Turn the machine ON

- 5.) Enter HX
- 6.) Define the current position as (0, 0, 0, 0). Enter DP*=0
- 7.) Move the X-axis in the positive direction and display the current position. Enter TP
- 8.) Move the X-axis in the negative direction and display the current position
- 9.) Move the Y-axis in the positive direction and display the current position
- 10.) Move the Y-axis in the negative direction and display the current position
- 11.) Move the Z-axis in the positive direction and display the current position
- 12.) Move the Z-axis in the negative direction and display the current position
- 13.) Move the W axis in the positive direction and display the current position
- 14.) Move the W axis in the negative direction and display the current position
- 15.) Turn the machine OFF
- 16.) Reconnect the motor power cables
- 17.) Turn the machine ON

14.6.2 With a Z-Axis Brake


- 1.) Follow steps 1-3 above
- 2.) Enable EMERGENCY STOP button
- 3.) Remove wire 454 from terminal 3 on SSR1
- 4.) Add a wire from terminal 3 on SSRx* to the 304 terminal block
- 5.) Add a wire from terminal 1 on SSRx* to the 306 terminal block
- 6.) Turn the machine ON
- 7.) Enter HX in the terminal program
- 8.) Define current position as (0,0,0,0) by entering DP*=0
- 9.) Move the intended axis in the positive direction and display the current position by entering TP
- 10.) Move the intended axis in the negative direction and display the current position by entering TP
- 11.) Turn the machine off
- 12.) Remove the added wire from terminal 3 on SSRx and terminal block 304 and reconnect wire 454
- 13.) Remove the added wire from terminal 1 on SSRx and terminal block 306 and reconnect wire 307
- 14.) Turn the machine ON
- 15.) Disable EMERGENCY STOP button

NOTE: SSRx, where x refers to the number on the solid state relay associated with the motor. Contact Sono-Tek for schematic review.

14.7 Motor Feedback Test

Use this procedure to verify that the motor power and hall effect sensors are wired correctly. If a problem is found with any of the axes, repair and report to the production supervisor.

- 1) Turn the machine ON.
- 2) Enable the *EMERGENCY STOP* button. This cuts the power to the amplifiers.
- 3) Open a terminal program and establish communication with the DMC controller. This can be done via the 'terminal' option in PathMaster®.
- 4) Enter the following commands via the terminal screen. The motors may be wired incorrectly. The following program limits the acceptable error and power available to the amplifiers. **This protects personnel and equipment.**
 - OE*=1 Off on error enabled for all axes.
 - ER*=1000 Error limit for all axes.
 - TL*=1 Torque limit of 1 for all axes.
 - SP*=5000 Set the speed.
 - AC*=10000 Set the acceleration.
 - DP*=0 Define the current position as (0,0,0,0).
 - SB5 Enable power (only on machines without a POWER ON button).
 - SH Apply power to the servo motors.
- 5) Release the EMERGENCY STOP push button. Push the POWER ON button (if present) so it lights up. This restores power to the amplifiers. Care must be taken because any of the axes can move at this time.
- 6) Command the X-axis to make a positive move. If the axis runs away debug and repeat the procedure.
 - PRX=2000
 - BGX

 **WARNING:** Make sure that the workspace is clear of any obstacles. In the event of a runaway condition, the machine may be irreversibly damaged.
- 7) Display the current position and position error. TP; TE.
- 8) Command the X-axis to make a negative move. If the axis runs away debug and repeat the procedure.
 - PRX=-2000
 - BGX
- 9) Display the current position and position error. TP; TE.
- 10) Repeat step 6 through 9 for the Y, Z and W axes.

15.0 Spare Parts

ORDERING PARTS - Customers can order parts by contacting the Sono-Tek Service department. When ordering spare parts, be prepared to provide the following information:

- Your Company Name
- Billing Address
- Shipping Address
- Serial Number of the system (on the back of the equipment)
- Part number or description
- Quantity
- Purchase Order or Credit card information
- Shipping Instructions

TIP: Keeping an extra set of frequently used spare parts can help reduce down time.

Spare Parts Lists:

| General Spare Parts List | | Part Number | Description |
|--------------------------|--|-----------------|--|
| Part Number | Description | 21-06-00049 | ON/OFF Switch for Heater/Vacuum |
| 21-03-00019 | Light Tower Assembly | 21-06-00050 | BOARD, BREAKOUT, LOGIC |
| 21-06-00043 | Servo Motor CURRENT | 21-06-0005X | BOARD, MOTION, BREAKOUT |
| 21-06-00044 | Motor Amp CURRENT | 21-06-00051 | Power Supply (650/3000) |
| 21-06-00005 | X Axis Power and Feedback Cable | 21-06-00052 | Emergency Stop Button |
| 21-06-0000X | Y Axis Power and Feedback Cable | 06-03-00934 | Chassis Mount ECHO Generator |
| 21-06-00006 | Z Axis Power and Feedback Cable | 02-04-00942-001 | M8 Nozzle Power Cable ExactaCoat |
| 21-06-00008 | PIP Sensor | 02-04-00942-003 | M8 Nozzle Power Cable FlexiCoat |
| 21-06-00013 | Safety Relay | 06-01-00653-002 | ECHO Communication Cable |
| 21-06-00014 | Relay, Solid State 5VDC Logic | 02-04-00085 | SMA Bulkhead Connector |
| 21-06-00026 | Relay, Solid State | 02-04-00708 | 220V Power Cord |
| 21-06-00032 | Snap opto I/O card – INPUT MODULE | 02-04-00448 | M12 Cable for Auxillary Equipment |
| 21-06-00033 | Snap opto I/O card – SINKING OUTPUT MODULE | 02-04-00678 | DB9 Female to Female |
| 21-06-00034 | Snap opto I/O card – SOURCING OUTPUT MODULE | 07-00-00010 | DB9 Male to Female Shielded |
| 21-06-00035 | Snap opto I/O card – CONTACT CLOSURE OUTPUT MODULE | 02-04-00377-002 | M12 Bulkhead Connector |
| 21-06-00039 | Watlow Temperature Controller | 06-03-00961 | 2W Isolation Valve |
| 21-06-00040 | Pressure Switch – Digital Gauge | 04-05-01080 | Dual Valve Plate |
| 21-06-00041 | Standard (150C) heat plate overtemperature switch | 06-03-00961-001 | 3W Isolation Valve |
| 21-06-00045 | Regulator, 0-60PSI, Panel Mount | | |
| 21-06-00046 | Trackball Teach Pendant | 04-05-01064 | Z-Slide Bracket for Nozzle/Isolation Valve |
| 21-06-00047 | Vacuum Generator for Vacuum Plate | 03-00-00561 | Impact Nozzle Mounting Bracket |
| 21-06-00048 | DOOR BY-PASS W/KEY | 04-06-00384 | Accumist Nozzle Mounting Bracket |

| Galil Motion Controllers | |
|----------------------------|---|
| 21-06-00025 | 8 AXIS Motion Controller (Exact/FlexiCoat) |
| 21-06-00038 | 4 Axis Controller (Exact/FlexiCoat) |
| 21-06-00053 | 4 Axis Controller (ExactaCoat OP) |
| Fuses | |
| 02-03-00149 | 600 VAC/ 300VDC TIME DELAY |
| 02-03-00150 | 600 VAC/ 300VDC TIME DELAY |
| 02-03-00151 | 600 VAC/ 300VDC TIME DELAY |
| For Liquid Delivery System | |
| 06-01-00466-001 | M12 Pump Trigger Cable |
| 02-04-00885 | Pump Communication USB Cable |
| Consumables | |
| 10-00-00028 | Ferrule for Swagelok Fittings 1/8 nylon (set of 10) |
| 01-00-00366 | Fitting for Isolation Valve & Syringes, 1/4-28 Vacutight |
| 01-00-00368 | Yellow Ferrule Mat'l:ETFE qty:10 fits 01-00366, 1/8" |

| | |
|-----------------|---|
| 01-00-00426 | Red Luer Fitting for Syringes, 1/4- 28 |
| 05-03-00012 | Teflon Liquid Delivery tubing order by foot, 1/8" |
| 05-03-00038 | BLUE tubing for Gas order by foot, 1/4" |
| 05-03-00039 | RED tubing for Gas order by foot, 1/4" |
| 05-03-00076 | PTFE tubing for Gas/Cooling order by foot, 4mm |
| 10-01-00129-001 | Syringe Tips, For Sonic Syringe or CSP ONLY qty:3 |
| 04-05-00762 | Syringe Tip, For Magnetic Stirring Syringe ONLY |
| 01-11-00161 | Microbore Cleaning Wire (measures .013, Qty 1) |
| 10-02-00155 | Cleaning Wire and Instruction Kit |
| 07-01-00017 | Glass Gas-tight Syringe, 10ml Syringe Luer Type |
| 07-01-00018 | Glass Gas-tight Syringe, 25ml Syringe Luer Type |

16.0 Warranty

SONO-TEK 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 SONO-TEK (or from factory authorized dealers) will void all warranties.

All SONO-TEK 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 SONO-TEK'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, SONO-TEK 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: _____

17.0 Appendix A – Definitions

Auto Cycle: Machine state where cycles are running.

Auto Purge: A machine function that automatically purges material after a predefined period of time or during solvent cups procedures.

Calibration Position: The location in the workspace where the X, Y, Z and W locations for the nozzle(s) is normalized.

Cycle Stop: Machine state where no action is occurring and the machine is at the standby position.

Depress: Push and hold for the duration of the operation.

Spray Path: A continuous motion profile. The nozzle is on (spray) during the entire motion profile. This is also known as a **Path** or **Motion Sequence**.

DMC: Language used to program the motion controller in the system.

End Effector: The spray head assembly. The end effector is moved by the axes.

Head: Selected machine device.

Home Position: The (0, 0, 0, 0) location of the workspace. This position is determined by the location of the home sensors. It is NOT the same as the **Standby Position**.

Jog: Moving any combination of axes continuously at a set rate of speed until commanded to stop.

Light Tower: The light tower consists of three stacked lights, red, amber and green (top to bottom). It is used to indicate the status of the machine.

Main Program File: A text file containing the code that runs the system during normal operations. Main Program File

Motion Sequence: A continuous motion profile. The nozzle is on (spraying) during the entire motion profile. This is also known as a **Spray Path** or **Path**.

Path: A continuous motion profile. The nozzle is on (spray) during the entire motion profile. This is also known as a **Spray Path** or **Motion Sequence**.

PathMaster®: Windows® programming software. Used to create, maintain and download program files for the system.

Push: Push and release.

Program: A collection (or series) of motion sequences.

Project: File containing the code for one or more programs (typically 30 programs).

Purge Position: The location in the workspace where the head moves to perform all auto purge operations.

Solvent Cups: Reservoirs containing a compatible solvent used to maintain the spray nozzle when the system is not processing product.

Solvent Position: The location in the workspace where the head moves to rest in a solvent solution to maintain the spray nozzles when the system is not processing product.

Standby Position: The rest position for the end effector. The machine moves here after homing and after each cycle. This position is usually located near the start point for the program(s). It is NOT the same as the **Home Position**.

Terminal: A program used as a communication link between the motion controller and operator.

Teach: A process by which the system registers its current gantry location with PathMaster® to create a motion sequence.

18.0 Appendix B – Serial Communication

18.1 Serial Communication

The system can communicate with a computer using the EIA RS-232C standard. This is used for debug purposes. The computer is the Data Terminal Equipment (DTE Device) and the motion controller is the Data Communications Equipment (DCE Device). The tables below give a brief overview of the connections required to communicate between DTE and DCE devices.

WARNING! *The computer must be at the same ground potential as the system. Damage to the system or computer may result if the ground potentials are different. Use the system service outlet for computer power if provided.*

18.29 Pin Serial Connector

Table describes the pin configuration for standard serial ports found on most portable computers.

Table 6: DTE 9 Pin Serial Connector

| Pin | Description |
|-----|---------------------------|
| 1 | Carrier Detect (CD) |
| 2 | Received Data (RD) |
| 3 | Transmitted Data (TD) |
| 4 | Data Terminal Ready (DTR) |
| 5 | Signal Ground |
| 6 | Data Set Ready (DSR) |
| 7 | Request to Send (RTS) |
| 8 | Clear to Send (CTS) |
| 9 | Ring Indicator (RI) |

18.3 Computer 9 Pin to System Programming Port

For standard communication between a computer and a system.

Table 7: Cable for Computer DB9 to system

| Comp | System |
|------|--------|
| DTE | DCE |
| DB9 | DM9F |
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |

19.0 APPENDIX C – DMC ERROR CODES

Table 8 – DMC Error Codes

| ID | Description |
|----|---|
| 1 | Unrecognized command |
| 2 | Command only valid from program |
| 3 | Command not valid in program |
| 4 | Operand error |
| 5 | Input buffer full |
| 6 | Number out of range |
| 7 | Command not valid while running |
| 8 | Command not valid while not running |
| 9 | Variable error |
| 10 | Empty program line or undefined label |
| 11 | Invalid label or line number |
| 12 | Subroutine more than 8 deep |
| 13 | JG only valid when running in jog mode |
| 14 | EEPROM check sum error |
| 15 | EEPROM checkwrite error |
| 16 | IP incorrect sign during position move or IP given during forced deceleration |
| 17 | ED, BN and DL not valid while program running |
| 18 | Command not valid when contouring |
| 19 | Application strand already executing |
| 20 | Begin not valid with motor off |
| 21 | Begin not valid while running |
| 22 | Begin not possible due to Limit Switch |
| 24 | Begin not valid because no sequence defined |
| 25 | Variable not given in IN command |
| 28 | S operand not valid |
| 29 | Not valid during coordinated move |
| 30 | Sequence segment too short |
| 31 | Total move distance in a sequence > 2 billion |
| 32 | More than 511 segments in a sequence |
| 41 | Contouring record range error |
| 42 | Contour data being sent too slowly |
| 46 | Gear axis both master and follower |
| 47 | Gearing and coordinated moves cannot run simultaneously |
| 50 | Not enough fields |
| 51 | Question mark not valid |
| 52 | Missing " or string too long |
| 53 | Error in {} |
| 54 | Question mark part of string |
| 55 | Missing [or [] |
| 56 | Array index invalid or out of range |
| 57 | Bad function or array |
| 58 | Unrecognized command in a command response (i.e._GNX) |
| 59 | Mismatched parentheses |
| 60 | Download error - line too long or too many lines |
| 61 | Duplicate or bad label |
| 62 | Too many labels |
| 65 | IN command must have a comma |

| | |
|-----|---|
| 66 | Array space full |
| 67 | Too many arrays or variables |
| 71 | IN only valid in task #0 |
| 80 | Record mode already running |
| 81 | No array or source specified |
| 82 | Undefined array |
| 83 | Not a valid number |
| 84 | Too many elements |
| 90 | Only X Y Z W valid operand |
| 95 | TM too large for stepper pulse |
| 96 | SM jumper needs to be installed for stepper motor operation |
| 100 | Not valid when running ECAM |
| 101 | Improper index into ET (must be 0-256) |
| 102 | No master axis defined for ECAM |
| 103 | Master axis modulus greater than 256*EP value |
| 104 | Not valid when axis performing ECAM |
| 105 | EB1 command must be given first |
| 118 | Controller has GL1600 not GL1800 |

20.0 APPENDIX D WIRING SCHEMATIC LEGEND

Table 9 – Wire Numbering

| Wire Numbering | | | |
|------------------|-----------|---------|--------------------------------|
| Type | ID | Example | Description |
| DC Control | 400 - 599 | 400 | |
| DC Supply | 300 - 399 | 300 | |
| AC Control | 200 - 299 | 200 | |
| AC Control Power | 100 - 199 | 100 | |
| AC Supply Power | nLm | 1L2 | Segment 1 of AC Supply Phase 2 |
| Ground | GND | GND | |
| Neutral | NEU | NEU | |
| AC or DC Motor | nTm | 1T2 | Motor 1, phase 2 |
| Inputs | n1mm | 1101 | Module 1, Input 01 |
| Outputs | n0mm | 2001 | Module 2, Output 02 |
| Connector | Jnnn/mm | J100/5 | Connector 100, pin 5 |

Table 10 – Wire Color Code

| Wire Color Code | | |
|-----------------|----------------------------|------------------------|
| Type | Color | Example |
| DC (<150 V) | BLUE | 0 Vdc, 80 VDC |
| DC (>150 V) | BLACK | 200 VDC |
| AC (<150 V) | RED | 120 VAC |
| AC (>150 V) | BLACK | 208 VAC, 480 VAC |
| Neutral | WHITE | |
| Ground | GREEN or GREEN with YELLOW | |
| Remote | YELLOW | Remote control circuit |

NOTE: This color code does not apply to multi-conductor cables.

21.0 Appendix E - Stop Codes

For position and limit errors, the error screen shows the stop codes for all the motors. This shows which axis (or axes) caused the machine to fault.

Table 11: Stop Code Definitions

| Code | Meaning |
|------|--|
| 0 | Motors are running, independent mode. |
| 1 | Motors stopped at commanded independent position. |
| 2 | Decelerating or stopped by FWD limit switch or software limit, FL. |
| 3 | Decelerating or stopped by REV limit switch or software limit, BL. |
| 4 | Decelerating or stopped by Stop Command (ST). |
| 6 | Stopped by Abort input. |
| 7 | Stopped by Abort command (AB). |
| 8 | Decelerating or stopped by Off-on-Error (OE1). |
| 9 | Stopped after Finding Edge (FE). |
| 10 | Stopped after Homing (HM). |
| 50 | Contour running. |
| 51 | Contour Stop. |
| 99 | MC timeout. |
| 100 | Motors are running, vector sequence. |
| 101 | Motors stopped at commanded vector. |

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Swagelok® Installation Instructions

INSTALLATION INSTRUCTIONS

SWAGELOK Tube Fittings

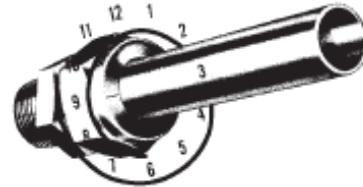
SWAGELOK Tube Fittings come to you completely assembled, finger-tight. They are ready for immediate use.

Disassembly before use is unnecessary and can result in dirt or foreign material getting into fitting and causing leaks.

SWAGELOK Tube Fittings are installed in three easy steps:



Simply insert the tubing into the SWAGELOK Tube Fitting. **Make sure that the tubing rests firmly on the shoulder of the fitting and that the nut is finger-tight.**



Now, while holding the fitting body steady with a backup wrench, tighten the nut 1-1/4 turns*. Watch the scribe mark, make one complete revolution and continue to the 9 o'clock position.

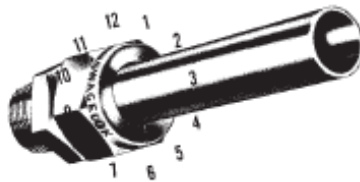
By scribing the nut at the 6 o'clock position as it appears to you, there will be no doubt as to the starting position. When tightened 1-1/4 turns* to the 9 o'clock position you can easily see that the fitting has been properly installed.

Use of the Gap Inspection Gage (1-1/4 turns* from finger-tight) assures sufficient pull-up.

High Pressure Applications or High Safety Factor Systems

Due to variations in tubing diameters, a common starting point is desirable. Use a wrench to snug up the nut until the tubing will not turn (by hand) in the fitting. At this point, scribe the nut at the 6 o'clock position. Tighten the nut 1-1/4 turns* and the fitting is ready to hold pressures well above the working pressures of the tubing.

Use of the Gap Inspection Gage (1-1/4 turns* from snug) assures sufficient pull-up.



Before tightening the SWAGELOK nut, scribe the nut at the 6 o'clock position.

*For 1/16", 1/8" and 3/16" size tube fittings, only 3/4 turn from finger-tight is necessary.

GAGEABILITY

As described on Page 3, SWAGELOK Tube Fittings are made to exacting tolerances. Without such close tolerances, the interaction of the nut, two ferrules, and body would not be successful.

If good quality tubing is used with SWAGELOK Tube Fittings, successful connections will result if installation instructions are followed.

SWAGELOK GAP INSPECTION GAGES are designed to assure the installer or inspector that a fitting has been sufficiently pulled up. They are particularly applicable to systems where fittings are installed in difficult or inaccessible locations or systems where insufficient pull-up could cause potentially dangerous or expensive consequences.

SWAGELOK GAP INSPECTION GAGES are placed between the nut and body of a tube fitting **after pull-up**. If the GAP INSPECTION GAGE will not fit in the gap between the nut and body hex, the fitting nut has been tightened sufficiently.



Gap Inspection Gage **does not** fit between nut and body hex.
Fitting is sufficiently tightened.



Gap Inspection Gage **fits** between nut and body hex.
Additional tightening is required.

| Fitting Size (Inches) | Series |
|-----------------------|--------|
| 1/16" | 100 |
| 1/8" | 200 |
| 3/16" | 300 |
| 1/4" | 400 |
| 5/16" | 500 |
| 3/8" | 600 |
| 1/2" | 810 |
| 5/8" | 1010 |
| 3/4" | 1210 |
| 7/8" | 1410 |
| 1" | 1610 |

*For 1/16", 1/8" and 3/16" size tube fittings, only 3/4 turn from finger-tight is necessary.

RE-TIGHTENING INSTRUCTIONS

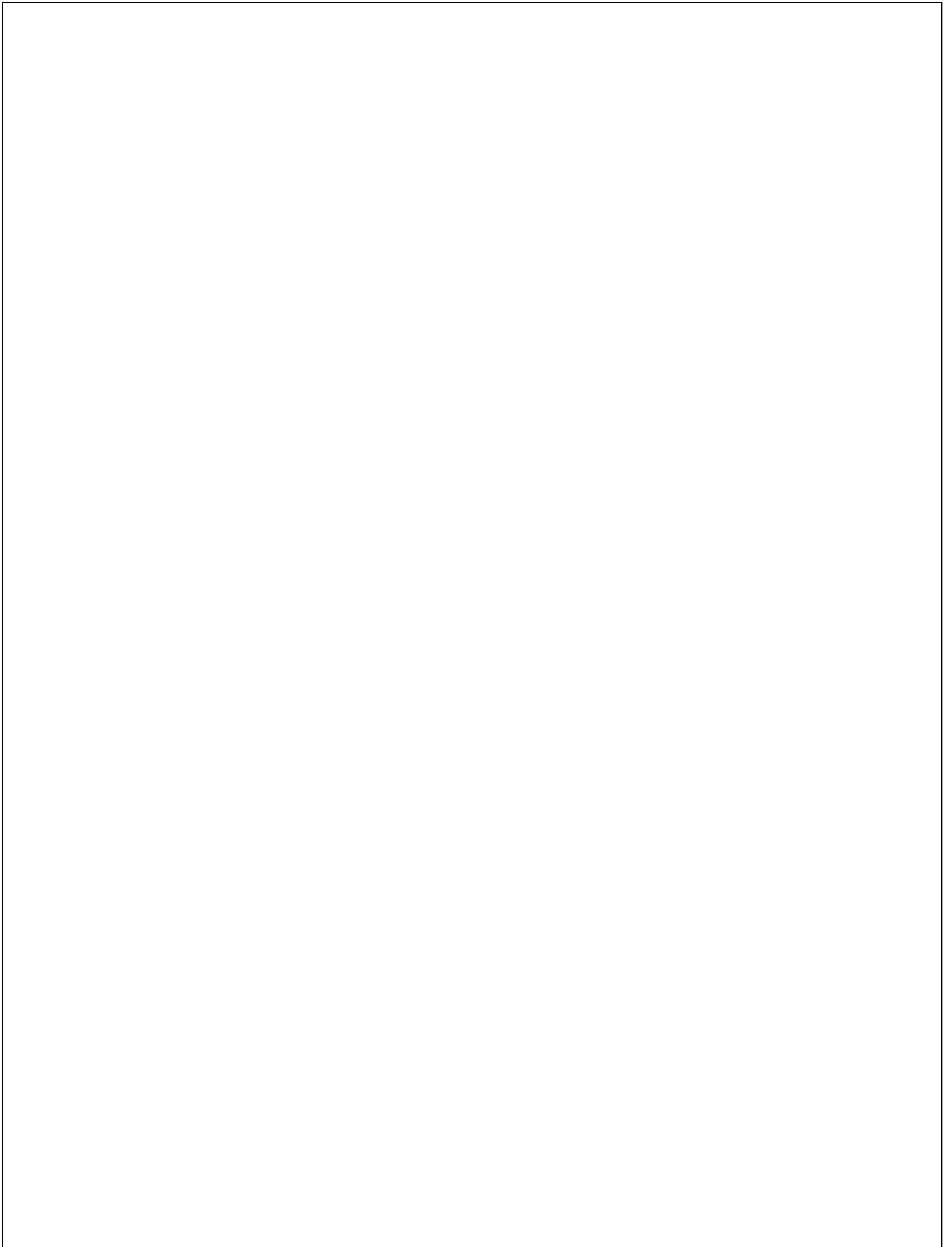
Connections can be disconnected and re-tightened many times. The same reliable, leak-proof seal can be obtained every time the connection is remade.

Tighten nut by hand. Rotate nut to the original position with a wrench. (An increase in resistance will be encountered at the original position). Then tighten slightly with the wrench. The original position will generally be about 1/4 turn for 1/4" to 1/2" tubing. (Smaller tube sizes will take less tightening to reach the original position, while larger tube sizes will require more tightening. The wall thickness will also have an effect on tightening).

Fitting shown in disconnected position.

Tubing with pre-swaged ferrules inserted into the fitting until front ferrule seats in fitting.





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