



GLOBAL ELECTRONIC MIX SOLUTIONS PLURAL COMPONENT MIXING SYSTEM



In this part sheet, the words **WARNING**, **CAUTION** and **NOTE** are used to emphasize important safety information as follows:

WARNING

Hazards or unsafe practices which could result in severe personal injury, death or substantial property damage.

CAUTION

Hazards or unsafe practices which could result in minor personal injury, product or property damage.

NOTE

Important installation, operation or maintenance information.

WARNING

Read the following warnings before using this equipment.



READ THE MANUAL

Before operating finishing equipment, read and understand all safety, operation and maintenance information provided in the operation manual.



OPERATOR TRAINING

All personnel must be trained before operating finishing equipment.



EQUIPMENT MISUSE HAZARD

Equipment misuse can cause the equipment to rupture, malfunction, or start unexpectedly and result in serious injury.



LOCK OUT / TAG-OUT

Failure to de-energize, disconnect, lock out and tag-out all power sources before performing equipment maintenance could cause serious injury or death.



AUTOMATIC EQUIPMENT

Automatic equipment may start suddenly without warning.



PRESSURE RELIEF PROCEDURE

Always follow the pressure relief procedure in the equipment instruction manual.



KEEP EQUIPMENT GUARDS IN PLACE

Do not operate the equipment if the safety devices have been removed.



KNOW WHERE AND HOW TO SHUT OFF THE EQUIPMENT IN CASE OF AN EMERGENCY



WEAR SAFETY GLASSES

Failure to wear safety glasses with side shields could result in serious eye injury or blindness.



INSPECT THE EQUIPMENT DAILY

Inspect the equipment for worn or broken parts on a daily basis. Do not operate the equipment if you are uncertain about its condition.



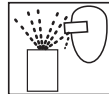
NEVER MODIFY THE EQUIPMENT

Do not modify the equipment unless the manufacturer provides written approval.



NOISE HAZARD

You may be injured by loud noise. Hearing protection may be required when using this equipment.



PROJECTILE HAZARD

You may be injured by venting liquids or gases that are released under pressure, or flying debris.



STATIC CHARGE

Fluid may develop a static charge that must be dissipated through proper grounding of the equipment, objects to be sprayed and all other electrically conductive objects in the dispensing area. Improper grounding or sparks can cause a hazardous condition and result in fire, explosion or electric shock and other serious injury.



ELECTRIC SHOCK / GROUNDING

Improper grounding or sparks can cause a hazardous condition and result in fire, explosion or electric shock and other serious injury.



PINCH POINT HAZARD

Moving parts can crush and cut. Pinch points are basically any areas where there are moving parts.



HIGH PRESSURE CONSIDERATION

High pressure can cause serious injury. Relieve all pressure before servicing. Spray from the spray gun, hose leaks, or ruptured components can inject fluid into your body and cause extremely serious injury.



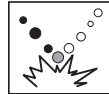
WEAR RESPIRATOR

Toxic fumes can cause serious injury or death if inhaled. Wear a respirator as recommended by the fluid and solvent manufacturer's Material Safety Data Sheet.



TOXIC FLUID & FUMES

Hazardous fluid or toxic fumes can cause serious injury or death if splashed in the eyes or on the skin, inhaled, injected or swallowed. LEARN and KNOW the specific hazards or the fluids you are using.



PLURAL COMPONENT MATERIALS HAZARD

Because of the vast number of chemicals that could be used and their varying chemical reactions, the buyer and user of this equipment must determine all facts relating to the materials used, including any of the potential hazards involved.



EXPLOSION HAZARD

Halogenated hydrocarbon solvents can cause an explosion when in contact with aluminum components of a pressurized or closed fluid system.



FIRE AND EXPLOSION HAZARD

Improper equipment grounding, poor ventilation, open flame or sparks can cause a hazardous condition and result in fire or explosion and serious injury.



**CA PROP
65**

PROP 65 WARNING

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

IT IS THE RESPONSIBILITY OF THE EMPLOYER TO PROVIDE THIS INFORMATION TO THE OPERATOR OF THE EQUIPMENT. FOR FURTHER SAFETY INFORMATION REGARDING THIS EQUIPMENT, SEE THE GENERAL EQUIPMENT SAFETY BOOKLET (77-5300).

Binks reserves the right to modify equipment specification without prior notice.

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1: Introduction

The GEMS system is designed to accurately mix most two component (2K) paints. It will supply any low-pressure manual or automatic spray gun and can easily handle very low flow rates or high ratio materials (greater than 20:1). The system uses real-time metering to accurately dispense and mix the resin and hardener on-ratio regardless of varying flow rate as seen in real world paint applications such as feathering or rapid triggering with manual guns.

The system is easily set up and operated with a 7" touch screen. Access to system parameters and usage data is restricted via password protection.

GEMS systems are configurable with many options and accessories:

- Up to 5 paint colors
- Hardener flow sensor
- Gun flush boxes
- Pedestal Stand
- Stack light
- Atomizing air cut-off
- 2nd gun capability

See section **14.0** in this manual for information on accessory equipment.

1.1: Features

The GEMS System has unique features that provide superior benefits:

Continuous Flow — The mix manifold is designed to optimize mix quality and minimize internal volume by receiving Resin (Component A) and Hardener (Component B) continuously.

Accurate Dispensing — Control and positioning of the B metering pump is precise. An electronically controlled stepper motor with integral linear actuator allow for dispense from 2cc to 600cc per minute, and ratios from 1:1 to 100:1 depending on the pump size chosen. Ratio tolerance down to 1% is possible.

Ease of Use — The touchscreen user interface is easy to learn and efficient to use. It provides control of the system with few actions, along with real-time data and in-depth troubleshooting when alarms occur.

Easily Configurable — Use up to five different paint resins and up to two spray guns. Flush boxes, atomizing air control, and other options and accessories can be added at any time.

Programmable Flushing — Set unique flushing options specific to material needs.

Mounting Options — The system can be mounted to a wall and plumbed into an existing workspace, or it can be bolted to the floor with an available pedestal stand.

Alarm Warnings — The alarm system warns the user of system errors and suggests possible solutions. Help screens provide troubleshooting information to remedy system alarms.

Modular Design — Sub-assemblies are easily and quickly removed for maintenance and repair.

1.2: System Part Numbering

E2L -125201

Flow Meter:
 0 = No Flow Meter
 1 = 90-3800cc Flow Meter

B Pump Size:
 1 = 600cc Pump
 2 = 300cc Pump

Number of Colors:
 1 = 1 Color
 3 = 3 color
 5 = 5 color

Number of Guns:
 1 = 1 gun
 2 = 2 guns
 3 = 1 gun with GFB
 4 = 2 guns with GFB's

Pre-wired options:
 0 = none
 1 = maximum

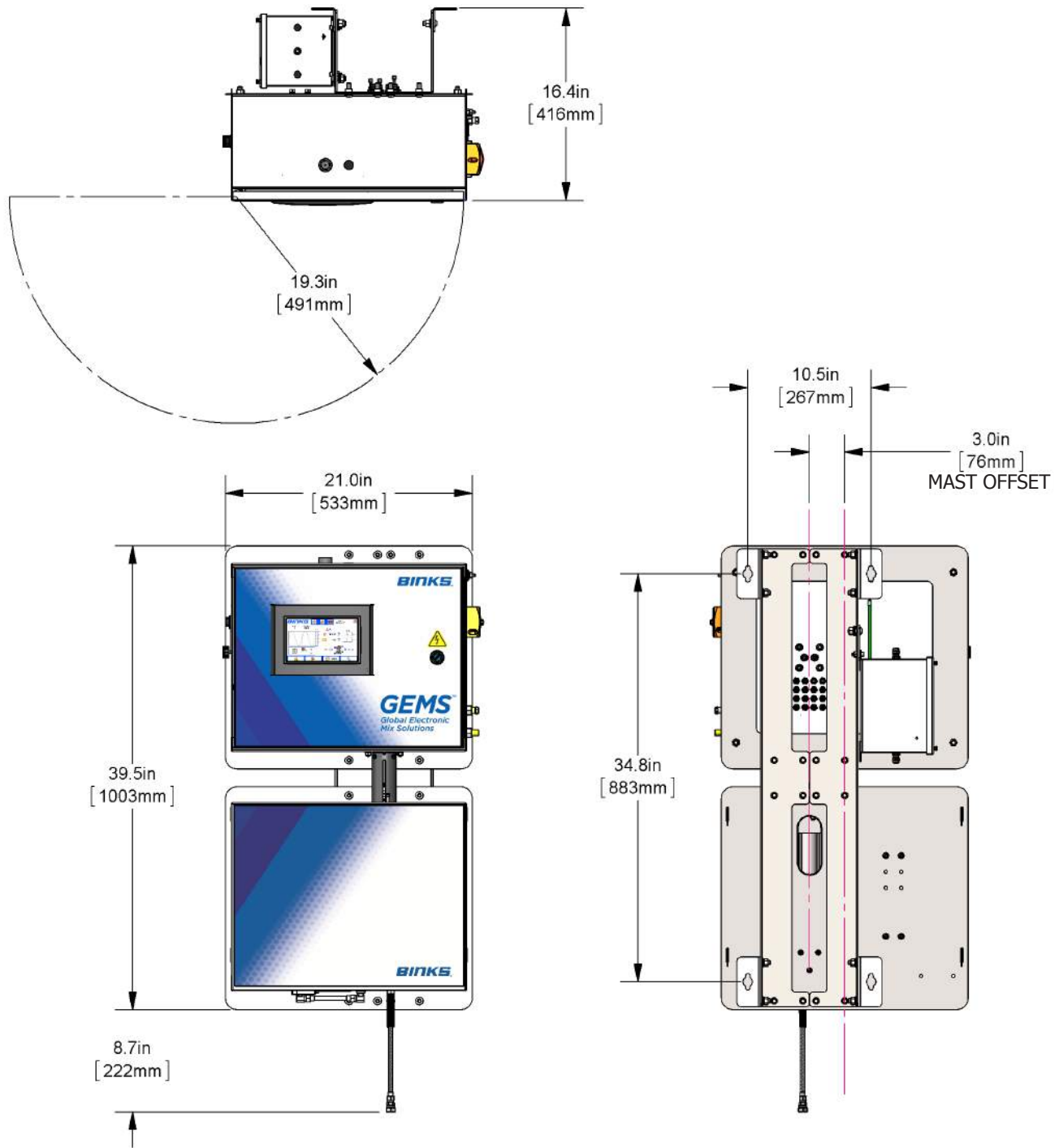
In-booth fluid panel:
 0 = no in-booth capability

If the example number shown above was ordered the customer would receive the following:
 GEMS system with 600cc Dispense Pump, 5 colors, two guns, pre-wired for all accessory equipment.

TECHNICAL SPECIFICATIONS		
Max Working Air Pressure	105 psi	7.2 bar
Optimal Working Air Pressure	75 – 105 psi	5.2 – 7.2 bar
Max Inlet Fluid Pressure	250 psi	17.2 bar
Max Dispense Pump Flow Rate	10.1 or 20.3 oz/min	300 or 600 cc/m
Min Dispense Pump Flow Rate	0.07 or 0.7 oz/min	2 or 20 cc/min
"A" Side Flowmeter Range	1.3 – 64 oz/min	40 – 1900 cc/min
Operating Temperature Range	41 – 122 Fahrenheit	5 – 50 Celsius
System Weight	130 – 150 lbs.	59 – 68 Kg
Viscosity Range of Fluid	20 – 3000 cPs	
Mixing Ratio Range	1:1 – 100:1	
Ratio Tolerance Range	Up to +/- 1%	
Wetted Parts	300 series stainless steel, PTFE, perfluoroelastomer, UHMW polyethylene	
External Power Requirements	100 – 240 VAC, 50 – 60Hz. 1.4 Amp, 16 AWG power supply wire gauge	
Environmental	Indoor use, pollution degree (2)	



2: Wall Mount Dimensions

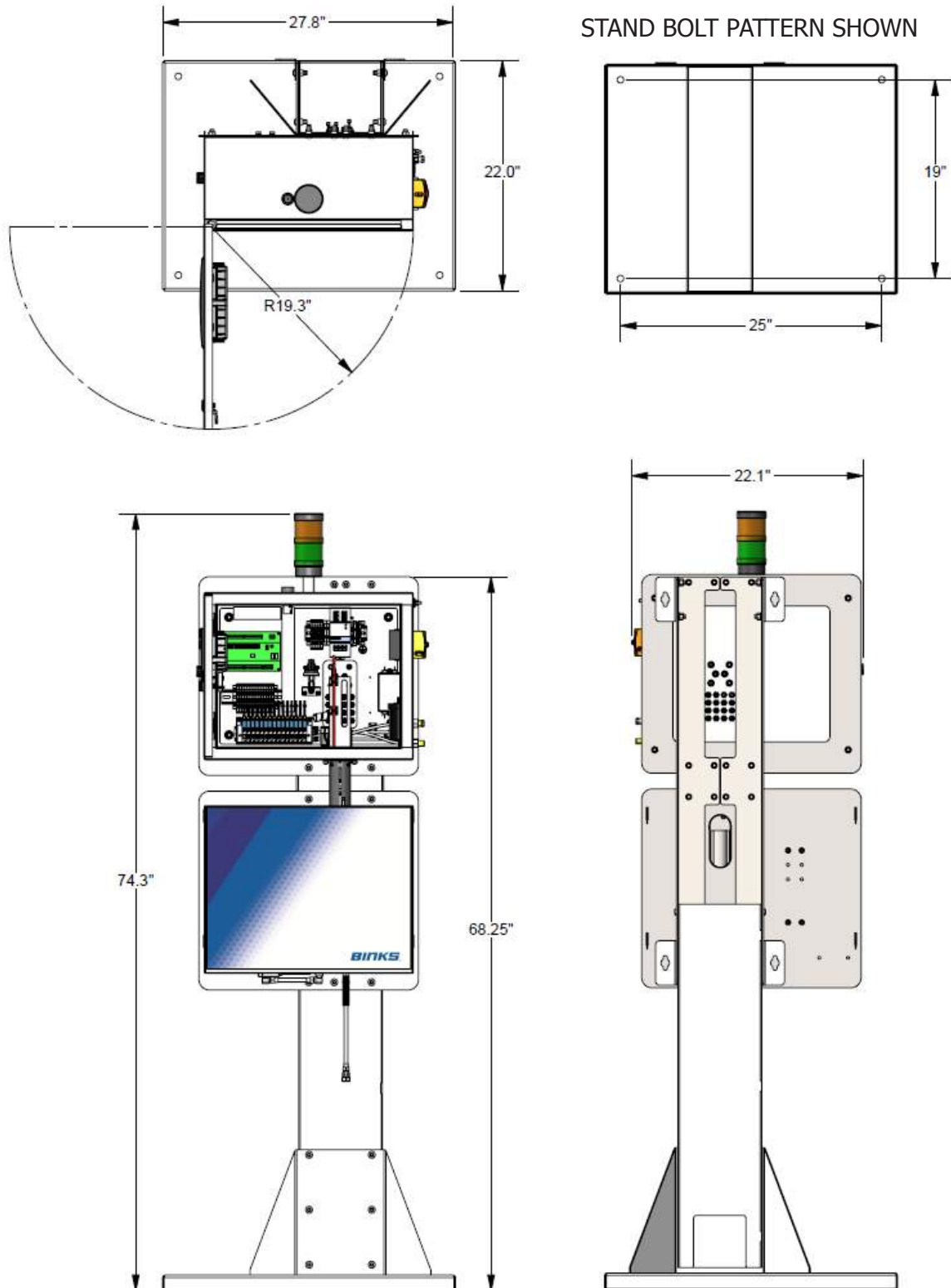


Wall mounting requirements:

- Ensure wall is able to support weight of complete system, including air and fluid hoses and other connected devices. (Minimum 200 lbs. [91 kg])
- Ensure clearance for electrical and fluid connections to system, and door swing radius.
- Bolt GEMS mast to wall or panel using minimum 4 each of 3/8" lag screws or cap screws with flat washers.

2.1: Floor Stand Dimensions

Shown with accessory floor stand kit (240-3160) and stack light kit (240-3115)

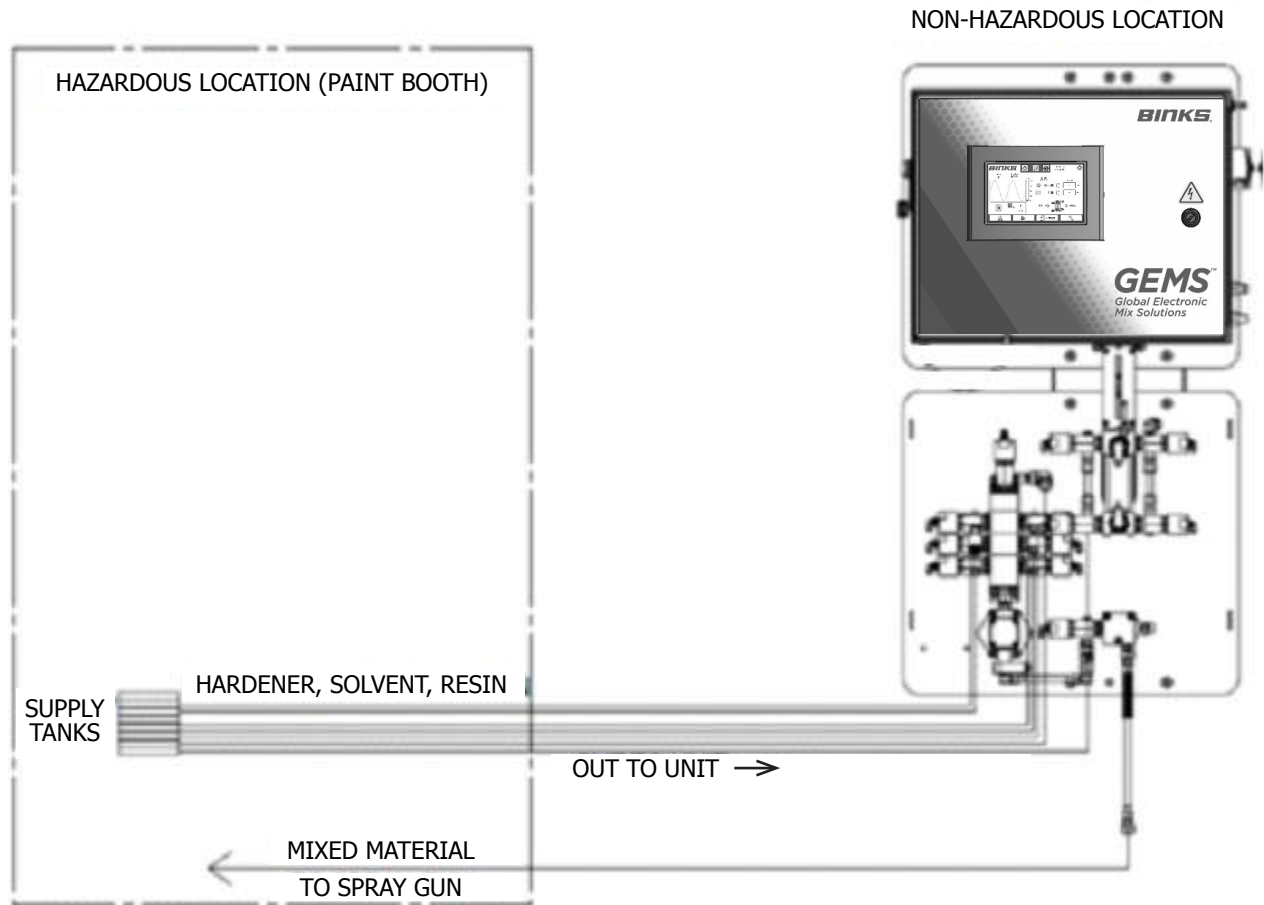


Stand mounting requirements:

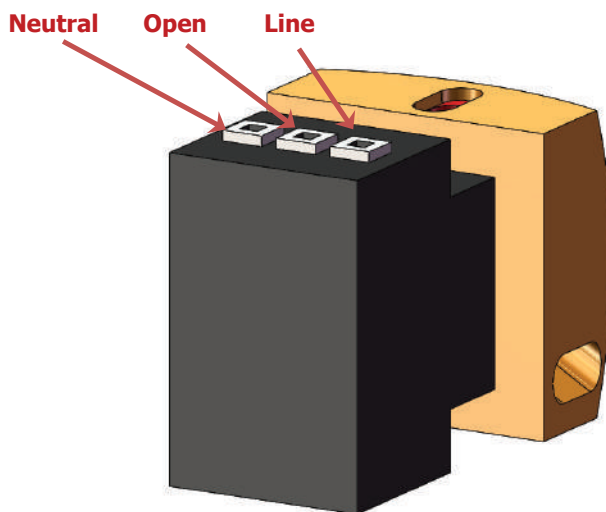
- Stand should be bolted to floor per recommendations in **77-3092 Stand Assembly Instructions**.

3: Installation Diagram for Non-Hazardous Locations

Wall or stand-mounted systems



3.1: Connecting Direct Power



AC LOCK OUT SWITCH:
Top right corner of control enclosure

If direct connection to power disconnect is preferred to AC power cord, use AC Conduit Kit (part#: 76453). Installation should only be performed by a qualified electrician. Connect power as follows:

1. Remove AC Inlet assembly. Install 76453 kit.
2. Use a compatible cord grip / strain relief.
3. Connect power cord to the appropriate terminals as shown at left.
4. For the complete electrical schematic please see the electrical diagram section in the **Maintenance and Repair Manual 77-2983**.

⚠ WARNING

Before making electrical, air, and fluid connections to GEMS, be sure to understand and verify all requirements for installation, including but not limited to: electrical codes, OSHA requirements, NFPA requirements, and all applicable local codes and ordinances.

Read and understand all operating manuals for connected equipment. Do not supply GEMS with higher fluid or air pressures than recommended in the technical specifications section of this manual.

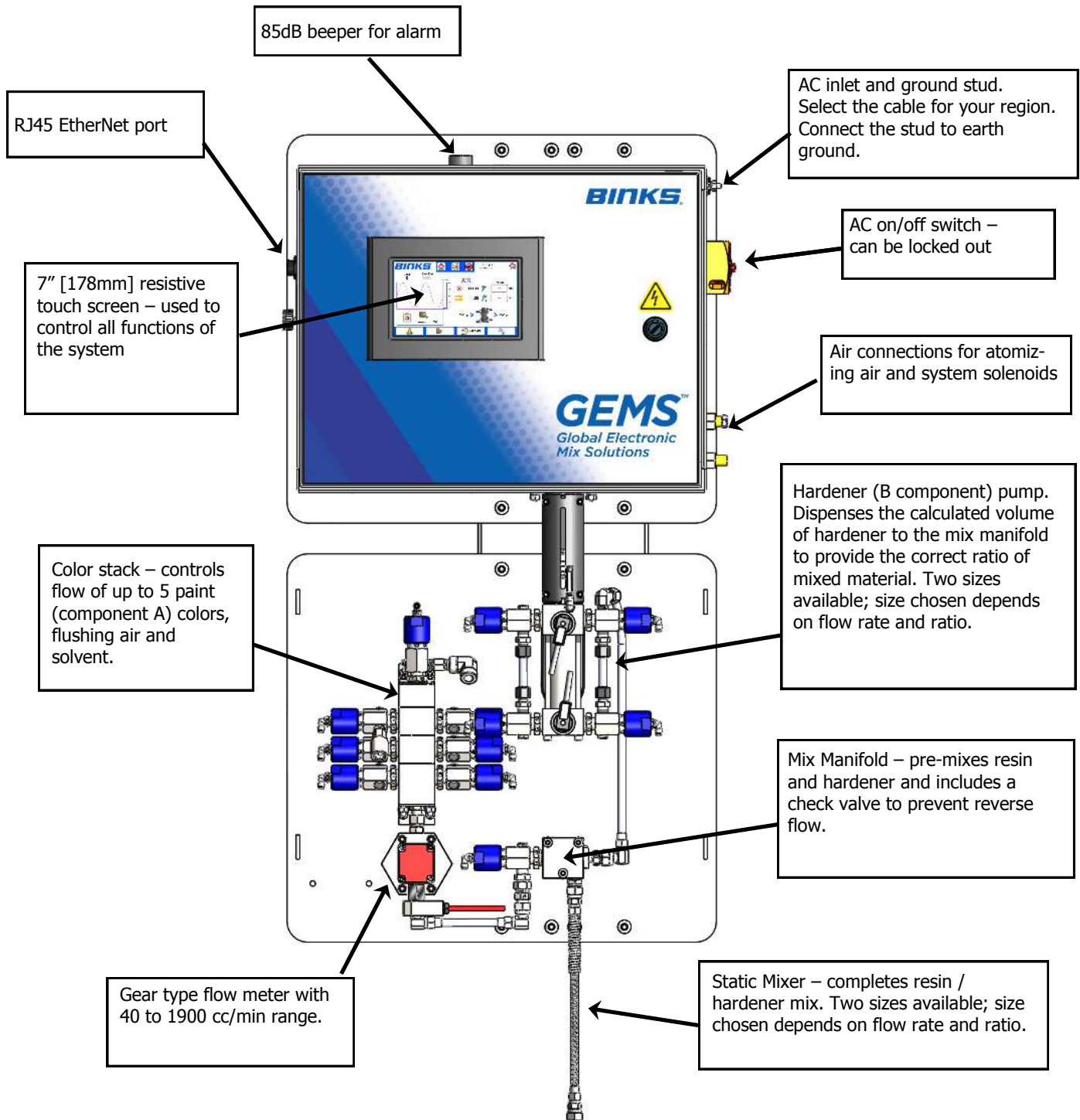
⚠ WARNING

Control enclosure cannot be placed in a hazardous location. Do not use equipment not approved for hazardous locations. Do not modify system equipment.

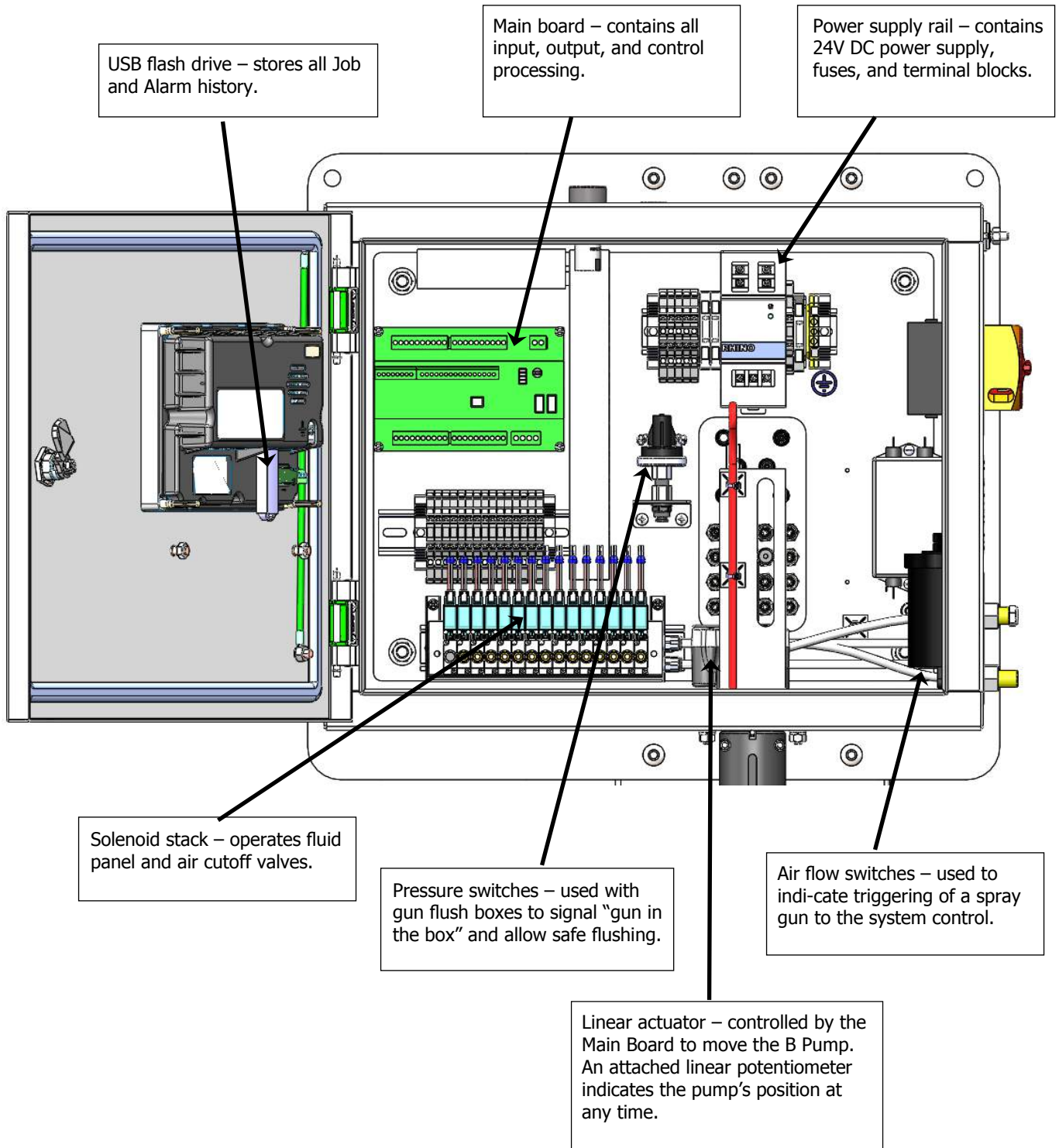
⚠ WARNING

To maintain non-hazardous classification of this equipment, the dispense pump and fluid panel components and assemblies must be monitored for leaks and serviced regularly to prevent leaks from occurring. If a leak is discovered the system must be immediately shut down, de-energized, and repaired to correct the problem.

4: Component Overview



4.1: Control Enclosure Detail

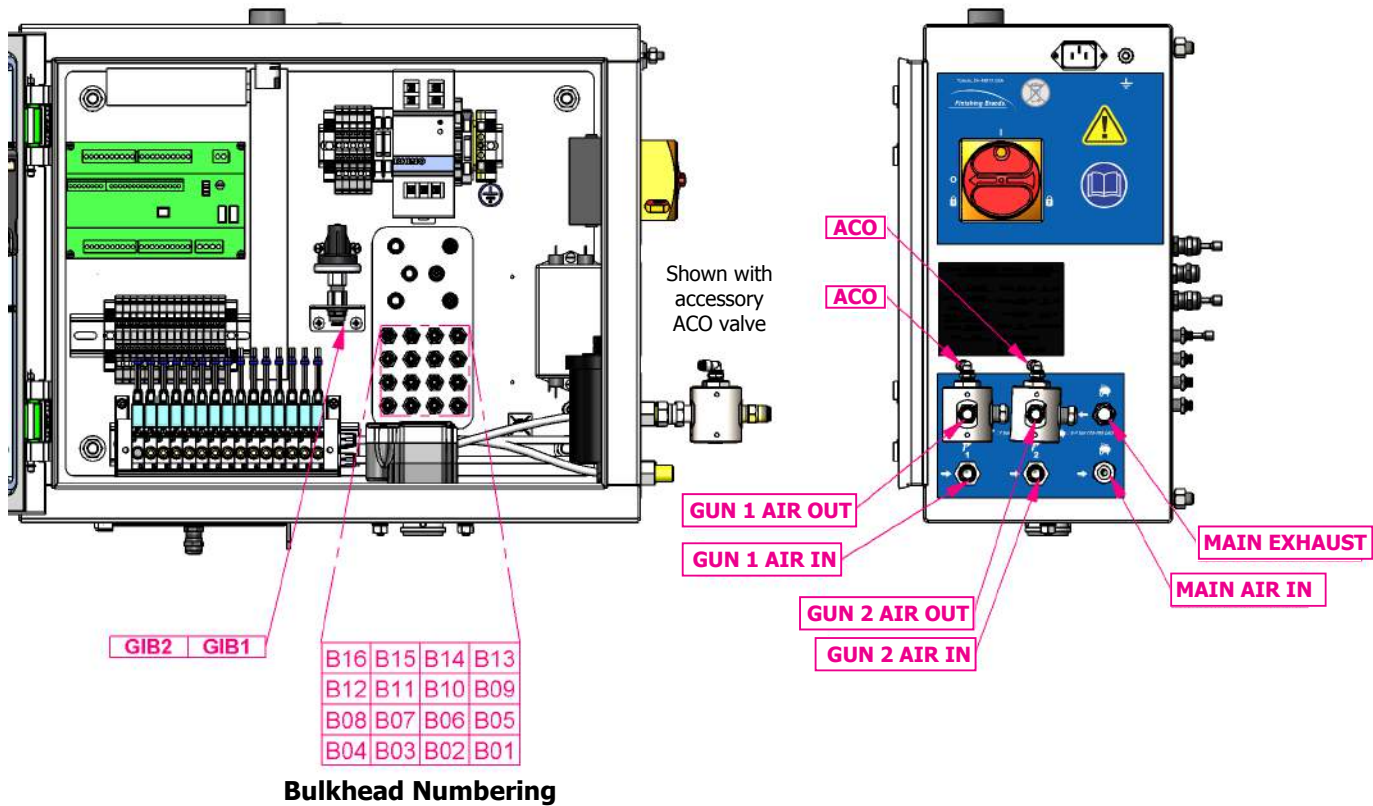


5: Air Connections

Air pressure for the control enclosure should range from 75 – 100 psi (5 to 7 bar) for proper actuation of the system valves. Clean, dry (-40F [-40C] dew point), regulated compressed air is recommended for use with all pneumatic components in this system. Air filters, coalescers, regulators, and dryers are not included with the system. Consult your representative for details concerning air control equipment.

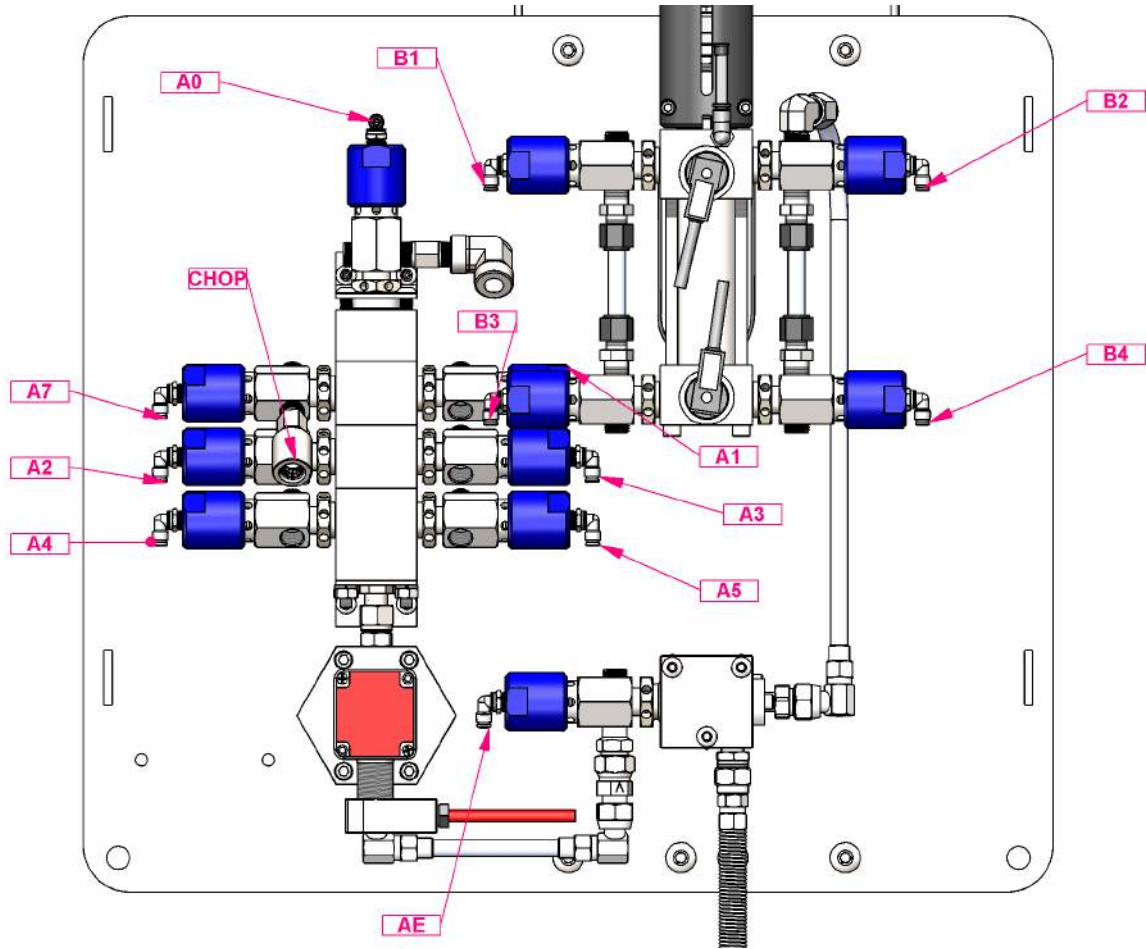
Air flow to spray gun should be greater than 3 – 4 SCFM (85 – 113 l/m) for proper function of the air flow switches.

5.1: Control Enclosure Air Connections



CONNECTION NO.	BULKHEAD NO.	DESCRIPTION	TUBE OD	CONNECTING THREAD
—	—	MAIN AIR IN	—	1/4 NPT female
—	—	MAIN AIR EXHAUST	—	1/4 NPT female
—	—	GUN 1 AIR IN	—	1/4 NPS/BSP male
—	—	GUN 1 AIR OUT	—	1/4 NPS/BSP male
—	—	GUN 2 AIR IN	—	1/4 NPS/BSP male
—	—	GUN 2 AIR OUT	—	1/4 NPS/BSP male
ACO	B16	Gun 1 Atomizing ACO control	5/32" / 4mm	—
ACO	B16	Gun 2 Atomizing ACO control	5/32" / 4mm	—
GIB1	B15	Gun In Box 1 (GIB1) Air Signal	5/32" / 4mm	—
GIB2	B16	Gun In Box 2 (GIB2) Air Signal	5/32" / 4mm	—

5.2: Fluid Panel Air Connections



CONNECTION NO.	BULKHEAD NO.	DESCRIPTION	TUBE OD	CONNECTING THREAD
CHOP	—	Color stack flushing air – includes check valve	—	1/4 NPT female
B1	B01	B pump top inlet signal	5/32" / 4mm	1/8 NPT
B3	B03	B pump bottom inlet signal	5/32" / 4mm	1/8 NPT
B2	B02	B pump top outlet signal	5/32" / 4mm	1/8 NPT
B4	B04	B pump bottom outlet signal	5/32" / 4mm	1/8 NPT
A7	B05	Air flush signal	5/32" / 4mm	1/8 NPT
A0	B06	Solvent flush signal	5/32" / 4mm	1/8 NPT
AE	B07	A Enable Valve signal	5/32" / 4mm	1/8 NPT
A1	B08	Color 1	5/32" / 4mm	1/8 NPT
A2	B09	Color 2	5/32" / 4mm	1/8 NPT
A3	B10	Color 3	5/32" / 4mm	1/8 NPT
A4	B11	Color 4	5/32" / 4mm	1/8 NPT
A5	B12	Color 5	5/32" / 4mm	1/8 NPT
TRG2	B13	Gun Box—Trigger gun 2 signal	5/32" / 4mm	—
TRG1	B14	Gun Box—Trigger gun 1 signal	5/32" / 4mm	—

6: Fluid Connections

Paint resins and hardeners may be supplied to the GEMS system via pressure tanks or pumps. Fluid regulators are strongly recommended if supplying from a pump, and entrained air must be avoided.

Fluid supplied to the GEMS system must also be free of contaminants and solid particles that may clog the flow meter gears or other downstream components. Typical filtration for paint resins is 100 mesh (150 micron) or smaller. Contact your GEMS representative for information regarding fluid supply and conditioning equipment.

For compression fittings with ferrules, tighten the ferrule nut 1 to 1.5 turns past finger tight. Do not over tighten, as exceeding 1.5 turns will likely cause the ferrules to cut through the tubing.

Use PTFE tape or liquid sealant on tapered pipe threads.

NOTE

The inlet fluid pressure to the B Pump should always be maintained 5 to 10% above the outlet pressure. This ensures proper operation of the Dispense Pump.

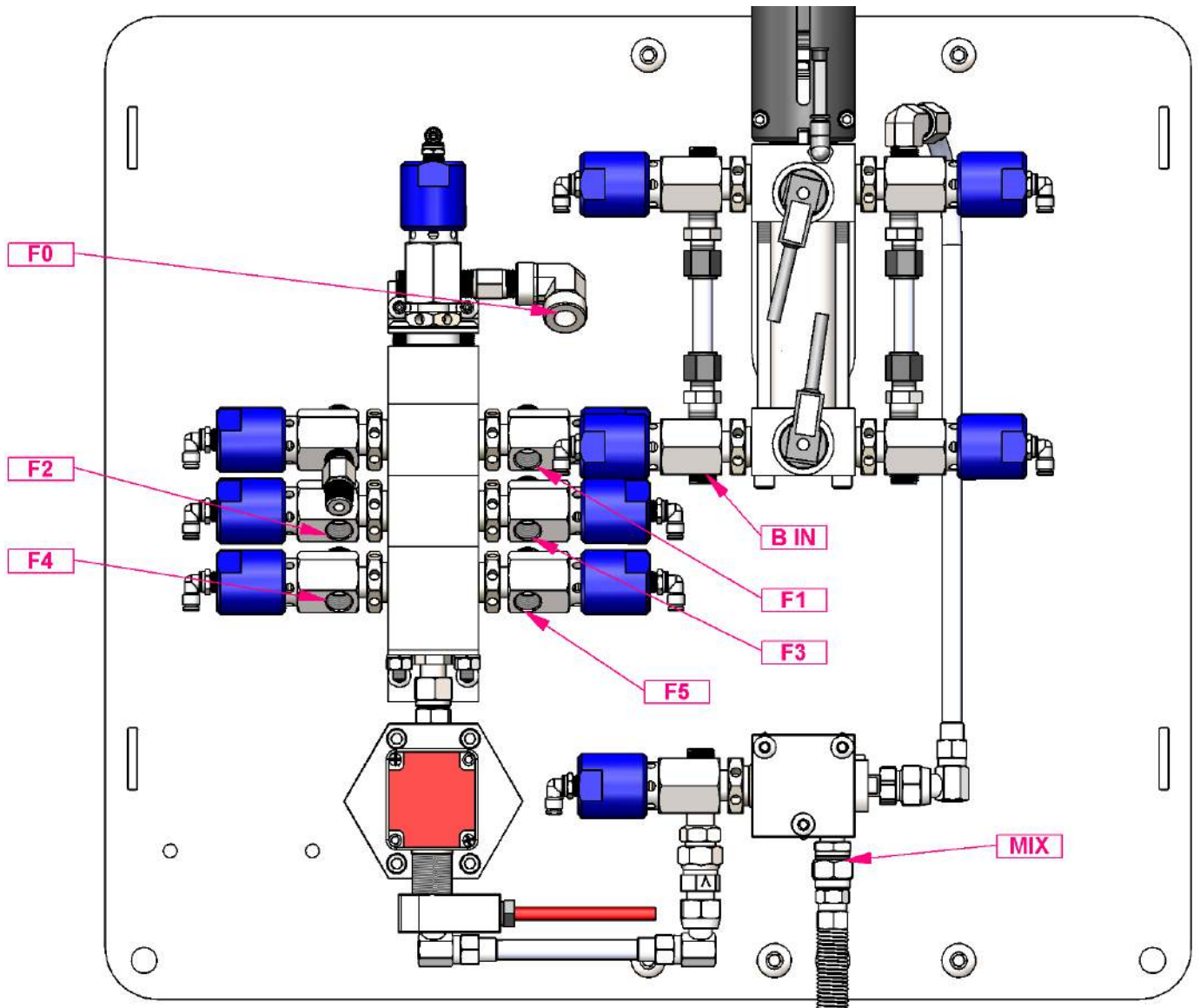
NOTE

The static mixer assembly (240-3122) connects to the mix manifold outlet. The 240-3122 downstream end connection is 3/8" NPS male thread.

NOTE

F1 - F5 plugs may be removed from back of valves for connection to paint circulation systems.

6.1: Fluid Panel Fluid Connections



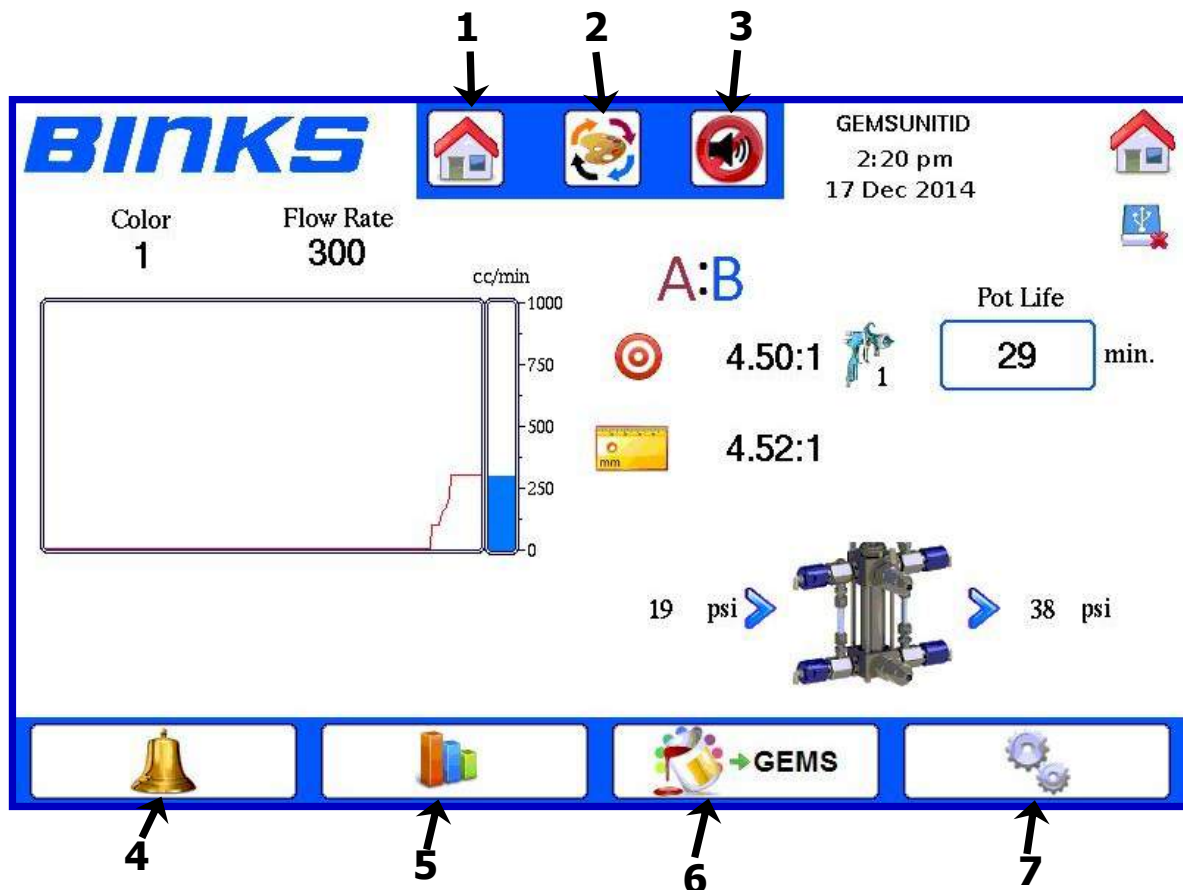
CONNECTION NO.	DESCRIPTION	CONNECTING THREAD
F0	Solvent Inlet – includes check valve	1/4" NPT female
F1	Color 1 Inlet	1/4" NPT female
F2	Color 2 Inlet	1/4" NPT female
F3	Color 3 Inlet	1/4" NPT female
F4	Color 4 Inlet	1/4" NPT female
F5	Color 5 Inlet	1/4" NPT female
B IN	B Pump Inlet	1/4" NPT female
MIX	Mix manifold outlet	3/8" NPS male

7: User Interface Guide

The touch screen display is used to control GEMS. The following pages identify the various screens and their associated controls. Read and understand this guide to properly understand and operate the GEMS system.



7.1: Home Screen Buttons



1. **Home:** This button can be pushed at any time to return the display to the Home Screen.



2. **Color:** Used to perform color changes and programmed flush sequences. Advances to the Color Change screen. Always visible.



3. **Mute:** Silence a sounding alarm. This button will NOT reset the alarm, it will only silence it until the alarm has been reset.



4. **Alarms:** Advances to the alarms screen to reset alarms or view alarm history and help.



5. **Usage:** Advances to the usage and jobs screens for paint usage totals and job functions.



6. **Prime:** Advances to the Prime screen for loading paint colors, solvent, and hardener into the system.

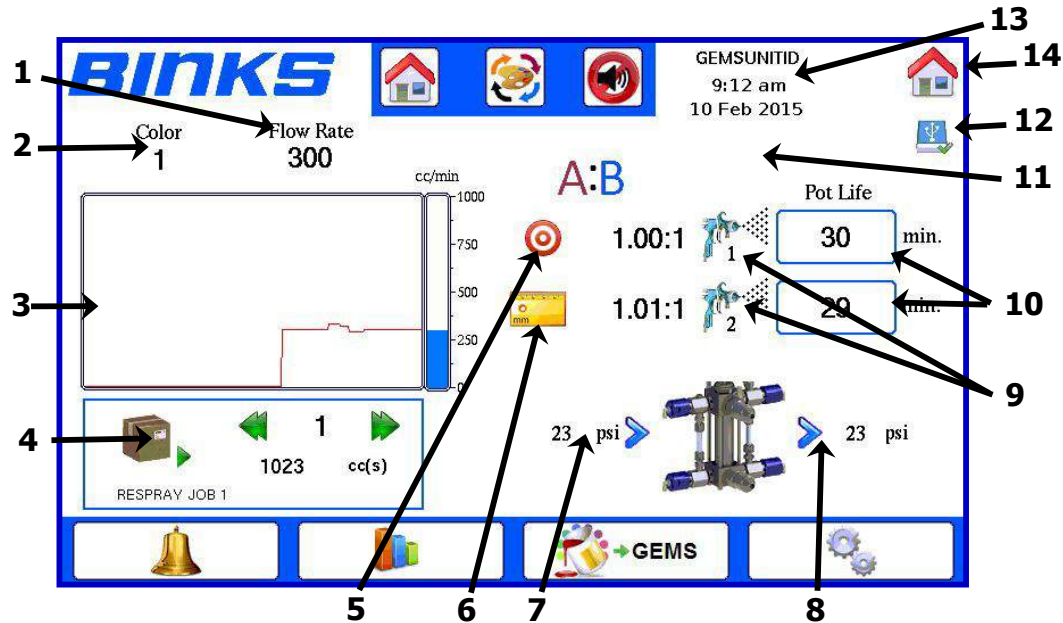


7. **Settings:** Advances to the settings screens (password protected) to change system settings and perform calibrations.



7.2: Home Screen Information

The Home Screen displays the GEMS current conditions and status. Valuable information like current flow rate, color number, job number, ratio, pot life, pressures, and gun status are visible here.

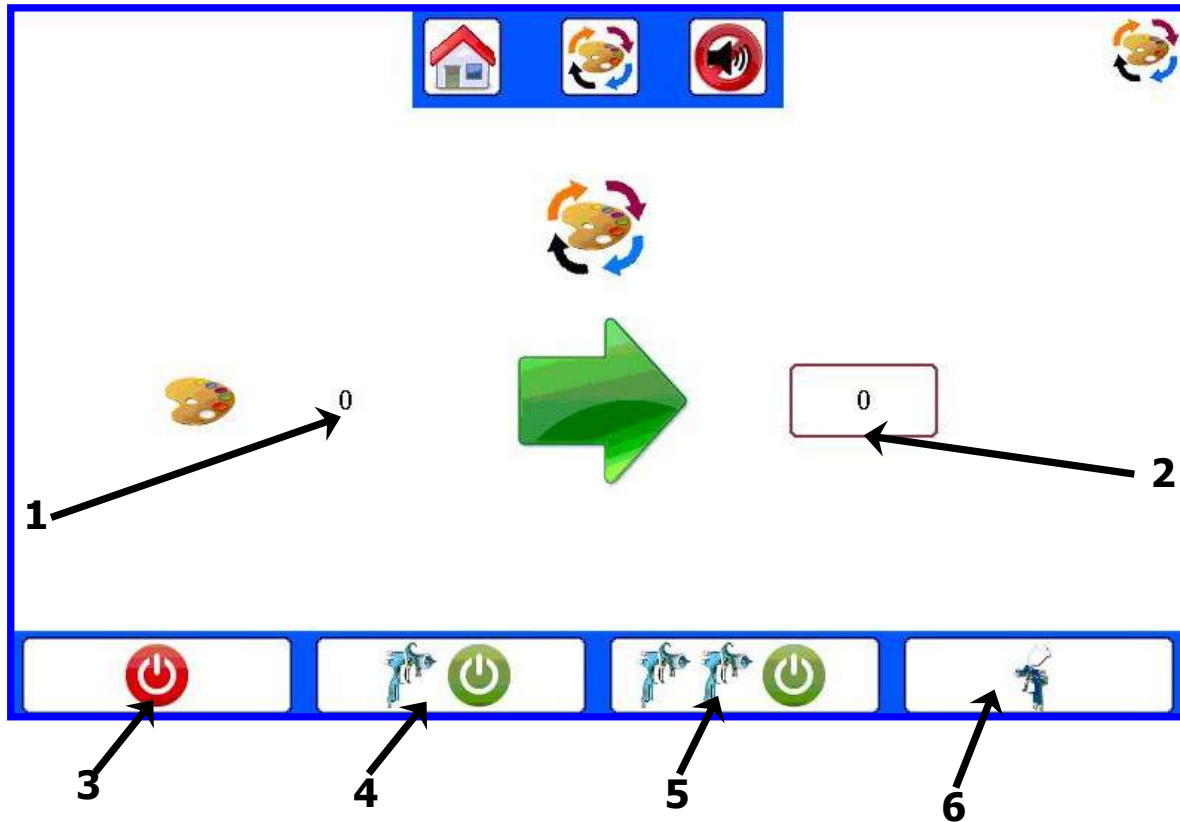









1. **Current flow rate:** Flow rate (cc/minute) also displayed on the graph below.
2. **Current Color:** This is the color currently loaded. Zero (0) will be displayed if solvent is loaded, a color change failed, or an "A only" calibration has been performed.
3. **Flow rate graph:** Combination bar and scrolling line graphs that show current and last 75 seconds of spraying. The graph freezes when spraying stops or an alarm is triggered. The graph scale is adjustable via system settings.
4. **Usage/Job Data:** Shows the current job number and name, whether the job is active or paused, and current color usage for the job shown.
5. **Target ratio:** the programmed ratio of paint resin (A) to hardener (B)
6. **Measured ratio:** The ratio calculated by comparing the motion of the B pump to the flow rate of paint resin through the flow meter.
7. **B Pump inlet pressure:** Monitors the inbound supply pressure to the B pump from the hardener supply.
8. **B Pump Outlet Pressure:** Monitors the outbound pressure from the B pump to the mix manifold. Note: The upper and lower pressure transducers alternate inlet / outlet function depending on the direction of the B pump piston.
9. **Gun status:** Shows if gun 1 or gun 2 is currently spraying with an animation. If only 1 gun is enabled gun 2 will not be displayed.
10. **Pot Life display:** Display the pot life remaining for each gun (if active).
11. **Background Color:** The background color will be white until an alarm is triggered, when it will change to flashing yellow.
12. **USB Status:** Indicates if USB flash drive is installed.
13. **Current time and date:** Local system name, time, and date.
14. **Current screen icon:** Icon showing which screen is currently shown

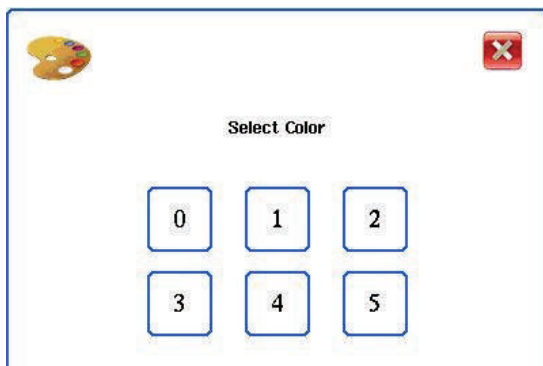


7.3: Color Change Screen

Only this screen and the Home screen are accessed directly from every screen of the display. It is used for changing colors and flushing the system with the flush / load sequences programmed in the settings screens.



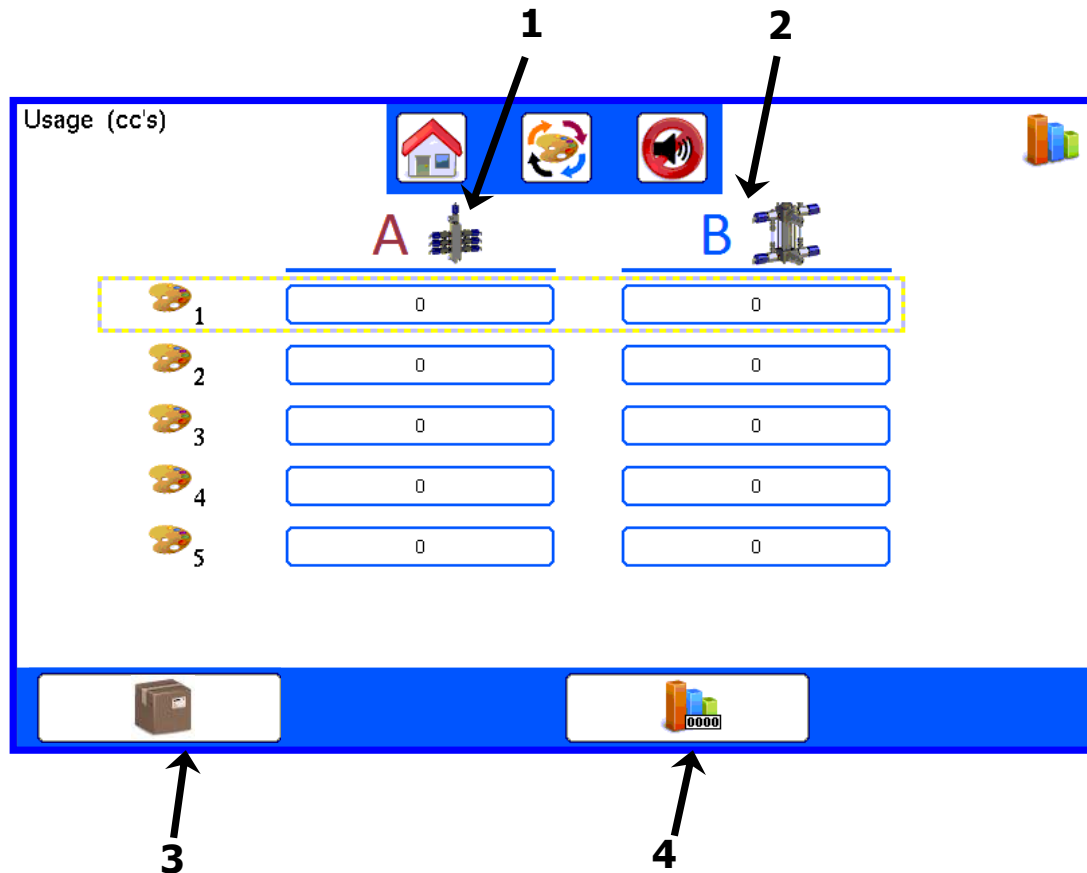
- 
1. Current/ Active Color: The current color loaded in the system.
- 
3. Stop: Stop the color change process. Only visible after GO is selected. Selecting this will trigger a Color Change alarm.
- 

4. 1 Gun GO: Starts the flush / load process for gun #1 only. The color # entered in the New Color field will be loaded.
- 

5. 2 Gun GO: Starts the flush / load process for gun #1 and gun #2. The color # entered in the New Color field will be loaded. Only available if the system is configured for 2 guns and both guns are enabled.
- 
6. Batch: Advances to the Batch screen. Only visible if a color other than 0 is loaded. See section **7.11** for Batch screen details.





7.4: Usage Screen

This screen tracks the global usage of resin and hardener, sorted by color number. If the solvent meter is installed the solvent usage will be visible at the bottom of this list. For additional information regarding Jobs, see **8.22: Job Advance**.



1. **Resin (A):** The total volume of paint resin dispensed for each color. Measured in cc's.



2. **Hardener (B):** The total volume of paint hardener dispensed for each color. Measured in cc's.



3. **Jobs:** Advances to the Jobs screen. See section 7.10 for Jobs screen details.



4. **Reset:** Resets usage totals. Note this action requires the Administrator password. Tap on the desired A or B box for the color # to reset; the color selected will be highlighted with a yellow/grey border as shown above. Tap the reset button to reset totals for the selected color number.

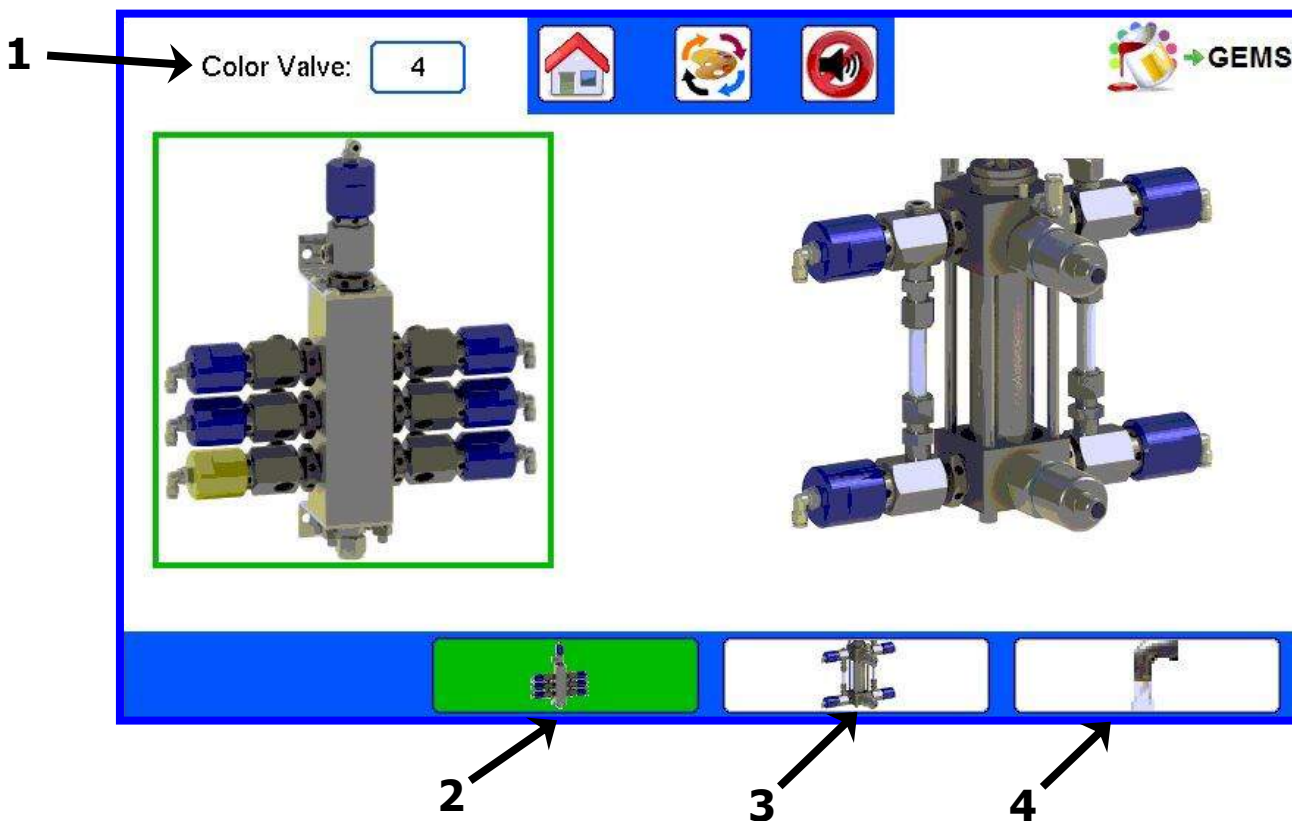
NOTE

The clear/reset command is only accepted if the Administrator password is provided.



7.5: Prime Screen

Use this screen to prime the GEMS unit with Resin (A) and Hardener (B). Buttons will independently operate the Resin color valves (A0-A7), or the B Pump for material loading. Gun atomizing air must be off while priming. For resin priming, the active color valve will blink yellow for easy recognition.



1. **Color Valve:** The icon displaying which color valve is being opened when pressed.

- Color 0 is reserved for flushing solvent
- Colors 1-5 are for A material (resins)
- Color 7 is reserved for flushing air



2. **Color Stack Prime:** Press the button once to open the AE and selected color valve. Trigger the spray gun with atomizing air off to allow resin to flow. Press the button again to stop.



3. **B Pump Prime:** When pressed, the B Pump valves will open, and the Pump will cycle. The gun must be triggered with atomizing air off for successful component B priming. Press the button again to stop.



4. **Flush Mode:** Use the Flush button to put the system in a continuous air/solvent chop process for flushing. It will timeout after 5 minutes.

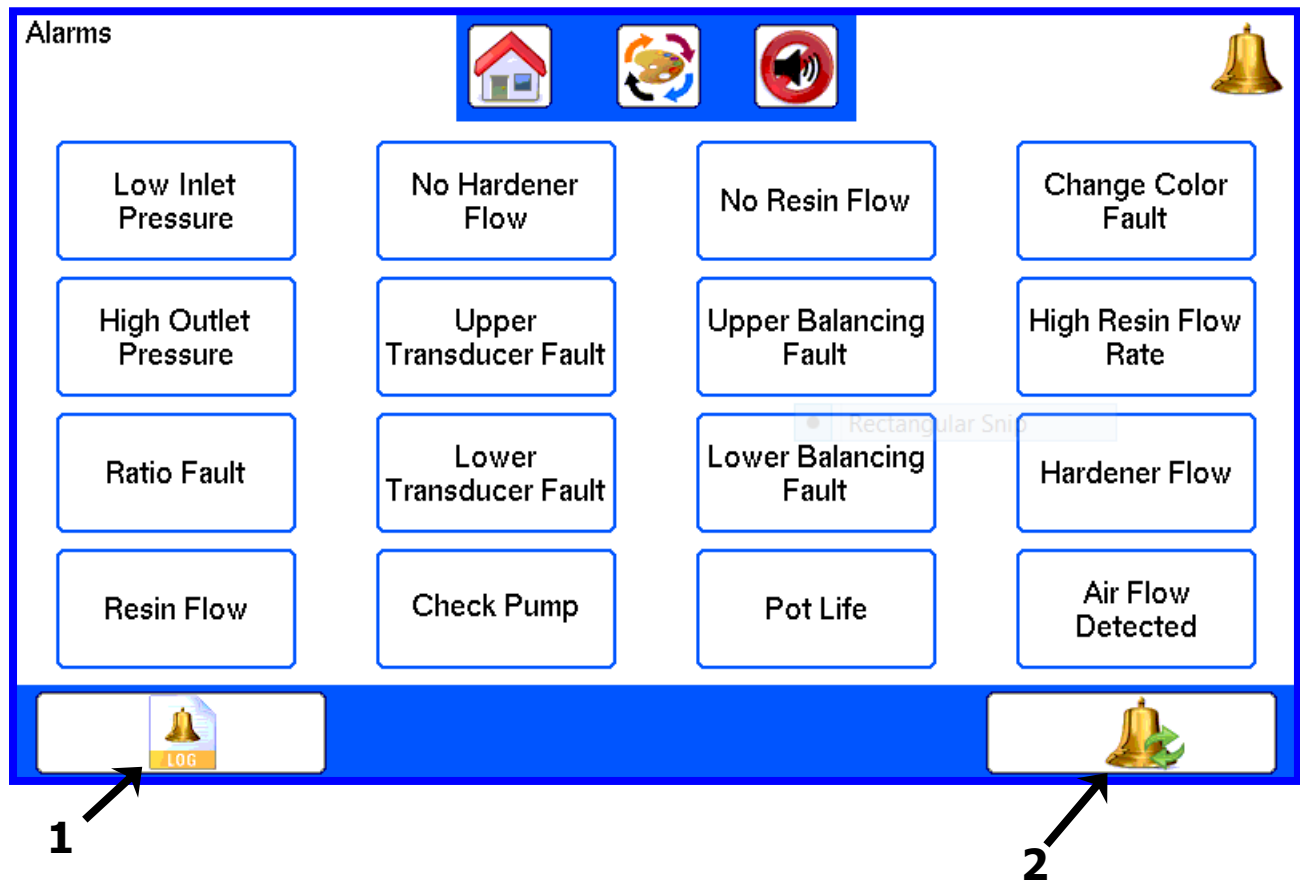
CAUTION

Always follow the Prime mode with a color 0 (solvent) load to flush out the fluid lines and prevent unmixed material from being sprayed or hardening in the system.



7.6: Alarm Screen

This screen displays all of the available system alarms. If an alarm sounds it will be highlighted, and the Reset button must be pushed before the system can spray again. Alarm history is also saved. Additional alarm information and troubleshooting can be found in **10: Alarm Guide**. If an alarm has been disabled, the highlighted status will still display, but the alarm will not sound. Click the individual alarm icons for troubleshooting help.



1. **History:** Touch the History button to access a timeline of alarms and events. The last 40 events will be recorded. For more information, see **7.7: Alarm History**.



2. **Reset Button:** This button will reset all active alarms except for pot life. Must be pushed if an Alarm has sounded to reset the state of the machine. Only reset if the alarm has been corrected.

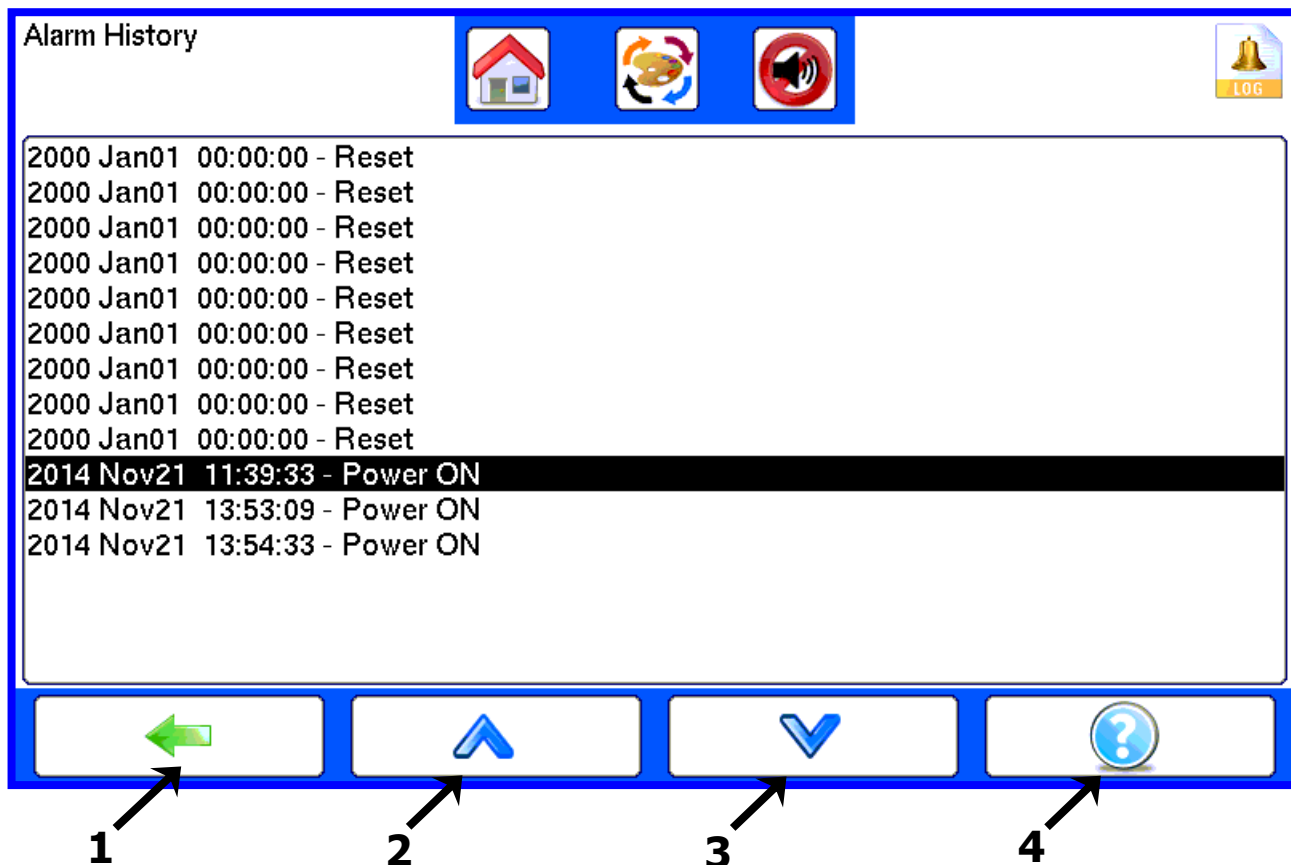


7.7: Alarm History

Use this screen to see the system's last 40 events. All events are saved to the system USB flash drive. To view alarms before the last 40 copy the alarm log from the USB.

Additional alarm information and troubleshooting can be found in **section 10**.

An alarm may be directly highlighted by tapping it on the touch screen. Tapping the selected alarm enables the Alarm Help screen for that alarm. See **7.8: Alarm Help Screen**. Disabled alarms will show in the list.



1. **Back Arrow:** Press the back arrow to return to the alarm screen.



2. **Arrow Up:** Moves the highlighted bar up (back) in time. The last 40 events will be shown in the Alarm History. The entry at the bottom of the screen is the most recent.



3. **Arrow down:** Moves the highlighted bar down (forward) in time.

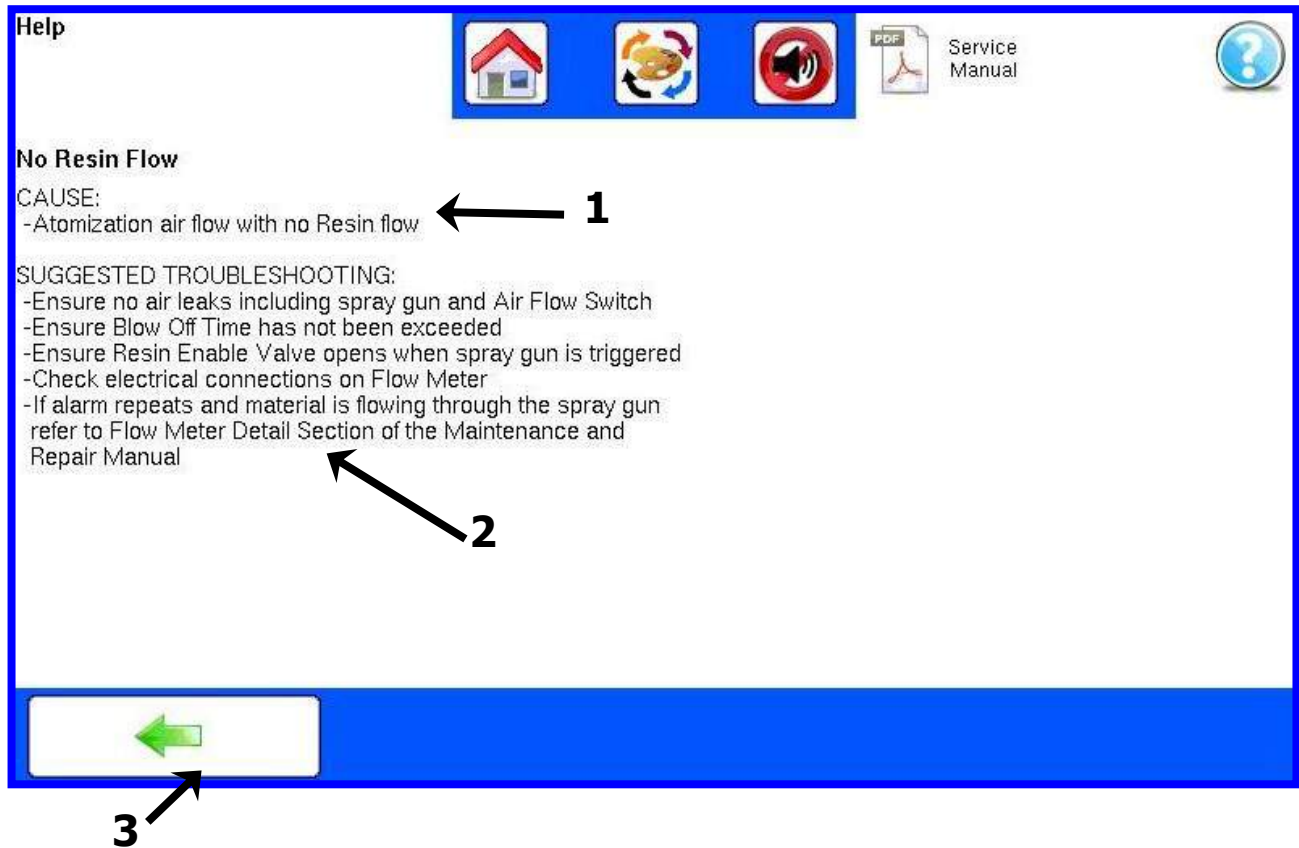


4. **HELP:** Pressing [HELP] will bring up a help screen for the given highlighted alarm.



7.8: Alarm Help Screen

The Alarm Help screen is a quick reference guide to suggest possible causes of an alarm. If the system is in an alarm state, the home screen background will flash white/yellow. For additional details regarding alarms, see the **Maintenance and Repair Manual 77-2983**. This example shows a No Resin Flow alarm.



1. **Details:** A detailed description indicating relevant information and troubleshooting ideas for the selected event.

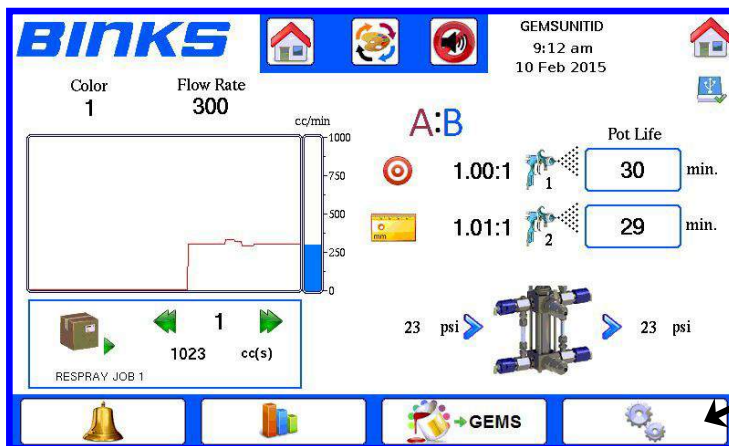
2. **Troubleshooting:** Troubleshooting tasks are listed in order of difficulty. Easier tasks are listed first. Items with lower probability or checks requiring disassembly are listed last.

3. **Back Arrow:** To return to the alarm history page, press the back arrow.



7.9: Settings Screens

Select the settings button from the Home screen to access system settings and . This icon will bring the user to a password prompt for access. Access to view or change settings requires the use of a password.



Settings button



7.9.1: Password Prompt

The password prompt screen displays the following elements:

- Header:** Enter Password
- Input:** A text box for entering the password.
- Keypad:** A numeric keypad with buttons for 1, 2, 3, 4, 5, 6, 7, 8, 9, CLR, 0, and ENT.

Passwords are required to perform certain system functions:

- Accessing setup screens to view or change settings.
- Erasing Job or Usage data.

There are two levels of password protection: User and Administrator.

The **Administrator** password allows the user to perform the above, plus:

- Change ratios and cc/pulse values
- Perform resin only calibration
- Reset job and usage values
- Change time, password, name, and FTP settings
- Enable / disable alarms
- Set pump limits
- Change system configuration

The **User** password allows the user to:

- Change system settings (see section 8.11)
- Change gun flush / load sequence settings
- Perform a resin + hardener calibration

Type the password then press the enter key (ENT) to accept it.

The default User password is 0 and the default Administrator password is 1.

NOTE

User and Administrator passwords may be changed after entering the default Administrator password. Proceed to the set up password screen and enter the new password.



7.9.2: System Settings

This screen is used to set up system parameters for alarms and standard usage. Tap on the box to change the desired setting.

System Settings

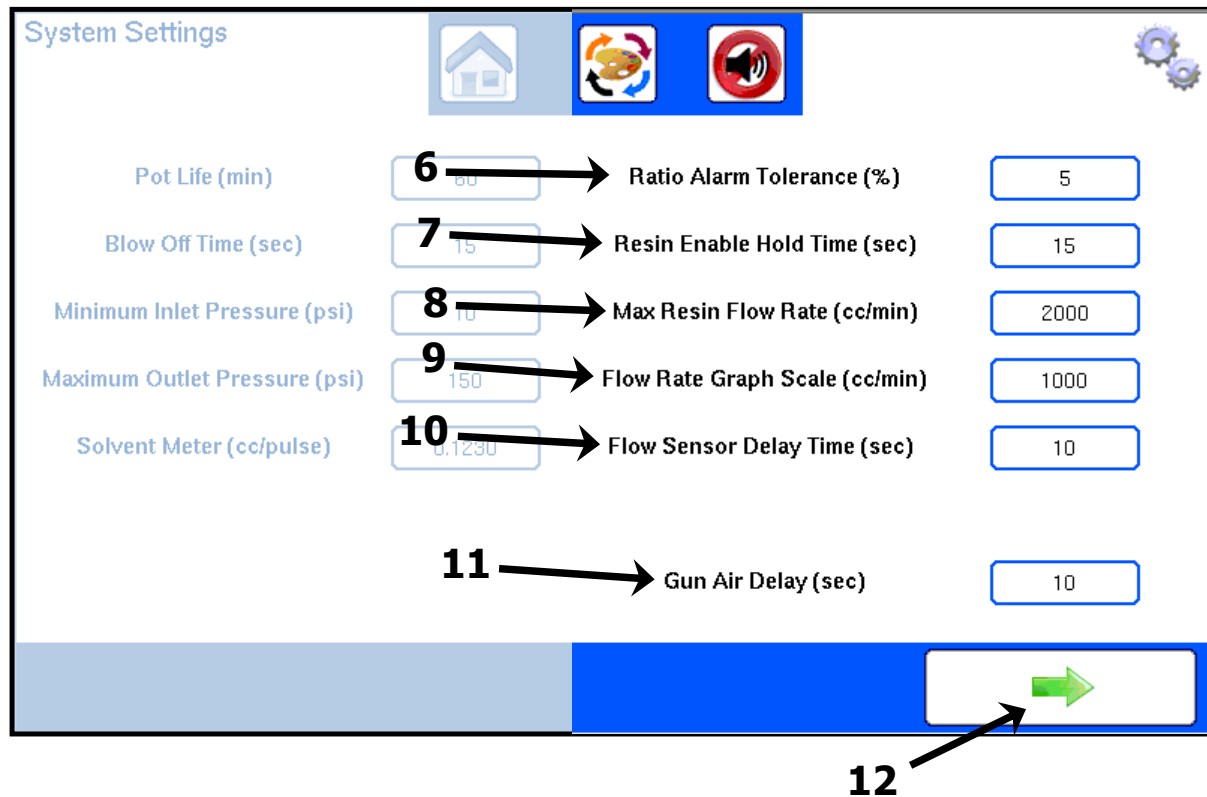
Pot Life (min)	60	1	Ratio Alarm Tolerance (%)	5
Blow Off Time (sec)	15	2	Resin Enable Hold Time (sec)	15
Minimum Inlet Pressure (psi)	10	3	Max Resin Flow Rate (cc/min)	2000
Maximum Outlet Pressure (psi)	150	4	Flow Rate Graph Scale (cc/min)	1000
Solvent Meter (cc/pulse)	0.1230	5	Flow Sensor Delay Time (sec)	10
			Gun Air Delay (sec)	10

- Pot Life (min):** Indicates the time allowed before mixed material becomes unusable, represented in minutes. The end of the pot life will result in a pot life alarm. The system will not reset the pot life alarm until the specified volume of material has been dispensed through the spray gun(s), either through spraying or flushing. The pot life will not reset if a second gun is connected but not spraying.
- Blow Off Time (sec):** The time in seconds atomizing air may be triggered without spraying material. If the time is exceeded, the No Resin Flow alarm will sound. Useful for dusting parts immediately prior to spraying.
- Minimum Inlet Pressure (psi):** This sets the low limit (in psi) that will trigger a Low Inlet Pressure alarm. Default is 10 psi.
- Maximum Outlet Pressure (psi):** This sets the high limit (in psi) that will trigger a High Outlet Pressure alarm. Default is 150psi.
- Solvent Meter (cc/pulse):** Changes the pulse count for the optional solvent meter. To verify this value, perform a color 0 Resin Only calibration.



7.9.2: System Settings (continued)

Additional settings and parameters explained.



6. **Ratio Alarm Tolerance %:** When the calculated ratio falls out of this tolerance, the ratio alarm will be triggered. The default value is 5%. Set this number in accordance with paint supplier recommendations.

7. **Resin Enable Hold Time (sec):** The duration that the A Enable valve (AE) will stay open after the air flow switch signal is lost. Default is 15 seconds.

8. **Max Resin Flow Rate (cc/min):** The limit of resin flow through the flow meter. Default is 2000 cc/min. This setting is useful for detecting air flow and to reduce.

9. **Flow Rate Graph Scale (cc/min):** The scale of the flow rate graph shown on the Home screen. Default is 1000; max value is 4600.

10. **Flow Sensor Delay Time (sec):** Represents the ramp up time for the Dispense Pump Flow Sensor. For high ratios where flow is very low, a longer time such as 5-10 seconds is recommended to prevent nuisance alarms.

11. **Gun Air Delay (sec):** The delay between a color load and Atomizing Air activation. Only available with Air Cut Off valves installed and configured.

12. **Next Arrow:** Pressing the next arrow will advance to the next screen.



7.9.3: Color Setup Screen

This screen sets the A:B ratio for each color loaded into the system. Ratios are programmed as the part of component A (resin) relative to one part component B (hardener or catalyst). The CC/pulse value may be changed individually for each color, so accurate mixing is achieved.

Color Setup

	A:B		CC/Pulse
1	5.00:1.00	2K = 5.00:1	0.1230
2	33.30%	2K = 3.00:1	0.1230
3	1.00:0.00	1K = 1.00:0	0.1230
4	15.00:5.30	2K = 2.83:1	0.1230
5	7.32	2K = 7.32:1	0.1230

Navigation icons: Home, Refresh, Stop, Settings.

Next button:

1. **Ratio Entry:** Enter the A (resin) ratio for each color relative to one part B (hardener). See Ratio Entry 7.13 for various ways to enter a ratio.

2. **CC/Pulse:** Enter the CC's per pulse for each color. Default value is .123, but this should be verified by performing an A+B Calibration.

NOTE

When changing paint resins and / or loading a new material into the system always perform a Flow Meter Calibration - Resin + Hardener, especially when starting up the system for the first time.

If changing the ratio of a loaded color, the paint must be reloaded for the changes to take effect.

A:B

7.9.4: Ratio Entry Screen

This screen sets the A:B ratio for each color loaded into the system. Ratios may be programmed three ways:

1. **A:B Entry** – A and B entered independently. For example 5:2
2. **Percent Entry** – B percent entered. For example 7% = 100 parts A and 7 parts B, or $100/7 = 14.28:1$ Useful for high ratio materials where catalyst is expressed as volume percent.
3. **Decimal Entry** – only A entered. Used for ratios expressed as A:1; for example 3:1

Use the ratio entry method best suited to your material application information.

1K operation: The GEMS system may be operated as a single component system (vs. plural component). Select the 1K option by use of the slider at the top left.

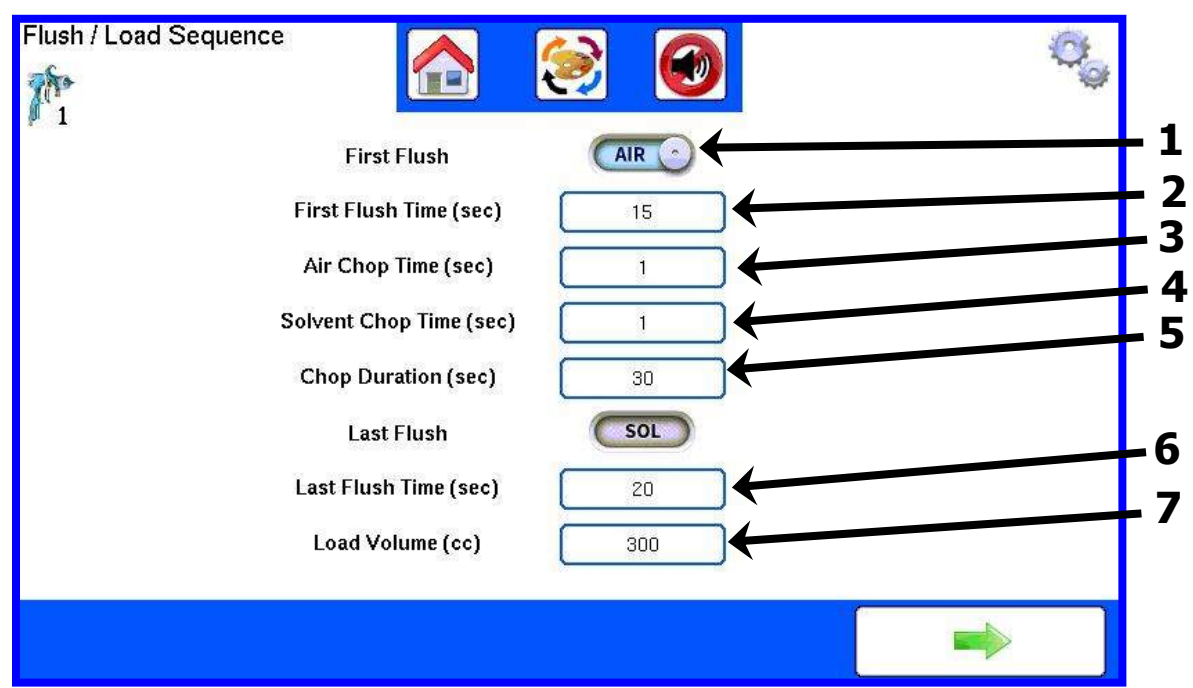
The diagram illustrates the A:B Ratio Entry Screen in three modes, with annotations explaining the interface elements:

- Ratio Entry (A:B):** Shows the "Enter 2K Ratio" screen. The "Entry Mode" toggle is set to "2K". The screen displays "A" and "B" with input boxes containing "5.00" and "3.00" respectively. Annotations include:
 - "Entry Mode Toggle: Choose between 2K or 1K" pointing to the toggle.
 - "Tap boxes to change number. Keypad will pop up" pointing to the input boxes.
 - "Cancel" pointing to the red 'X' button.
 - "Select Ratio Entry mode: A:B, Percent, or Decimal" pointing to the mode selection buttons.
 - "Accept new ratio" pointing to the green checkmark button.
- Decimal Entry - A:1:** Shows the "Enter 2K Decimal" screen. The "Entry Mode" toggle is set to "2K". The screen displays "A:1" with an input box containing "2.45". Annotations include:
 - "Accept new ratio" pointing to the green checkmark button.
- Percent Entry:** Shows the "Enter 2K Percentage" screen. The "Entry Mode" toggle is set to "2K". The screen displays "A : % B" with an input box containing "1.00" followed by a percent sign. Annotations include:
 - "Accept new ratio" pointing to the green checkmark button.
- 1K Mode (toggle):** Shows the "1K Ratio" screen. The "Entry Mode" toggle is set to "1K". The screen displays "A:1" with input boxes containing "1.00" and "0.00". Annotations include:
 - "Accept new ratio" pointing to the green checkmark button.



7.9.5: Flush / Load Sequence

This screen designates gun 1 flush and load times. If the system has 2 spray guns, a second, identical screen will appear after pressing the next arrow. The setup page for gun 2 will be the same. For more information on flush sequences and recommended settings, see **10.6: Flushing Setup**.



- 1. First Flush:** Touch the toggle to switch the First Flush between solvent and air. This is the initial flush of the mix manifold and mixed material line.
- 2. First Flush Time (sec):** This is the duration of the first flush for gun 1.
- 3. Air Chop Time (sec):** After first flush is completed, the system will begin a repeating, alternating solvent and air flush known as a chop. This value determines the duration that the air valve remains open during each chop.
- 4. Solvent Chop Time (sec):** Determines the solvent valve duration for the chop.
- 5. Chop Duration (sec):** The total duration of the alternating solvent and air chop. The air and solvent valves will repeat their respective chop times until the duration is complete.
- 6. Last Flush Time (sec):** The total duration of the Last Flush of solvent.
- 7. Load Volume (cc):** This is the volume required for new material to properly fill the fluid lines for gun 1. See table below for starting point. This value is also used to calculate material sprayed for pot life reset.

HOSE SIZE	15 FEET	25 FEET	50 FEET	75 FEET	100 FEET
1/4" ID estimated volume	225 cc	325 cc	600 cc	875 cc	1150 cc
3/8" ID estimated volume	400 cc	625 cc	1200 cc	1775 cc	2350 cc



7.9.6: Calibration – Resin+Hardener

This screen is used to check the ratio of the mixed material without interrupting the flow of mixed material through the system. It is also used to calibrate the Flow Meter when loading a new color.

Flow Meter Calibration - Resin+Hardener

0

1

2

Flow Meter cc/pulse

0.2400

x

Pulse Count

1

=

Expected Volume (cc)

0.0000

3

4

Press start button to begin calibration
or press flow meter cc/pulse to change the value

5

Measured Volume (cc)

0.0000

Calculated cc/pulse

0.0000

7

8

- Active Color:** The color being calibrated.
- Flow Meter cc/pulse:** This is the pulse count per cc delivered in the system. **This number will need to be calibrated for each individual color.** Default value is .1230
- Pulse Count:** The number of Flow Meter pulses received during a calibration test.
- Expected Volume (cc):** This is the calculation of total expected volume at the current Flow Meter cc/pulse and programmed ratio.
- Measured Volume (cc): This is a user input.** Enter the measured volume after triggering the gun for a specified time. Press Save (the floppy disc) after entering the Measured Volume.
- Calculated cc/pulse:** After a new measured volume is entered, the new cc/pulse will be displayed in this box. This is a preview of the new cc/pulse. **The Save button must be pressed to accept the new value.**
- START:** This button will reset the expected volume and pulse count to zero. Press this button twice before every calibration.
- SAVE:** This button is used after a new value is typed into the Measured Volume field and the enter key is pressed. Pressing SAVE stores the new cc/pulse value.

NOTE

Always follow any saved calibration with a paint reload. Administrator password required.



7.9.7: Calibration – Resin Only

This screen is used to check the Flow Meter calibration ONLY. Performing a calibration using this screen will flow paint resin without hardener through the system, and should be followed by a Color 0 flush / load. This calibration is used to more accurately calibrate the Flow Meter or troubleshoot the B Pump.

Flow Meter Calibration - Resin+Hardener

0

Flow Meter cc/pulse: 0.2400

x Pulse Count: 1

= Expected Volume (cc): 0.0000

Press start button to begin calibration
or press flow meter cc/pulse to change the value

Measured Volume (cc): 0.0000

Calculated cc/pulse: 0.0000

Start button (power icon), Save button (floppy disc icon), Next button (green arrow icon)

- Active Color:** The color being calibrated.
- Flow Meter cc/pulse:** This is the pulse count per cc delivered in the system. **This number will need to be calibrated for each individual color.** Default value is .1230
- Pulse Count:** The number of Flow Meter pulses received during a calibration test.
- Expected Volume (cc):** This is the calculation of total expected volume at the current Flow Meter cc/pulse and programmed ratio.
- Measured Volume (cc): This is a user input.** Enter the measured volume after triggering the gun for a specified time. Press Save (the floppy disc) after entering the Measured Volume.
- Calculated cc/pulse:** After a new measured volume is entered, the new cc/pulse will be displayed in this box. This is a preview of the new cc/pulse. **The Save button must be pressed to accept the new value.**
- START:** This button will reset the expected volume and pulse count to zero. Press this button twice before every calibration.
- SAVE:** This key is used after a new value is typed into the Measured Volume field and the enter key is pressed. Pressing SAVE stores the new cc/pulse value.

NOTE

Use the Resin + Hardener Calibration first. This calibration procedure will load un-catalyzed paint resin (A) in fluid lines and will require a solvent flush / load after performing.
Always follow Resin Only calibrations with a Color 0 flush / load.



7.9.8: Alarm Enables

This screen displays all of the active alarms in the system and allows any listed alarm to be enabled or disabled. For example, if the Pump flow sensor cable gets damaged, this screen allows the user to disable the No Hardener Flow alarm temporarily so spraying may continue and production is not halted.



1. **Alarm Toggle:** By pressing the toggle button, alarms can be activated or deactivated as needed. If the alarm indicator is green, as shown, the alarm is active.

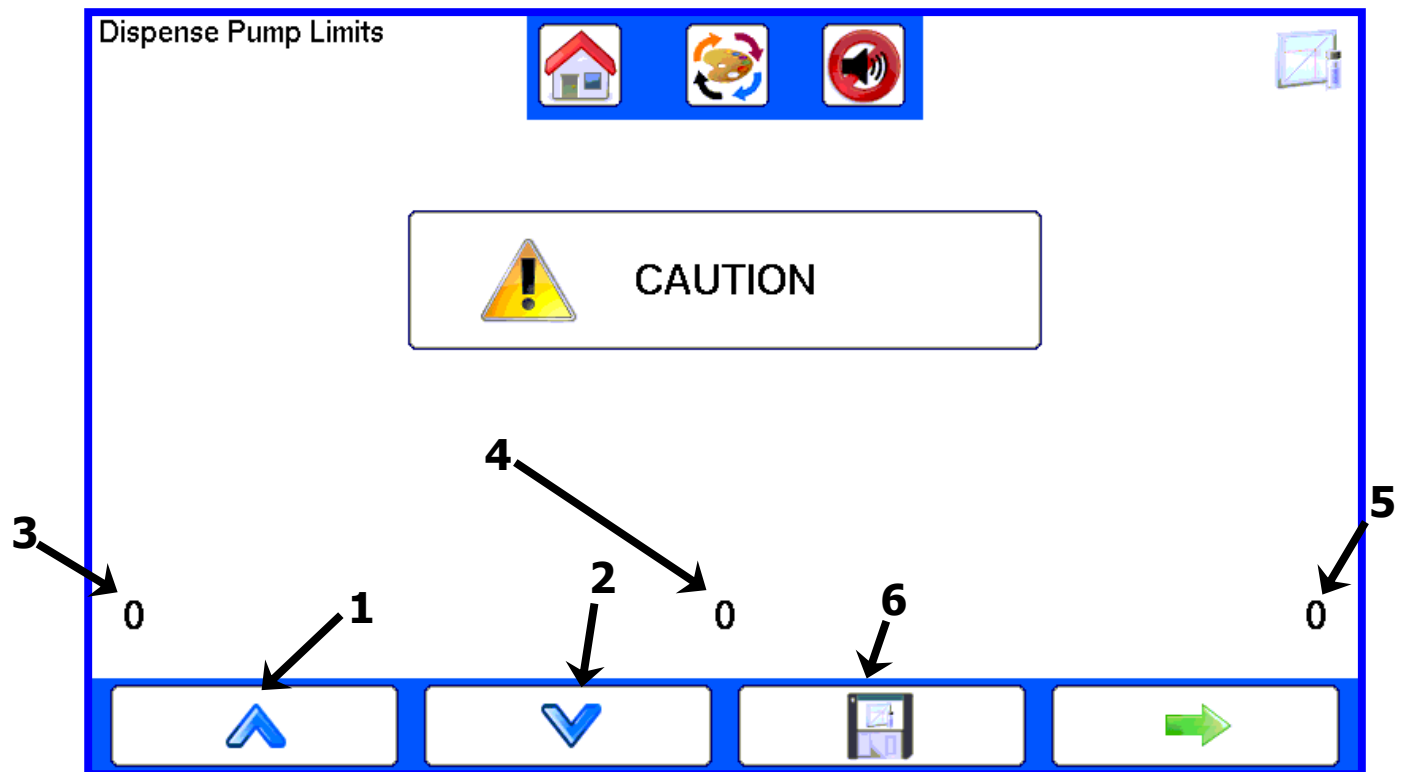
CAUTION

**It is not recommended to turn off any alarm during normal operations.
This page is only accessible with the Administrator password.**





7.9.9: Dispense Pump Limits

This screen is used to set the upper and lower limits of motion of the B Pump. Limits may be saved after moving the piston in the direction and position desired. This screen is typically used when the potentiometer bracket assembly is replaced. See the **Maintenance and Repair Manual 77-2983** for more information regarding this procedure.



⚠ WARNING

The JOG function could potentially damage the motor. Have trained personnel familiar with pump operations adjust these settings to prevent the risk of damage.

-  1. **Jog Up:** By pressing this button, the Stepper Motor will move the piston upward. Press again to stop movement.
-  2. **Jog Down:** By pressing this button, the Stepper Motor will move the piston downward. Press again to stop movement.

3. **Top limit:** This number is the upper limit. The default value is typically set between 0.70 and 0.85.

4. **Current measurement:** This number displays the current position of the piston. This number typically ranges between 0.5 and 4.5.

5. **Bottom limit:** This number is the lower limit. The default value is typically set between 3.85 and 4.0.



6. **SAVE:** Pressing save will record the position of the piston. Push when the roller has reached the desired location for either the top or bottom limit. Must move the pump in the up direction to save the top limit.



7.9.10: Time/Password Setup

Passwords and current date and time can be entered here. The current date and time is used to time stamp events in the Alarm History screen. The time is displayed in 24h time (2:34pm=14:34).

- Administrator Password:** This password will allow access to all options in the set up menus. Acceptable password ranges are numbers from 0 to 99999.
- User Password:** This password will allow access to everything needed for daily operations. Acceptable password ranges are numbers from 0 to 99999.
- Unit ID:** Press this button to change the name of the system. Enables a popup keyboard (see facing page)
- Job Control:** Toggle the Job quick access on the Home screen to be on or off.
- Date/Time:** Enter the current date and time for timestamp data.
- FTP Configuration:** Press to enter the FTP server configuration screen (see **7.9.11: FTP Server Configuration**).

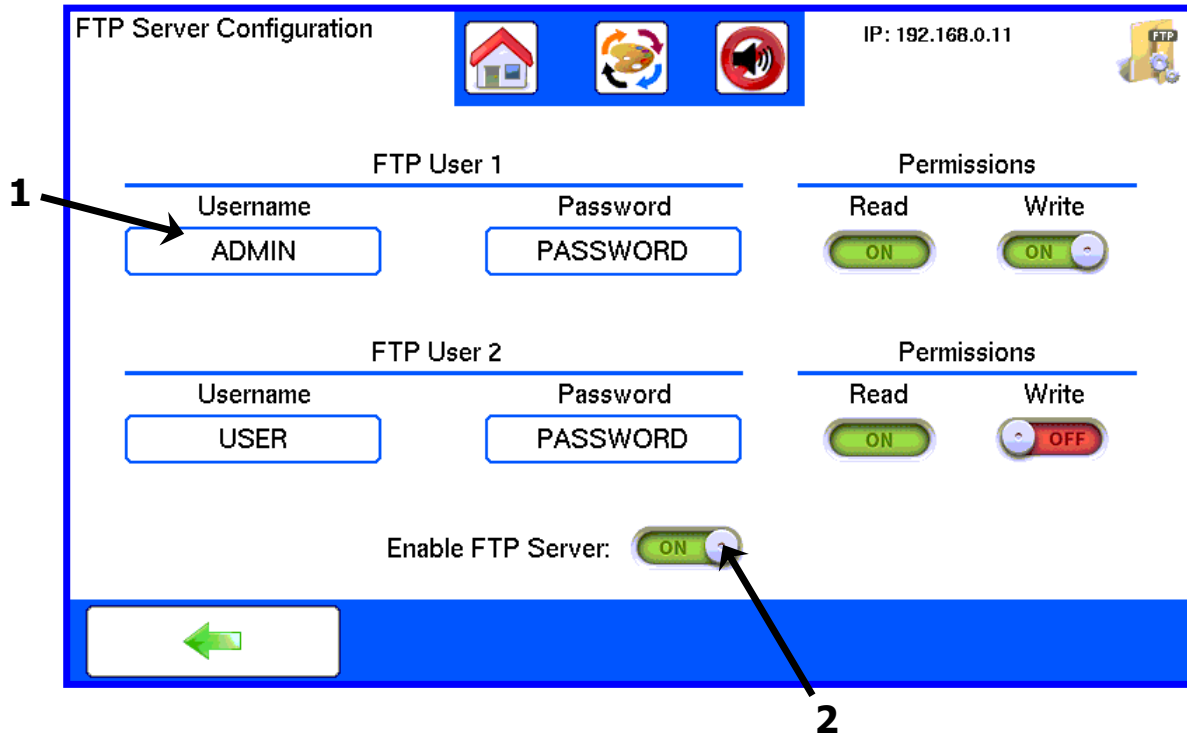
NOTE

This screen is only accessible with the Administrator password.
To change values, press the down arrow until the field in question is highlighted.
Use the number pad on the pendant to enter the desired value, then press the enter key to accept the value.



7.9.11: FTP Server Configuration

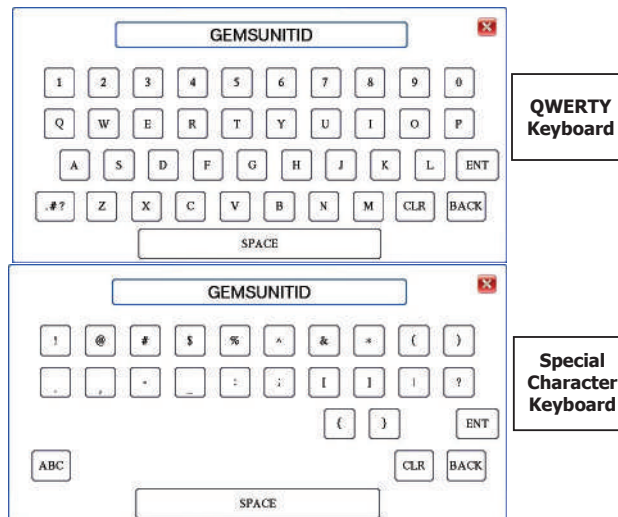
An FTP server for data collection and read/write access may be configured here. FTP enable, username/ password configuration and read/write access may be changed on this screen.



1. **Username/ Password:** Enter Username and password information for FTP users. A Keyboard popup (shown below) will allow text entry.



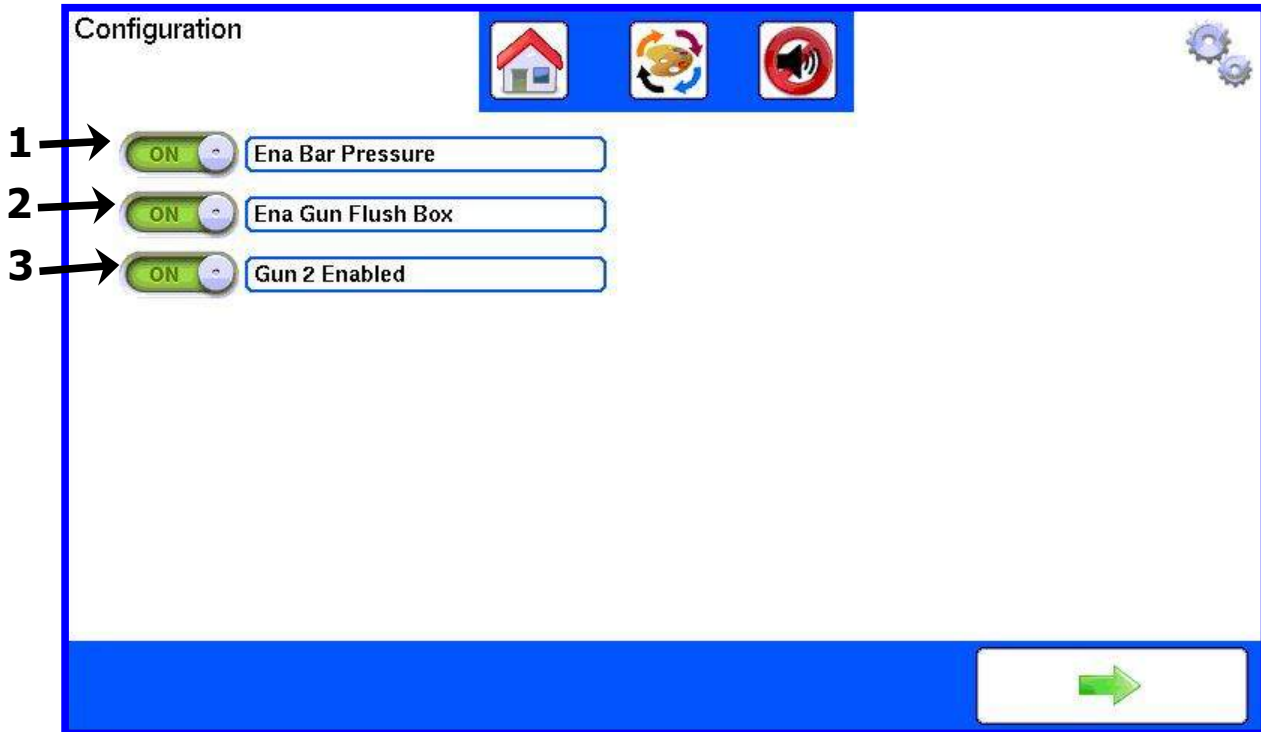
2. **Toggle:** Press the toggle button, to change read/write access or enable/disable server.





7.9.12: Configuration

Settings on this screen are used to enable or disable Bar pressure (vs. PSI), gun flush boxes, and second spray gun capability.



- 1. Enable Bar Pressure:** Select pressure display in BAR or PSI.
- 2. Enable Gun Flush Box:** If the system is built to accept gun flush boxes this setting will enable or disable flush box function. If the system is not built to accept flush boxes this option will not appear.
- 3. Gun 2 Enabled:** If the system is built for 2 gun capability this toggle enables or disables the 2nd gun.

NOTE

This screen is only accessible with the Administrator password.



7.10: Jobs Screen Selection

Color 0 Flow Rate 0

GEMSUNITID
1:56 pm
21 Nov 2014

A:B
1.00:1
0.00:1

Pot Life -- min.

0000 psi 0000 psi

GEMS

To access the jobs information, select the usage icon from the Home screen. This button will select the Usage screen.

From the usage screen, select the box icon to advance to the Jobs screen.

Usage (cc's)

	A	B
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0

GOOD



7.10: Jobs Screen

This Jobs screen shows paint usage for a selected elapsed time, or "job". Jobs may be used to track paint usage for a batch of parts or a work period for example. Jobs capture events, paint usage, solvent usage (if system is equipped with a solvent meter), color change success / failure / time, and painter trigger times for 1 or 2 guns. All data is stored on the USB drive and may be read via USB or FTP.

The screenshot shows the Jobs Screen interface with the following elements and callouts:

- 1** Job:
- 2** Total:
- 3** Color Change Usage Totals table:

	Resin	Hardener
1	345	32
2	347	34
3	349	36
4	351	38
5	353	40
Flush	89220	

- 4** Gun Trigger Times and Flow section:

 - Gun 1:
 - Gun 2:

- 5** Job Information section:

 - Name:
 - Label:
 - Status: Job Active
 - Started: 2014 Dec 17 13:54:12

- 10** Job File:
- 5** Log File:

- Job Number:** Show the current job being displayed. 100,000 possible jobs allowed.
- Total CC's:** Total count of material mixed for all colors sprayed **for the current job**.
- Color Usage for Job:** Total cc's of individual colors **for the current job**, both Component A (Resin) and Component B (Hardener). The total average ratio will also display for each color. Flush solvent is also counted if the solvent flow meter is installed and configured.
- Toggle:** Use the toggle slider to switch between color usage information and color change/flush information. Color Usage information explained on the following page.
- Job Information:** Job name and label may be changed here. Job status (active or paused), job starting date, job data (*.csv), and job log (*.log) file names and path are also displayed.



7.10: Jobs Screen (continued)

Job:

Total:

Color Usage Totals and Ratios

	Resin	Hardener	A:B
1	200	123	1.63
2	204	126	1.62
3	208	129	1.61
4	212	132	1.61
5	216	135	1.60
Flush	123354		

Gun Trigger Times and Flow

⏻	0h57m01s
⏮	0h02m03s
⏭	00000000
#	5

⏻	0h20m34s
⏮	0h02m03s
⏭	00000000
#	17

Name:

Job File: /usb1/jobs/job1.csv*

Log File: /usb1/jobs/job1.log*

Label:

Status: Job Active

Started: 2014 Dec 17 13:54:12

6

7

8

9

11

- 6. Job Reset:** Clears current job totals. Administrator password required.
- 7. Previous Job:** Move to the previous job in the list.
- 8. Job Start/Pause:** Start or pause a job with this button.
- 9. Next Job:** Advances to the next job screen. If the next job number does not already exist it will be created.

10. Color Change Information: The current job's number of successful and unsuccessful color changes, average and last color change time.

11. Flow And Triggering:

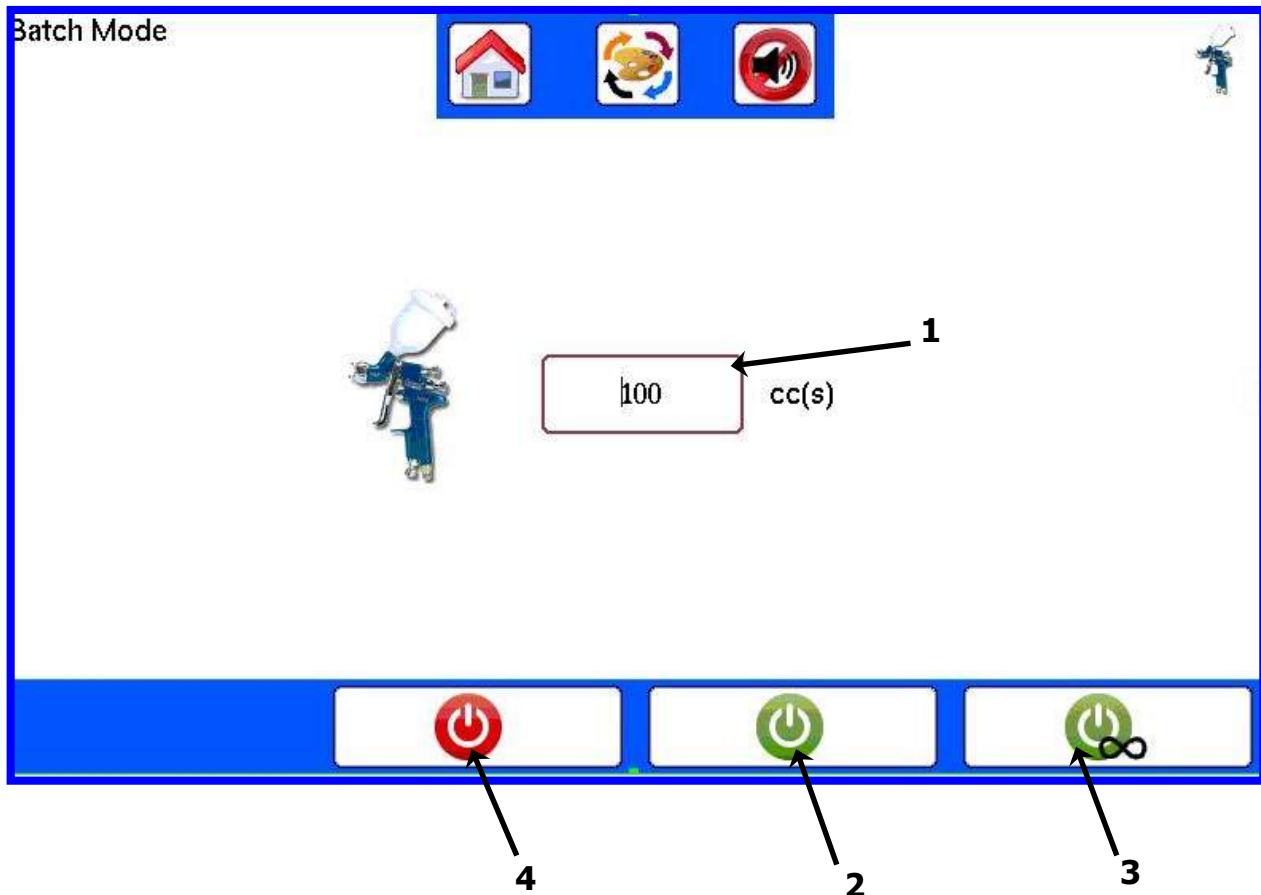
- Gun trigger time is captured by the air flow switch.
- Paint flow time is captured by the flow meter.
- Average flow rate is calculated by dividing total paint cc's by flow time. Note: when two guns are triggered at the same time the flow rate is split equally between the gun totals.
- # The number of trigger pulls is shown.

7.11: Batch Screen

This screen is accessed through the Color Change screen; see section 7.3.

Batch mode provides dispensing of mixed material through the spray gun nozzle with atomizing air turned off. This function is useful for:

- Providing material for a touch-up or gravity gun for spot repair.
- Dispensing a pre-determined "shot" or quantity of paint.

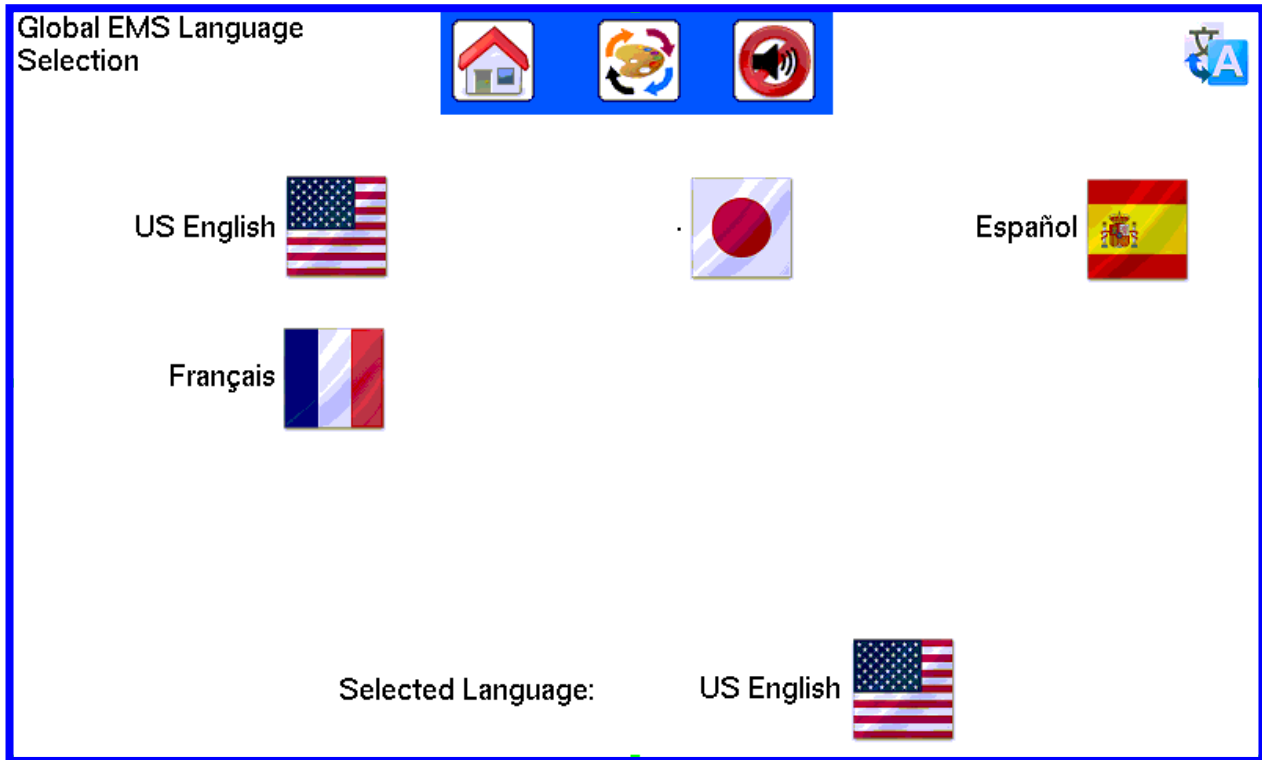


Shut off atomizing air for Batch dispensing.

1. **Quantity field:** Tap to enter a volume of paint to be dispensed.
2. **Quantity Batch GO:** Starts the quantity Batch dispense. Trigger the spray gun into a container to dispense mixed paint. The flow will stop when the requested quantity has been dispensed. To stop this process press the STOP button.
3. **Infinite Batch GO:** Dispenses mixed paint continuously until the STOP button is pressed. The Quantity field changes to a counter to show cc's dispensed.
4. **STOP:** Stops dispensing and returns the counter to zero.

7.12: Language Selection

This screen is accessed from the Home screen; press Settings then enter password 3 when prompted. The screen below will appear and allow selection of a language available for your region.



Tap the flag of the language desired – it will show at the bottom as Selected Language. Press the Home button to return to the Home screen. The new language will be displayed on all control and troubleshooting screens.

8: Startup Guide

Use the following pages as a quick reference to make electrical, air, and fluid connections to GEMS and begin operation. Be familiar with the configuration of the machine and any options or accessories attached. Return to the **7.0: User Interface Guide** portion of this manual for information on configuration and settings.

Startup checklist:

1. Verify the frame is secured to the ground or wall and that all components are mounted securely to the enclosure, fluid panel or mast.
2. Check that all cables for pressure transducers, flow meter, flow sensor and any other electrical components are connected. Connect the enclosure ground stud to earth ground.
3. Verify all energy sources are de-energized. Inspect for loose wires anywhere inside the enclosure. Do not attempt to operate with loose wiring. Refer to the **Maintenance and Repair Guide: 77-2983** for wiring diagrams. After wiring verification, it is safe to plug in the system to a proper grounded AC receptacle.
4. Verify all CCV signal lines are properly connected. See the **5.0: Air Connection** pages for reference.

Air connections:

Connect the external air connections before use (see below). For more information, see the **5.0: Air Connections** pages:

1. Regulated air supply to the **MAIN AIR IN** connection. Air pressure should be between 75 – 100 psi [5 – 7 bar].
2. Regulated air supply to **GUN 1/2 AIR IN** on control enclosure. For atomizing, typically 20 – 75 psi [1.3 – 5 bar].
3. **GUN 1/2 AIR OUT** directly to the spray gun(s).
4. Regulated air supply to the color stack flushing air (**CHOP**).
5. If the system is equipped with gun flush boxes:
 - a. Regulated air supply to gun flush box(es) "air" connection.
 - b. Gun trigger (TRG) 1 to Bulkhead 14(B14) and (TRG) 2 to Bulkhead13 (B13).
 - c. Gun in box (GIB) signal lines to pressure switches (B16, B15).
 - d. Air Cut Off (ACO) trigger lines to Air Cut Off Valve(s) (**ACO**)

Fluid Connections:

Perform the following fluid connections before use. For more information, go the **6.0: Fluid Connections** pages. Oil Reservoirs should be filled with pump packing lube supplied with the system.

1. Connect hardener supply line to inlet of dispense pump or flow sensor (**B IN**).
2. Verify dispense pump outlet is connected to mix manifold.
3. Connect solvent supply line to the color stack solvent inlet (**F0**).
4. Connect resin material supply to color stack ports (**F1-F5**).
5. Confirm flow meter outlet hose is tightly connected to the mix manifold material inlet.
6. Connect static mix tube to outlet of mix manifold (**MIX**). Connect spray gun fluid line(s) to static mix tube.
7. Energize all fluid lines and check for leaks of any kind. If any are present, be sure to remove pressure and repair the leak before continuing with the **8.1: Startup Procedure**.

8.1: Startup Procedure

When air and material connections have been tested for leaks the machine should be ready to power on.

Startup for systems without gun flush boxes:

1. Ensure all compressed air and fluid sources are connected to GEMS and energized.
2. Turn the AC lock out switch to the on position. Select the PRIME button on the home screen.
3. With atomizing air off for this step, trigger the spray gun into a grounded metal waste container. Press the B Pump enable button and allow the pump to stroke for at least 2 full cycles (typically about 30 seconds), allowing all air to be removed from the inner chambers.
4. Press B Pump enable again to stop. Release gun trigger.
5. Ensure Color 0 shows in the display box and press Resin enable to open the solvent valve. Trigger the gun until solvent is loaded in the fluid lines.
6. Repeat the Resin load process for all system colors to ensure functionality and to clear air from the fluid lines. After each color has been loaded into the fluid lines, be sure to load with solvent (color 0) so that the inner passageways remain clean and all air is removed.
7. Return to the Home screen by pressing the HOME button.
8. Press the SETUP button on the home screen. Proceed through each page and enter the desired values. Refer to 7.0: User Interface Guide for more information about each screen.
9. Verify the Pot Life Check Volume (cc) setting is correct for the fluid line setup. Refer to the Hose Size table below.
10. For each color used in the system, an initial calibration must be performed to maintain a proper mixed ratio. Advance to the 7.15: Resin + Hardener Calibration page, and perform the test.
11. Press the Color button and load the desired color.
12. After the completion of the color load energize atomizing air and spray.
13. When spraying is complete, shut off atomizing air and perform a color change or flush as required.

Startup for systems with gun flush boxes:

1. Ensure all compressed air and fluid sources are connected to GEMS and energized.
2. Turn the AC lock out to the on position. Select the PRIME button on the home screen.
3. Place the spray gun in the gun box and close the lid.
4. Press B Pump enable and allow the pump to cycle for about 30 seconds to prime the pump and hardener line to the mix manifold. Press F2 again when the Pump is primed and no air bubbles are visible in the fluid line leading to the mix manifold.
5. Ensure color 0 shows in the display box and press Resin enable to prime solvent. Press F3 again when solvent is visible downstream from the mix manifold.
6. Repeat this process for the remaining paint colors. Follow up this prime process with a color 0 (solvent) prime again to clear resin from the lines and mix manifold.
7. Press the HOME button to return to the HOME screen.
8. Press the SETUP button (F4 from the home screen). Proceed through each page and enter the desired values. Refer to 7.0: User Interface Guide for more information about each screen.
9. Verify Pot Life Check Volume (cc) using the chart below.
10. For each color used in the system, an initial calibration must be performed to maintain a proper mixed ratio. Advance to the 7.15: Resin + Hardener Calibration page, and perform the test.
11. Press the Color button on the home screen and load the desired color.
12. Remove the gun from the gun box, close the gun box lid, and spray.
13. When spraying is complete, place the gun in the gun box and close the lid. Perform a color change or flush as required.

HOSE SIZE	15 FEET	25 FEET	50 FEET	75 FEET	100 FEET
1/4" ID estimated volume	225 cc	325 cc	600 cc	875 cc	1150 cc
3/8" ID estimated volume	400 cc	625 cc	1200 cc	1775 cc	2350 cc

9: Daily Operations

Daily use of the GEMS system involves several procedures. Understanding how the system works and knowing the properties of the paint materials in use is the best way to ensure continuous use with few alarms and repairs. Study the procedures and tips below to better understand the function of the system. Read the Maintenance & Repair Manual 77-2983 to review maintenance schedules and repair procedures.

9.1: Daily Start Up Procedure

Follow the steps below during startup to ensure proper operation and optimal safety. These daily procedures assume paint solvents, resins, and hardeners have been loaded into the machine, have already been calibrated, and remain connected between each use of the system.

1. Ensure all fluid and air connections on the system are tight and secure. Ensure fluid supply is adequate for duration of operations.
2. Check all valves on the system for fluid supply leaks. Correct if necessary.
3. Connect regulated pressurized air to the system and open. Maintain 75 psi [5 bar] minimum at all times to the enclosure main air inlet.
4. Energize fluid supplies and open valves supplying GEMS with resin(s), hardener, and solvent.
5. Connect power and turn the power switch to the 'On' position.
6. Navigate to the Alarms History page. Verify no alarms have occurred recently. If an alarm has occurred, verify that the problem has been resolved.
7. Load the desired color. Go to **9.2: Loading a Color** for additional detail.

CAUTION

If using a GUN BOX, ensure gun is in box with the lid closed. If loading a color or flushing without a gun box, ensure atomizing air is turned off, and trigger material into a grounded metal waste container.

8. Verify Inlet and Outlet hardener pressures are correct for the application, and that the Inlet Pressure is 2 – 5% higher than the Outlet.
9. If using a gun flush box, remove the gun from the box and begin to spray. If not using a gun box, turn on atomizing air and begin to spray.
10. Fine tune gun settings for the application (flow rate, atomizing air pressure, fan control).
Remember that changing the resin pressure to adjust flow rate at the spray gun should be followed by a matching change to the hardener pressure to maintain the 2 to 5% higher target inlet pressure.

9.2: Loading a Color

1. Follow steps 1 through 6 of **9.1: Daily Start Up Procedure** before proceeding.
2. Go to the Home screen and ensure atomizing air is turned off. For systems with gun flush boxes, place the gun in the box and close the lid.
3. Press the Color Change button on the Home screen to access the Color Change screen.
4. Enter the color number desired, and press 1 GUN GO or 2 GUN GO to load the color to one or both guns respectively. If not using a flush box, trigger the gun into a grounded metal waste container. When loading a color if the current color is 0, the fluid lines will not be flushed, since it is assumed there is no material in the lines following the **9.5: End of Day Flushing Procedure**.

NOTE

For a color change with gun flush boxes, the GO button will not display if:

- **The spray gun(s) are not in the Gun Box(es).**
- **The Gun Box lids are not closed.**

5. The color should be loaded and ready to spray. If adjustments need to be made to the flush sequence, go to **9.4: Flushing Setup**. If an Alarm occurs, correct the problem and restart the procedure.

9.3: Color Change Procedure

1. To change colors, the initial color must be loaded per **9.2: Loading a Color** procedure.
2. Press the Color Change button on the Home screen to access the Color Change screen.
3. Enter the color number desired, and press 1 GUN GO or 2 GUN GO to load the color. The system will proceed to flush the gun(s) in sequence and then load the desired color at the mix ratio for that color.
4. The color selected will be loaded, completing the color change procedure. Enable atomizing air to start spraying. If an ACO valve is installed it will enable atomizing air after the gun air delay time has passed.

9.4: Flushing Setup

1. Press the Settings button on the Home screen and enter the Administrator password.
2. Advance to the **Gun 1 Flush / Load Sequence** screen, and adjust the settings as needed using the table below as a guide. The recommended settings are a baseline for 25 foot x 1/4" ID fluid hose. Adjust the values accordingly.

NAME	SUGGESTED INITIAL SETTING	DESCRIPTION
First Flush	AIR	Air or Solvent to initially flush fluid lines.
First Flush Time	15 seconds	Duration of first flush. This flush is used to move paint out of the system before attempting to "clean" with the chop process.
Air Chop Time	1 second	Duration of each air burst in the chop process
Solvent Chop Time	1 second	Duration of solvent burst in the chop process
Chop Duration	30 seconds	Total duration of chop process.
Last Flush	SOLVENT	Last flush with Solvent. Final clearing of system – this is also the fluid left in the system when properly shut down.
Last Flush Time	20 seconds	Duration of last solvent flush – should be timed to minimize sol-vent waste but still completely load the fluid lines with solvent.
Load Volume	300cc – Use the chart from 8.1: Startup Procedure	Volume needed to load mixed material into the fluid lines.

The following factors will influence the choices listed above:

Worst case flushing – Always set up the flush parameters using the most viscous/worst case resin material.

Flushing air and solvent pressure – Higher pressures may reduce the time needed to flush the system, but can create significant spitting from the spray gun during the process.

Material viscosity – Viscous materials move more slowly and may require additional time to be purged from the system.

Hose volume/ length – Longer fluid lines encompass a larger volume and may require a longer flush time. Pressure drop through a longer hose or smaller diameter hose will affect the time required to purge paint and clean the system.

Spray gun tip size – Small tips may restrict flow during a flush.

Try to optimize the system to minimize solvent usage during color changes and flushes by:

- Using air instead of solvent for the first flush
- Let the "chop" process do most of the cleaning
- Don't use more solvent than necessary for the last solvent flush

9.5: End of Day Flushing Procedure

To shut down the machine for longer periods or overnight follow the steps below.

1. Flush the Mixed Material using one of the methods below.
 - A. Color 0 Load: Perform a color 0 load to clear the fluid lines of material and load with solvent. For information on loading, see 10.2: Loading a Color.
 - i. If the fluid lines are not fully flushed, adjust the Flush / Load Sequence values as necessary.
 - ii. When Flush / Load values are correct, go to Flush mode and trigger gun to remove the mixed material remaining in the fluid lines. The machine will go into an air/ solvent chop until the button is pressed again, or until 5 minutes have passed. Typically, 30 seconds of flush mode will clear a standard 25 foot hose.
 - B. Flush Mode:
 - i. Press the button for Flush mode (found on the Prime screen) and allow the valves to cycle until the fluid lines have been cleared of mixed material. Perform a color 0 load to fill the fluid lines with solvent.
2. Always ensure there are no mixed materials remaining in the fluid lines when shutting down for the day.
 - i. Optionally, power off GEMS using the AC Lock Out Switch.
3. Depressurize all fluid supplies and close fluid supply valves. Depressurize system air pressure.

CAUTION

Always shut down the GEMS with flushed fluid lines that are loaded with solvent (color 0). Leaving air or paint in the system may cause clogging or sticking of system components.

9.6: System Depressurization Procedure

1. Flush the system if it will not be used for extended periods. Ensure all guns are in gun flush boxes, and that lids are securely closed. If not using flush boxes or ACO, shut off atomizing air for the next steps and use a grounded metal waste container.
2. From the Home Screen, press the Color Change button. Enter Color 0 (Solvent) and press 1 GUN GO (or 2 GUN GO if two guns are in use). If not using a flush box trigger the spray gun.
3. Wait for the system to flush the fluid lines and load the solvent. This will purge resin from the color stack and flow meter and also remove mixed material from the mix manifold. If there is still material visible in the lines, Load color 0 again, or switch the system to Flush mode as long as needed to clear any debris from the fluid lines.
4. Shut supply of all paint resin and hardener. Do NOT shut off solvent supply yet - it will be needed in a later step.
5. The fluids in the Color Stack and Dispense Pump are still under pressure. To release this pressure, go to the Prime screen.
6. On the Prime screen press **B Pump Prime** to engage the B Pump and cycle it to release any internal pressure. Allow it to run for 5 seconds, and then press **B Pump Prime** again to stop.
7. Press **Color Stack Prime** with the spray gun triggered and open color stack valves 1 through 5 to bleed pressure. Finally, open valve 0 to allow solvent through the system until all lines have been flushed with solvent. Press **Color Stack Prime** again to close valves.
8. Shut off Solvent supply to the system. Trigger gun and press **Color Stack Prime** again, opening valve 0 to bleed remaining pressure in the solvent valve.
9. Power off the system. Shut the main air supply to the system.

10: Alarm Guide

System alarms are used to alert the user to conditions which may result in off-ratio spraying or fluid pressure out of range. Refer to the table below to troubleshoot GEMS alarms. Troubleshooting suggestions are listed in order of difficulty with the easier solutions presented first.

If at any time the alarm issue cannot be immediately corrected, the fault may be temporarily disabled until the problem can be resolved. Alarms should never be left disabled.

FAULT	CAUSE	SUGGESTED TROUBLESHOOTING
Low Inlet Pressure	B Pump inlet pressure is below the set limit during operation.	<ul style="list-style-type: none"> Confirm B supply valve is open Confirm B supply pressure correct / matches Home Screen reading Confirm B supply material present Check Minimum Inlet Pressure setting on System Settings screen Confirm CCVs B1 – B4 are functioning properly Confirm solenoids B1 – B4 are functioning properly Confirm B Pump pressure transducers are functioning properly
High Outlet Pressure	B Pump outlet pressure is above the set limit at any time.	<ul style="list-style-type: none"> Trigger spray applicator to relieve pressure Confirm main air inlet pressure into GEMS is 75 – 100 psi (5 – 7 bar) Confirm CCVs B1-B4 are functioning properly Confirm solenoids B1-B4 are functioning properly Check for restrictions leading to Mix Manifold Confirm A supply pressure is below Maximum Outlet Pressure on System Settings screen Confirm B supply pressure is below Maximum Outlet Pressure on System Settings screen Remove and inspect Static Mixer Remove and inspect Mix Manifold components Confirm B pump pressure transducers are functioning properly
Ratio Fault	Measured A:B ratio is outside of tolerance	<ul style="list-style-type: none"> Check for air in the A supply line Check for air in the B supply line Confirm CCVs B1 – B4 are functioning properly Coating flow rate too high Adjust Ratio Alarm Tolerance on System Settings screen. Increase as needed or perform a Resin + Hardener Calibration.
Resin Flow	Component A flow sensed when system is not spraying	<ul style="list-style-type: none"> Confirm CCV AE is closed Check CCV AE for leaks Confirm flow meter is not detecting pulses – refer to DIN0 LED on control board Confirm fluid panel is not being vibrated

10.0: Alarm Guide (continued)

FAULT	CAUSE	SUGGESTED TROUBLESHOOTING
No Hardener Flow	No Flow is detected through B Pump Flow Transducer when the B Pump is running	<ul style="list-style-type: none"> Confirm B supply valve is open Confirm B pressure in the supply line Confirm B material in the supply line Check Connection of Flow Transducer cable Confirm CCVs B1-B4 are functioning properly – opposite valves should be open (B1 & B3 or B2 & B4) Confirm solenoids B1-B4 are functioning properly Flow Transducer out of adjustment – see Flow Transducer calibration procedure in manual
Upper Transducer Fault	Improper electrical signal from upper pressure transducer on B Pump	<ul style="list-style-type: none"> Check electrical connection and wiring Confirm top pressure transducer on B Pump is functioning properly
Lower Transducer Fault	Improper electrical signal from lower pressure transducer on B Pump	<ul style="list-style-type: none"> Check electrical connection and wiring Confirm bottom pressure transducer on B Pump is functioning properly
Check Pump	B Pump movement does not match potentiometer output	<ul style="list-style-type: none"> Check for air in all fluid lines Confirm CCVs B1-B4 are functioning properly – opposite valves should be open (B1 & B3 or B2 & B4) Confirm solenoids B1-B4 are functioning properly Perform a calibration procedure Inadequate B Pump inlet pressure – increase to 5 ~ 10% greater than outlet pressure Coating flow rate too high Confirm wiper is properly engaged with potentiometer – check Dispense Pump Limits screen
No Resin Flow	Atomizing air flow detected with no fluid flow	<ul style="list-style-type: none"> Confirm no air leaks including spray applicator, air flow switch, and air hoses Confirm Blow Off Time has not been exceeded Confirm CCV AE opens when spray gun is triggered Check connections on flow meter Check solenoid AE Check for stuck flow meter gears Check for excessive component A pressures – check A supply pressures and regulation are working properly
Upper Balancing Fault	B Pump top fluid pressure not balanced at pump direction change	<ul style="list-style-type: none"> Air in top of B Pump – if air is present perform a Component B prime Excessive B Pump inlet pressure – reduce to 5 ~ 10% greater than outlet pressure Inadequate B Pump inlet pressure – increase to 5 ~ 10% greater than outlet pressure Confirm pressure transducers are functioning properly

10.0: Alarm Guide (continued)

FAULT	CAUSE	SUGGESTED TROUBLESHOOTING
Lower Balancing Fault	B Pump bottom fluid pressure not balanced at pump direction change	<p>Air in bottom of B Pump – if air is present perform a Component B prime</p> <p>Excessive B Pump inlet pressure – reduce to 5 ~ 10% greater than out-let pressure</p> <p>Inadequate B Pump inlet pressure – increase to 5 ~ 10% greater than outlet pressure</p> <p>Confirm pressure transducers are functioning properly</p>
Pot Life	Mixed material programmed pot life timer expired	<p>If possible spray out load volume of material in line</p> <p>Flush mixed material from fluid lines with Color 0 load on Color Change screen</p> <p>Flush mixed material from fluid lines with Flush Mode on Prime Screen</p>
Color Change Fault	A color change sequence has been interrupted	<p>Confirm red stop button was not pressed</p> <p>Confirm spray applicator was triggered within 3 minutes of color change start</p> <p>If equipped – confirm gun(s) are in Gun Flush Box and lid has been closed</p> <p>If equipped – confirm proper operation of Gun Flush Box</p>
High Resin Flow Rate	Component A flow rate above set limit during operation	<p>Check for air in fluid lines to CCVs A1-A5</p> <p>Confirm no leaks in fluid lines</p> <p>Verify Max Resin Flow Rate on System Settings screen</p> <p>Adjust fluid pressure / flow to A1-A5 valves to ensure limit is not exceeded</p>
Component B Flow Fault	Component B flow detected without pump operation	<p>Check component B supply for fluid leaks</p> <p>Confirm component B supply valve is open and supply adequate</p> <p>Confirm component B pressure correct</p> <p>Adjust Flow Transducer so display returns to red signal after spray applicator stops triggering</p> <p>Adjust Flow Transducer at minimum flow rate so display moves off red signal</p> <p>Confirm CCVs B1-B4 are functioning properly – opposite valves should be open (B1 & B3 or B2 & B4)</p> <p>Confirm solenoids B1-B4 are functioning properly</p>
Air Flow Detected	Atomization air detected during Color Change or Flush mode	<p>Turn off atomizing air during flush or color change</p> <p>Check operation of Air Flow Switch</p> <p>If equipped – check operation of Gun Flush Box</p> <p>If equipped – verify operation of Air Cut Off Valves</p>

11: Flow Meter

240-3176

The flow meter is a gear-type positive displacement meter specially designed for paint and will measure flow up to 1900cc per minute. A sensor detects the movement of the inner gears and sends an electronic signal in the form of a pulse to the controller.

Flow Meter Do's:

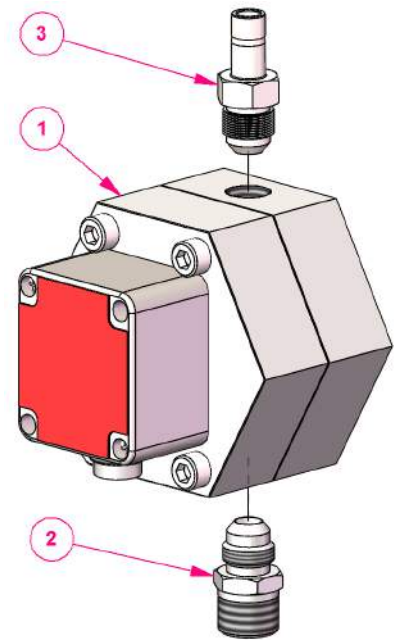
- Filter the paint with a minimum 100 mesh filter. Change filter screens regularly.
- Use pressure regulators upstream from the flow meter to prevent false readings from fluctuating pump pressure spikes.
- Make sure the system is properly grounded and avoid electrical noise at the machine location.
- Calibrate the flow meter cc's/pulse frequently. Even different batches of the same paint can have different flow characteristics.
- Always store the meter filled with solvent.
- The flow meter is mounted to the base of the color stack using a tube fitting. Always remove the tube/nut when removing the flow meter from the fluid panel. Leave inlet and outlet fittings intact.

Flow Meter Don'ts:

- Never run the meter dry or spin the gears for a prolonged time with air only.
- Never leave the meter to sit / stagnate with air or water inside.
- Never let the meter dangle by the cable
- Never let the meter drop onto the floor

Flow Meter Calibration

Perform flow meter calibration regularly as described on the next page. The A+B calibration will verify ratio and flow meter calibration in one simple operation.



Troubleshooting

Flowmeter problems can be caused by improperly filtered fluid.

Particulates in the fluid can cause gear binding, resulting in improper signals for the actual flow rate. Maintain the fluid filters according to the instructions from the filter manufacturer. If repeated disassembly and cleaning for removal of solids and particulates occurs, inspect the entire fluid supply system and evaluate the system cleaning cycle.


Fluid back-up, that is, reverse flow, can cause reacted/catalyzed material to enter the flow meter. The flow meter should be cleaned immediately, before the fluid gels or hardens.

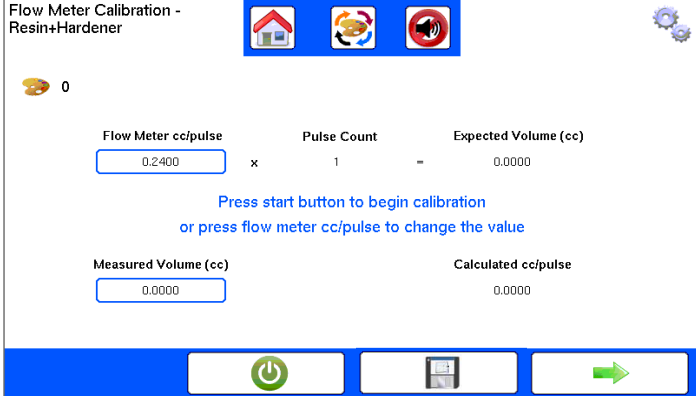
Under normal operation the sensors or electrical connections will not require replacement.

NO.	PART NO.	DESCRIPTION	QTY.
1	A13159-01	FLOW METER	1
2	6-6JIC	ADAPTER #6 JIC x 3/8 NPS	1
3	76628-00	3/8" TUBE ADAPTER	1

11.1: Flow Meter Calibration

The GEMS system uses a gear flow meter to measure the flow rate of resin through the system. The control uses the resin flow rate to calculate the required flow of hardener to be dispensed by the B Pump. To maintain ratio accuracy it is very important to ensure the gear flow meter is calibrated for each paint resin used in the system. Follow the steps below to calibrate the flow meter and check proper operation of the dispense pump. Repeat for each color.

1. Ensure the desired color to be tested has been loaded. The correct ratio values should be entered into the system for all colors to be calibrated.
2. Use the Administrator password to access the Resin + Hardener Calibration screen.
3. Shut off atomizing air so a continuous fluid stream can be captured by a beaker.
4. Place a beaker or graduated cylinder under the fluid tip of the spray gun.
5. Press the start icon  to start the test. This will reset the pulse count and expected volume values to zero. Trigger the gun into the beaker.
7. Trigger the gun long enough to capture a convenient measurable fluid volume, such as 100 – 500cc. High ratios will require higher volumes. This volume will be the total volume of BOTH A+B components at the specified ratio.
8. If the measured beaker volume matches the expected volume then no further action is necessary. If different, input the beaker volume into the Measured Volume field and press enter. The program will then display the calculated cc/pulse. The calculated cc/pulse should be entered into the Flow Meter cc/pulse field.
9. Press the Save button to use the new Flow Meter cc/pulse value.
10. Repeat steps 1-9 to verify the new cc/pulse value is repeatable. The new Measured Volume should match the Expected Volume. If these values match, the Flow Meter Calibration has been completed successfully. If the values do not match, continue to the next step.
11. If the two volumes are not close together (>.005 difference) proceed to Flow Meter Calibration – Resin Only. The Resin Only calibration will verify proper flow meter operation. Repeat the above procedure for the Resin only calibration, the difference being that the total volume will be the volume of the Resin component ONLY.
12. If the resulting actual volume is significantly different than the calculated volume after repeated tests, it is possible the Flow Meter may be clogged or sticking and may require disassembly, cleaning, or repair.
13. Conversely, if the Resin Only calibration results in accurate measured volumes but the Resin+Hardener calibration does not, there may be a problem with the Dispense Pump. Review the steps in 13.0: B Pump Troubleshooting Checklist to verify proper operation of the pump.



Flow Meter Calibration - Resin+Hardener

0

Flow Meter cc/pulse	Pulse Count	Expected Volume (cc)
0.2400	1	0.0000

Press start button to begin calibration
or press flow meter cc/pulse to change the value

Measured Volume (cc)	Calculated cc/pulse
0.0000	0.0000

NOTE

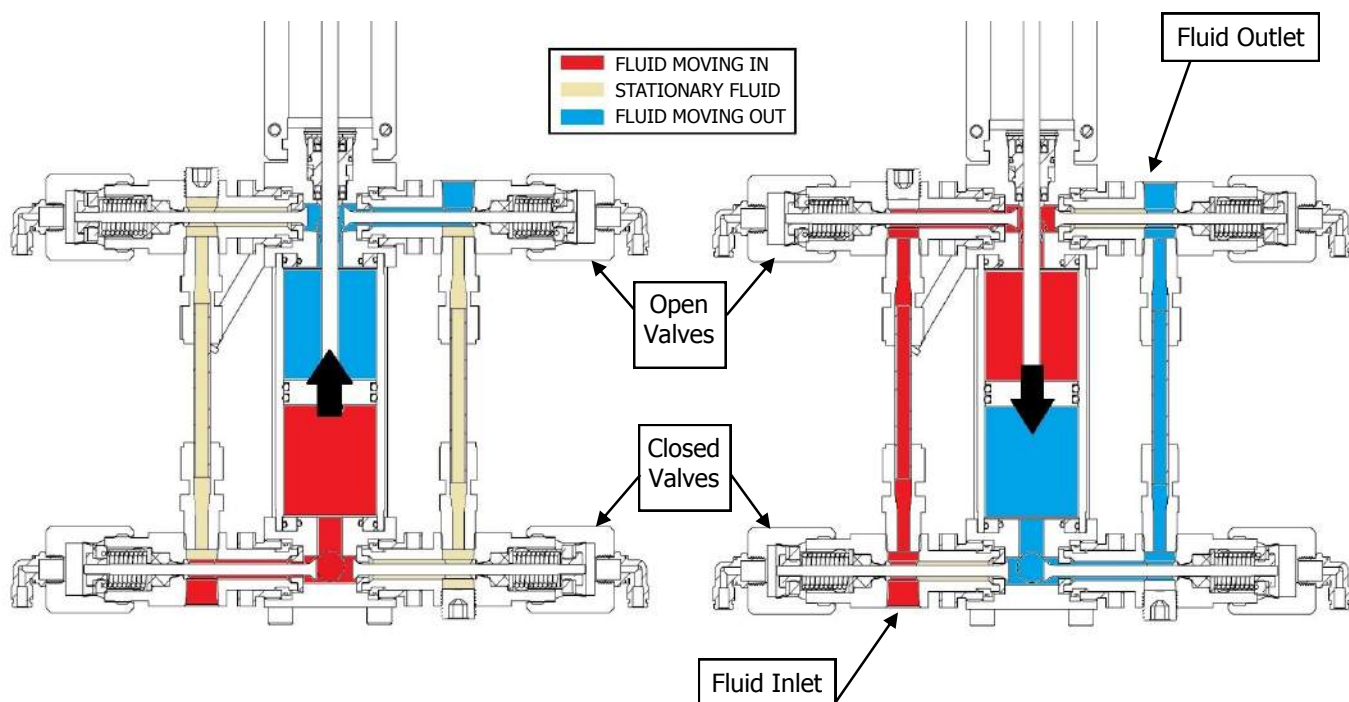
After performing a ratio test, mixed material will be loaded in the fluid lines. If a resin+hardener ratio test results in a changed value, be sure to reload the paint again to bring mixed paint into the line at the new ratio.

12: B Pump Operation

Material is delivered to be mixed by a piston and cylinder dispense pump. An inlet and an outlet valve on each end of the pump controls the material flow. When the piston is moving down, the bottom inlet valve is closed, and the bottom outlet valve is open. As the piston moves down, the material in the cylinder below the piston is dispensed through the bottom outlet valve. Also as the piston is moving down, the top outlet valve is closed and the top inlet is open. This allows material to be drawn into the top of the cylinder above the piston. When the piston gets to the bottom of its stroke, the valve settings and the piston direction reverse. This causes the material in the top of the cylinder to be dispensed, and the bottom of the cylinder to be filled.

A balance mechanism is programmed into the system controller to minimize pressure fluctuations at piston reversals. This logic assumes that the inlet material pressure is higher than the dispenser output pressure. When the dispenser reaches the limit of the potentiometer, the inlet valve will close, and the outlet valve will open. This continues dispensing material on the output side while filling material on the inlet side. At the point where the inlet side pressure is drawn down to match the output pressure, the direction will reverse. The appropriate valves will open, and the side which was filling begins to dispense.

The dispense pump is fitted with a linear potentiometer with a wiper. Movement of the motor's screw slides the wiper on the potentiometer and communicates the position of the pump piston.



NOTE

The 300cc and 600cc versions of the Dispense Pump operate in the same manner.

12.1: B Pump Troubleshooting Checklist

Use this checklist to help identify potential problems with the B pump - avoid unnecessary disassembly. If the problem is still not corrected, it may be necessary to remove the B Pump and clean it thoroughly after flushing it with a solvent. Look for clogged passageways and evidence of fluid leaks. See the **77-2983 Maintenance & Repair Manual** for B Pump disassembly / assembly instructions.

DISPENSE PUMP TROUBLESHOOTING CHECKLIST	
Description	Pass/Fail
Check that the system is not in an Alarm state. It is possible an Alarm is not allowing the pump to run.	<input type="checkbox"/>
Verify there are no leaks anywhere on the pump fluid end.	<input type="checkbox"/>
Examine the Oil Reservoir. Look for overflowing or hints of hardener/catalyst material in the reservoir.	<input type="checkbox"/>
Check for air in all fluid lines. There must be no air bubbles anywhere.	<input type="checkbox"/>
Visually inspect the threaded actuator rod; look for wear or damage. Check rod for adequate lubrication.	<input type="checkbox"/>
Verify the ball plunger is properly contacting the linear potentiometer. Do this by observing the center value change on the Dispense Pump Limits screen during Jog Up or Jog Down movement.	<input type="checkbox"/>
Go to the PRIME screen. Trigger the gun and B Pump. Confirm valve operation, look for a constant stream of material exiting the gun.	<input type="checkbox"/>
Examine the stepper motor. Verify smooth operation when the pump is running. There should not be any 'stuttering' movement of the pump. Unusual movement could be attributed to a flow meter that needs cleaning.	<input type="checkbox"/>
Verify DINO LED lights up and flashes when resin material is travelling through the flow meter. See the 77-2983 Maintenance & Repair Manual for more detail.	<input type="checkbox"/>

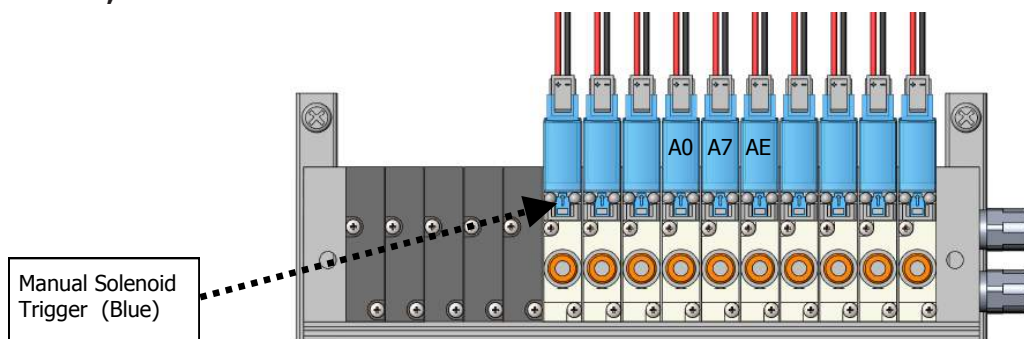
13: Power Outage Cleaning Procedure

In the event of a facility power outage GEMS can be cleared of mixed material manually if air pressure supply continues. If the fluid lines are not cleared, it is possible that the mix manifold, downstream fluid lines, and spray gun may become clogged with hardened material. Valves may be manually triggered to open passageways in the unit. Trigger the gun into a grounded waste receptacle. For systems with gun flush boxes add TRG1 and TRG2 solenoid, or remove the gun from the box for flushing.

Pressing up on the blue manual solenoid triggers will open the corresponding CCV if there is enough residual air pressure available. With the aid of a helper, open CCVs per the references below while triggering the gun.

Air Flush: AE, A7

Solvent Flush: AE, A0



13.1: Solenoid Connection Reference

Use the reference below to reconnect the solenoid air lines to their bulkheads and CCVs. Units that are not fully optioned may not have all 15 solenoids.

Solenoid #/ CCV	Location	Description	Bulkhead	Basic	Optioned
B1	B Pump	Top Inlet	B01	X	X
B2	B Pump	Bottom Inlet	B02	X	X
B3	B Pump	Top Outlet	B03	X	X
B4	B Pump	Bottom Outlet	B04	X	X
AE	Mix Manifold	Resin Enable Valve	B05	X	X
A7	Color Stack	Air Enable	B06	X	X
A0	Color Stack	Solvent Enable	B07	X	X
A1	Color Stack	Color 1	B08	X	X
A2	Color Stack	Color 2	B09	X	X
A3	Color Stack	Color 3	B10	X	X
A4	Color Stack	Color 4	B11		X
A5	Color Stack	Color 5	B12		X
TRG2	Gun Box	Trigger Gun 2	B13		X
TRG1	Gun Box	Trigger Gun 1	B14		X
ACO	Enclosure/Air Inlet	Air Cut Off Control	B16		X

14: Accessories

These accessories provide unique functionality for specific applications, such as a light indicator visible from 360 degrees, or solvent usage tracking. Your distributor will install and configure these accessories. Below is additional information regarding these part numbers, and the corresponding manual number for installation and use instructions.



Stack Light – A 360 degree visible LED light that mounts to the top of the control enclosure. It will display green when spraying, or will alert an operator to alarms with a flashing amber LED.

Kit # 240-3115
Manual # 77-3086.

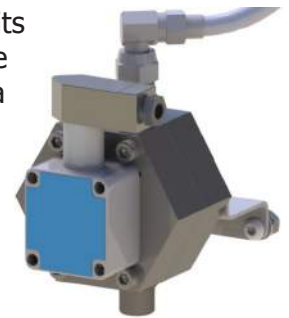
Dispense Pump Flow Sensor – Monitors flow of material into the B Pump. It can be fine tuned for high or low flow.

Kit # 240-3110
Manual # 77-3088.



Solvent Meter Kit – Transmits solvent flow information to the system for usage and job data collection.

Kit # 240-3113
Manual # 77-3089.



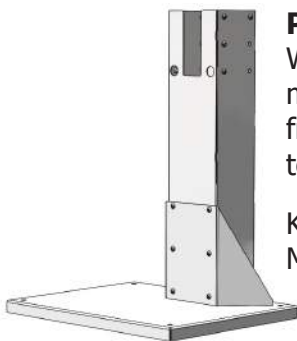
Atomizing Air Cut Off (ACO) – This kit is installed with gun flush boxes, but is also available for other systems as an upgrade to control gun atomizing air. It will prevent atomization of solvents and reduce “air flow detected” alarms.

Kit # 240-3118
Manual # 77-3087.



Pedestal Stand – When desired, the unit may be moved away from a wall and bolted to the floor.

Kit # 240-3160
Manual # 77-3092.



Gun Flush Box Kit –

Used for automatic gun flushing procedures for up to two guns. May be ordered as part of original system or as separate kit.

Kit # 240-3119-1 for single gun or
Kit # 240-3119-2 for two gun.
Includes Atomizing Air Control Valves.
Manual # 77-3090.

Other kits: 2 Gun add-on (240-3123), solenoid expansion (240-3090), screen protector install (240-3187), screen protector refill (240-3199). Consult your distributor for details.

15: Glossary of Terms

ACME Lubricant – Lubricant used on the threaded rod of the stepper motor rod. The lubricant reduces friction and prevents damage to the threads.

Air Cut Off (ACO) Valve – A pneumatically (pilot) operated valve that stops the flow of atomizing air to the spray gun during a flush, batch, or color change. Accessory equipment.

Air Flow Switch – A device used to send a signal to GEMS control when the spray gun atomizing air is triggered. The switch is located inside the control enclosure.

Alarm – Alarms sound when certain monitored values fall out of the operating range, such as the pot life or mixture ratio. Also known as a fault.

Atomizing Air – The air supplied to the spray gun that is used to atomize the mixed material. This air is routed through the Air Flow Switch(es), where recommended supply pressure is between 20 and 75 psi [1.4 – 5 bar].

Atomizing Air Cut Off (ACO) – The system used to control gun atomizing air. Uses the Air Cutoff Valve when an optioned solenoid stack is ordered.

Air Flush Valve – The color change valve (CCV) located on the color stack that controls flushing air. It controls the air used to flush the fluid lines and aid in the chop process. Valve number is 7.

B Pump – Dispenses hardener to the Mix Manifold at the flow rate proportional to Component A flow and the programmed A:B ratio. Also known as Dispense Pump.

Blow Off Time – Time allotted for the triggering of atomizing air with no fluid flow. This is a parameter set in the GEMS system to allow a painter to use the gun atomizing air for a short time to dust a part immediately prior to spraying mixed material.

Calibration – The process of setting a device to measure accurately. The Flow Meter is the only GEMS component that requires calibration. See 11.1: Flow Meter Calibration to verify the proper performance of the flow meter.

Catalyst – A coating component that initiates a chemical reaction in the coating to accelerate the hardening process. Catalysts are typically identified by high mix ratios such as 10:1 or 50:1. Sometimes the catalyst-to-resin ratio is expressed as a percentage such as 10% or 2%.

Check Valve – Valves used to limit the flow of fluid or air to one direction. The valve is typically held in the closed position by a spring until opened using fluid pressure. Check valves should be cleaned or replaced frequently as they are more likely to become clogged with hardened paint particles than other components.

Chop – The term used to describe short bursts of air or solvent in the fluid lines, typically in sequence at varying specified intervals. Chop durations are set in 7.9.5: Flush / Load Sequence.

Circulation System – A circulation system is fluid plumbing with the ability to circulate paint material in a continuous loop so particles remain in suspension. GEMS Color Stack CCVs allow paint circulation through the valve body.

Color Change Valve (CCV) – The pneumatic valves used to open and close ports throughout the system. Found on the Color Stack, Mix Manifold, and B Pump. Actuation pressure is 75-100 psi [5-7 bar].

Color Stack – The combination of manifolds and CCVs used to control up to 5 paint resins and flushing air and solvent.

15: Glossary of Terms (continued)

Component A – The paint resin that is sent through the color stack and flow meter.

Component B – The term used to describe the hardener material or catalyst that is metered by the Dispense Pump. Hardeners as used in Urethane or Epoxy paints become part of the final product, whereas catalysts are typically used to initiate a reaction in the crosslinking process of the paint material.

Controller – A digital computer used for control of devices, such as the operation of the dispense pump, solenoids, and other hardware. Accepts inputs from devices such as pressure sensors and the Pendant.

Crossover – Describes the backward flow of material through the system. In the GEMS system, this condition is prevented by the use of check valves to limit the direction of fluid flow. Ensure proper function of the check valves to prevent crossover and the corresponding damage that could occur to the B Pump, Flow Meter, or other components.

Depressurized – No residual fluid or air pressure.

B Pump Flow Sensor – The accessory flow sensor placed at the inlet of the Dispense Pump. It sends a signal to the control when it senses liquid flow, and is most useful with pressure tanks. Sensitivity is adjustable.

GEMS – Acronym for Global Electronic Mix Solutions.

Enclosure – The box that surrounds the electrical components of the system and houses the electrical end of the dispense pump.

Fault – see Alarm.

Floor Stand – The pedestal stand used to mount the unit together with the fluid panel and machine components. Allows the machine to be placed anywhere if the surface is flat and level.

Flow Meter – The device used to measure the volume flow rate of resin when the machine is running.

Fluid Lines – Describes the fluid hoses throughout the machine and out to the spray guns. These hoses are used to transport the mixed and unmixed fluids.

Fluid Panel – The panel used to mount the Color Stack, Mix Manifold and protective shroud. It is mounted to the support mast of GEMS .

Flushing – The process used to clean out the fluid lines and other GMS components when changing colors or shutting down for the day. Typically will involve an air and/or solvent chop to remove mixed materials. Always complete flushing with a solvent (color 0) load.

Gun Flush Box – The optional equipment that can be ordered to complete a fully automatic fluid line flush procedure. Sends and receives signal to the control in order to complete the flushing procedure.

Gun Lubricant – A low viscosity lubricant used to assemble and protect machine components and spray gun parts.

Hardener – The paint component that chemically reacts with the resin to provide a coating with superior properties to air-drying single component coatings. Also known as the "B" component.

HMI – Acronym for Human Machine Interface. See User Interface.

Jog Down – The command used to push the piston of the dispense pump downwards to set the B Pump lower limit.

15: Glossary of Terms (continued)

Jog Up – The command used to pull the piston of the dispenser pump upwards to set the B Pump upper limit.

Load Volume – After completing a flushing procedure, the load volume is the volume of material (in cc's) required to load the mixed material into the fluid lines so that spraying may begin.

Manual Flush – Describes the manual triggering of solenoid stack valves when power is not available. Using air pressure to the system, it is possible to flush fluid lines if air/solvent and Resin Enable valves are triggered.

Mast – The term used to describe the support that connects the enclosure to the fluid panel and routes hoses/wiring.

Mix Manifold – The combining location of the resin and hardener components.

Oil Reservoir – The region of the upper B Pump block containing lubricating oil for the pump rod and seals. Includes the clear tubes extending upward from the block. The tubes should be periodically checked for changes to the oil or signs of seal leaks.

Petroleum Gel – A lubricant used to protect parts from galling and damage upon reassembly. Follow callouts where labeled.

Polytetrafluoroethylene (P.T.F.E) – A chemically inert plastic commonly used for o-rings, gaskets, and thread tape.

Potentiometer – The device used to indicate the location of the B Pump piston. The potentiometer upper and lower limits must be reset if the potentiometer is ever removed or replaced.

Pot Life – The period of time during which mixed coatings remain sprayable. Not to be exceeded.

Power Switch – The On / Off AC power and lock out switch on the side of the enclosure.

Pressure Transducer – The device mounted on the dispense pump measuring B fluid pressure. Two pressure transducers are used on the B Pump to monitor inlet and outlet pressure for proper ratio control.

Prime Screen – Prime refers to running material through the machine and removing all air bubbles from the fluid lines. Prime the system by flowing hardener or resin material through the system via the prime screen.

Pulse Count – A count of pulses sent from the resin flow meter. One pulse per gear tooth.

Resin – The A Component that flows through the color stack and flow meter. The paint resin provides color and flexibility and other properties to plural component coatings. Polyols are resins used for urethane paints, and epoxy resins are used for epoxy paints

Resin Enable Valve – The CCV used to enable resin flow through the mix manifold. Also known as AE valve.

Shroud – The protective covering of the fluid panel. Removable for better access to fluid panel components

Solenoid – The device used to convert electrical signals to pneumatic trigger signals for CCVs. Can be manually triggered if needed.

Solvent – The material used to dissolve and remove mixed material from the fluid lines. Known as color 0 on the GEMS system.

15: Glossary of Terms (continued)

Static Mixer – A device used in a fluid line to mix fluids together. The static mixer divides, rotates, and recombines the flow many times to provide efficient mixing with minimal pressure drop.

Stepper Motor – Used to control movement of the dispense pump piston, the stepper motor engages the ACME threaded rod and moves the piston up and down. Universal for both sizes of the dispense pump.

Target Ratio – The current A:B ratio the system has loaded and ready to spray. Visible on the Home screen.

Thread Sealant – P.T.F.E tape or liquid pipe thread sealant is required on pipe threads to lubricate and prevent leaks. If using tape, wrap 2-3 times around the male threads. If using liquid, add a bead of sealant around entire 2nd male thread before tightening into female thread. Follow callouts where labeled.

User Interface – The touch screen device used to operate GEMS and configure machine settings.

Wall Mount – The frame and mast used to mount GMS to the wall.

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