



# Cyclomix™ Expert 2K & 3K Mixing & Dosing System



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## 1 Safety

### 1.1 Introduction

SAMES KREMLIN, Inc. is not and does not represent itself as an expert in safety systems, safety equipment, or the specific safety aspects of your company and/or its work force. It is the responsibility of the owner, employer, or user to take all necessary steps to guarantee the safety of all personnel in the workplace.

The appropriate level of safety for your application and installation can best be determined by safety system professionals. It is therefore, recommended that each customer consult with such professionals to provide a workplace that allows for the safe application, use, and operation of SAMES KREMLIN, Inc. equipment.

As the owner, employer, or user of a paint or dispensing system, it is your responsibility to arrange for the training of the operator to recognize and respond to known hazards associated with the equipment.

Additionally, personnel need to be aware of recommended operating procedures for your site-specific application and installation.

It is therefore, recommended that all personnel who intend to operate, program, repair, or otherwise use the SAMES KREMLIN, Inc. system or components be trained in an approved SAMES KREMLIN, Inc. training course and become familiar with the proper operation of the system.

All persons involved with electrostatic or non-electrostatic finishing operations should carefully read and fully understand this booklet and other applicable safety publications, particularly NFPA No.33. It is very important that both equipment operators and supervisory personnel be fully aware of the requirements for safe electrostatic finishing system operation.

The following guidelines are provided to emphasize the importance of safety in the workplace.

Other nationally recognized authorities which issue relevant safety standards are listed below.

#### **Reference Standards:**

NATIONAL FIRE PROTECTION ASSOCIATION 60 BATTERYMARCH PARK BOSTON, MASSACHUSETTS 02110	NFPA NO. 33 Spray Applications
NFPA NO. 63 Explosion Prevention	NFPA NO. 70 National Electric Codes
NFPA NO. 77 Static Electricity	NFPA NO. 86A Ovens and Furnaces
NFPA NO. 91 Blower and Exhaust Systems	NFPA NO. 654 Dust Explosions in Industrial Plants

#### **Reference Advisory/Regulatory Safety Authorities:**

NFPA National Fire Protection Association	NEMA National Electrical Manufacturers Association
Association	NIOSH National Institutes of Occupational Safety and Health
Safety and Health	OSHA Occupational Safety and Health
FM Factory Mutual	UL Underwriters Laboratories
IRI Industrial Risk Insurance	AIA American Insurance Association
Local Authorities	Insurance Carriers

### 1.2 General Safety Instructions

**Only trained and certified personnel should attempt to operate any equipment.** (To acquire necessary training, please contact the training center in Plymouth Michigan at 734-979-0100).

Supervisors must ensure that personnel are properly trained in the safe usage of all equipment as well as proper procedures which are outlined in system manuals for parts and accessories. All materials provided to the user address safety advisories, label markings, pictograms and warnings. All users of SAMES KREMLIN, Inc. products should be safety trained and certified before operating any equipment. Improper use of system equipment may result in injury. This equipment is for professional use only. Equipment should be used only for what it has been designed for. Never modify or alter any component of the system. All parts and accessories supplied should be routinely inspected. Always replace defective or worn parts whenever necessary.

**Never exceed the equipment’s maximum recommended operating pressure.**

Always comply with local and state regulations concerning safety, fire and electrical codes. Use only materials which are intended to be used with the design of the equipment. Insure solvents being used are also compatible with the components internal design. (Always refer to the material safety data sheet supplied by the manufacturer).

### 1.3 Pictograms

					
NIP HAZARD	WARNING MOVING ELEVATOR	WARNING MOVING PARTS	WARNING MOVING SHOVEL	DO NOT EXCEED THIS PRESSURE	HIGH PRESSURE HAZARD
					
RELIEF OR DRAIN VALVE	WARNING HOSE UNDER PRESSURE	WEAR GLASSES OBLIGATORY	WEAR OF GLOVE IS OBLIGATORY	PRODUCT VAPOR HAZARDS	WARNING HOT PARTS OR AREAS
					
ELECTRICAL HAZARD	WARNING FIRE HAZARDS	EXPLOSION HAZARDS	GROUNDING	WARNING (USER)	WARNING SERIOUS INJURIES

### 1.4 Pressure Hazards



Current legislation requires that an air relief shut off valve is mounted on the supply circuit of the pump motor as to bleed residual air pressure when closing the circuitry. Without this precaution, the motors residual air pressure may allow the pump to generate excessive pressure which may result in injury. Therefore, always ensure that a material drain valve is mounted in series of the material delivery circuit.

### 1.5 High Pressure Injection Hazards



When working with high pressure application equipment, special care is required. Fluid lines may burst from excessive pressures. This increases the risk of a material injection wound under the skin.

- Seek immediate medical attention should a material injection wound occur. Failure to do so could lead to serious, long lasting health issues.
- Never point the applicator nozzle toward another individual. Additionally, refrain from ever placing any extremities in front of the dispensing tip.
- Always follow the proper system shut down procedure and depressurize the air and fluid circuits before attempting to carry out any work. This includes collecting of fluids, cleaning, troubleshooting and preventative maintenance procedures.
- Whenever possible, always ensure the high-pressure applicator trigger is in the locked position when not in use.

### 1.6 Fire - Explosion - Sparks - Static Electricity Hazards



A poor earth ground connection, inadequate ventilation, sparks and static electricity may trigger a fire or explosion. In order to avoid these potential risks when using or servicing equipment, the following safety procedures should be adhered to at all times;

- Ensure a good earth ground connection and grounding of all parts to be handled by personnel. Use proper care with solvents and rags.
- Provide adequate ventilation.
- Stress good housekeeping measures to keep the worksite free and clear of any debris that may be a source of ignition. This might include waste or reclaimed solvent and paints, chemicals, paper and spent material drums.
- Identify any equipment failures which could cause a spark.
- Avoid using volatile application materials which may cause the formation of flammable gas.
- Verify that all material drums and paint totes are covered with secure lids and retain grounding straps.

### 1.7 Toxic Product Hazards



Toxic materials and vapors can cause severe injury not only through contact with the body, but also if they are ingested or inhaled. Therefore, it is imperative that personnel;



- Know the material products and risks they are being exposed to. Properly read all Material Safety Data Sheets and understand the content.



- Be certified in the handling and disposal of hazardous materials. Additionally, how materials must be stored in accordance with all regulations.

- Protective clothing should always be worn in compliance with the material manufacturers' recommendations.

- Depending on the application and chemical safety instructions, safety glasses, gloves, foot wear, protective masks and possible breathing equipment should be worn to comply with all regulations.



#### CAUTION!

**It is forbidden to use any solvent containing a halogenated hydrocarbon base to come in contact with equipment made from aluminum or zinc. The non-compliance with the instruction has the capacity to cause explosion hazards which may result in fatal injuries.**



### 1.8 Lockout Energy Sources



Lock out any source of energy and relieve/discharge any force/voltage/pressure before performing any maintenance on the system.

- Electrical – Main control panel before working on Temperature Conditioning System or Electrical service panel. Voltages 480V, 220V, 120V, 24V.
- Material Pressure – Bleed Pump pressure and lockout air supply to pumps before disconnecting any material hose, filter, pump fluid section, traced water hose and dispense applicator.
- Air Pressure – Close lockout pneumatic ball valve and bleed and stored air pressure in the system. NOTE: Air Intensifier outlet must be discharged separately.
- Water Pressure – Turn off TCU and Lockout Main control panel – close water ball valves at TCU before any maintenance is performed on the water system.
- Oil Recirculation – Turn off air supply to recirculation pump.

### 1.9 Heavy Equipment



Use proper lifting techniques and/or mechanical lifting aids remove the pumps, meters and applicators when repairing. Failure to follow instructions may result in personal injury.

## 1.10 Equipment Requirements

### 1.10.1 Pumps



Before carrying out any work, it is important that the user become familiar with all aspects of the fluid pump. The operator shall understand the equipment and the safety related issues that are associated with these components. When in operation, always keep ones' hands away from the moving parts. Before starting up any equipment, please read the **PRESSURE RELIEF** instructions. Insure that any relief or drain valves that have been incorporated are in proper working condition.

### 1.10.2 Hoses



- Keep all hosing runs away from moving parts and hot surfaces.
- Never expose product pneumatic or material lines and hoses to temperatures higher than 60°C / 140° F or lower than 0°C / 32° F.
- Avoid kinking of hoses. Always install pneumatic and material lines with sweeping soft bends.
- Before production, verify that all fittings are properly fastened as to avoid possible leaks.
- Routinely check the hoses for kinking and wear/leaks.
- Never exceed the working pressure (WP) indicated by the manufacturer.

### 1.10.3 Commercial Products

Considering the variety of products that may be used by the consumer, it is an impossibility to predict with any certainty issues which may arise when mixing non-compatible coating materials. Negative reactions (from non-compatible materials) can cause very serious conditions to the user. Therefore, SAMES KREMLIN, Inc. assumes no liability for:

- Any user equipment not designed to be compatible with a specific chemical composition of a material coating.
- Risks taken by staff or personnel who have not been properly trained or certified.
- Prior damage to existing equipment. (Pre-existing conditions).
- Overall quality due to improper equipment use.

### 1.10.4 Machinery Misuse

The following actions are considered misuse of the equipment:

- Over pressurizing
- Modifying parts, using non-genuine replacement parts.
- Using incompatible chemicals and fluids.
- Using damaged parts.

Misuse can cause parts to rupture or cause equipment malfunction and result in serious injury such as splashing fluid in the eyes, fire, or explosion.

### 1.11 General Electrostatic Systems

The introduction of high voltage electricity into a highly volatile and explosive atmosphere requires that the following additional design practices be observed for electrostatic spray operations:

1. Transformers, power packs, control apparatus, and all other electrical portions of the equipment, (except for high voltage grids and cascades and electrostatic atomizing heads and their connections) should be located outside the spraying area, unless otherwise specified.
2. The electrostatic apparatus should be equipped with automatic controls to disconnect the power supply to the high voltage transformer and the operator should be signaled in the event of the following:
  - a. Failure or stoppage of the ventilating equipment from any cause;
  - b. Stoppage of the conveyor carrying items through the spray area;
  - c. Occurrence of a ground or excessive current leakage at any point in the system;
  - d. Reduction of the clearance between the articles being coated and the electrodes or atomizing heads to less than the minimum sparking distance. (A sign indicating this safe distance should be conspicuously posted near the operation).
3. High voltage leads to electrodes and electrostatic atomizing heads should be effectively and permanently supported on suitable insulators and should be effectively guarded against accidental contact or grounding.
4. An automatic means should be provided for grounding and discharging any accumulated residual charge on the electrode assembly or the secondary circuit of the high voltage transformer when the transformer primary is disconnected from the source of supply.
5. The articles being coated should be supported on conveyors which are arranged as to maintain a proper electrical pathway to neutral earth and assure that there is a minimum safe sparking distance between the substrate and electrostatic equipment at all times.
6. Adequate booth, fencing, guards, or railings should be placed around the equipment for the protection of personnel. These should consist of conducting material which is adequately grounded and placed at least 5 feet from the spraying equipment.
7. Warning signs should be conspicuously posted in the area pointing out the hazards of high voltage equipment in a coating environment.
8. The areas used for electrostatic spraying should be protected by automatic fire extinguishing equipment.
9. If electrically conductive paint is used, the paint tank isolation stand and paint lines should be barricaded so that personnel or other equipment will not come in contact with or near proximity to the high voltage in that portion of the system.

10. Employees should not work on electrostatic equipment while the voltage is applied. Fail-safe photoelectric or body-capacitance safety controls or their equivalent safeguards should be installed as to insure the power supply will shut down should a person approach the equipment while in operation.
11. A red warning light should be conspicuously mounted on the spray booth or control panel to indicate when the high voltage is enabled.

#### *1.11.1 Manual Electrostatic Systems*

In addition to the above criteria, the use of manual electrostatic spraying equipment requires additional measures to protect personnel using an electrostatic hand applicator.

1. Electrostatic hand spray devices should be of the approved type and be designed to be intrinsically safe and not produce a spark of any sufficient energy to ignite vapor-air or powder-air mixtures nor result in an appreciable shock hazard upon contact with a grounded surface.
2. The electrostatically charged elements of the handgun should be designed so they can be energized only by the switch which also controls the material supply.
3. The handle of the gun should be secured to ground by a metallic connection in order to prevent a build-up of static charge on the operator.
4. The electrostatic hand spraying equipment and system should be designed so the maximum surface temperature of any object in the spraying area will not exceed 150 degrees Fahrenheit under any condition.
5. All electrically conductive objects in the spraying area, including paint, solvent containers, work carts and wash cans, etc., should be adequately grounded and posted with warning signs indicating the necessity for grounding.

## 2 Overview

The manual is written using a simple code of A Component or Component A for what the industry may refer to as “COLOR”, “RESIN” or “BASE”. The term B Component is typically referred to as the “CATALYST” or “HARDENER”. The C Component term is typically referred to as the “THIRD COMPONENT”, “REDUCER”, “REDUCING AGENT” or “DILUTING SOLVENT”. The words solvent and flushing agent are used through the manual and are interchangeable. The terms “A/B” and “A/C” should read as “A to B” and “A to C”, respectively. The machine works on the principle that A Component is free flowing while the B and C components are metered into the A component based upon A’s volume.

### 2.1 Cyclomix Expert System

The Cyclomix Expert is made of three major groupings of equipment; the mixing manifold, the electrical/pneumatic control panel, and optional accessories to enhance the utilization and operation of the System. The Cyclomix Expert can be used with manual and automatic gun systems.

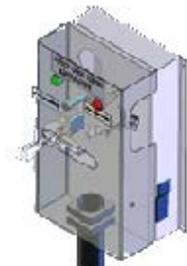
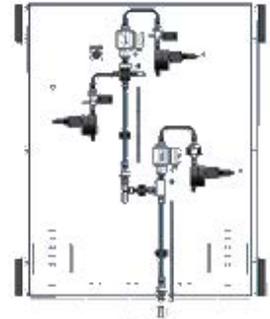
Mixing Manifold can be wall or frame mounted, and consists of three equipment groups. These groupings of equipment are configured at the time of order to match customer and material requirements.

- a. Mixing Section setup for 2K or 3K materials
- b. Color Change Management Section for A & B components
- c. The Fluid Management Section for A, B & C components

Electrical & Pneumatic Control Panel with linking cables to the mix manifold. The control panel is configured at the time of order to meet to requirements of the mix manifold. The panel comes complete to handle all optional accessories.

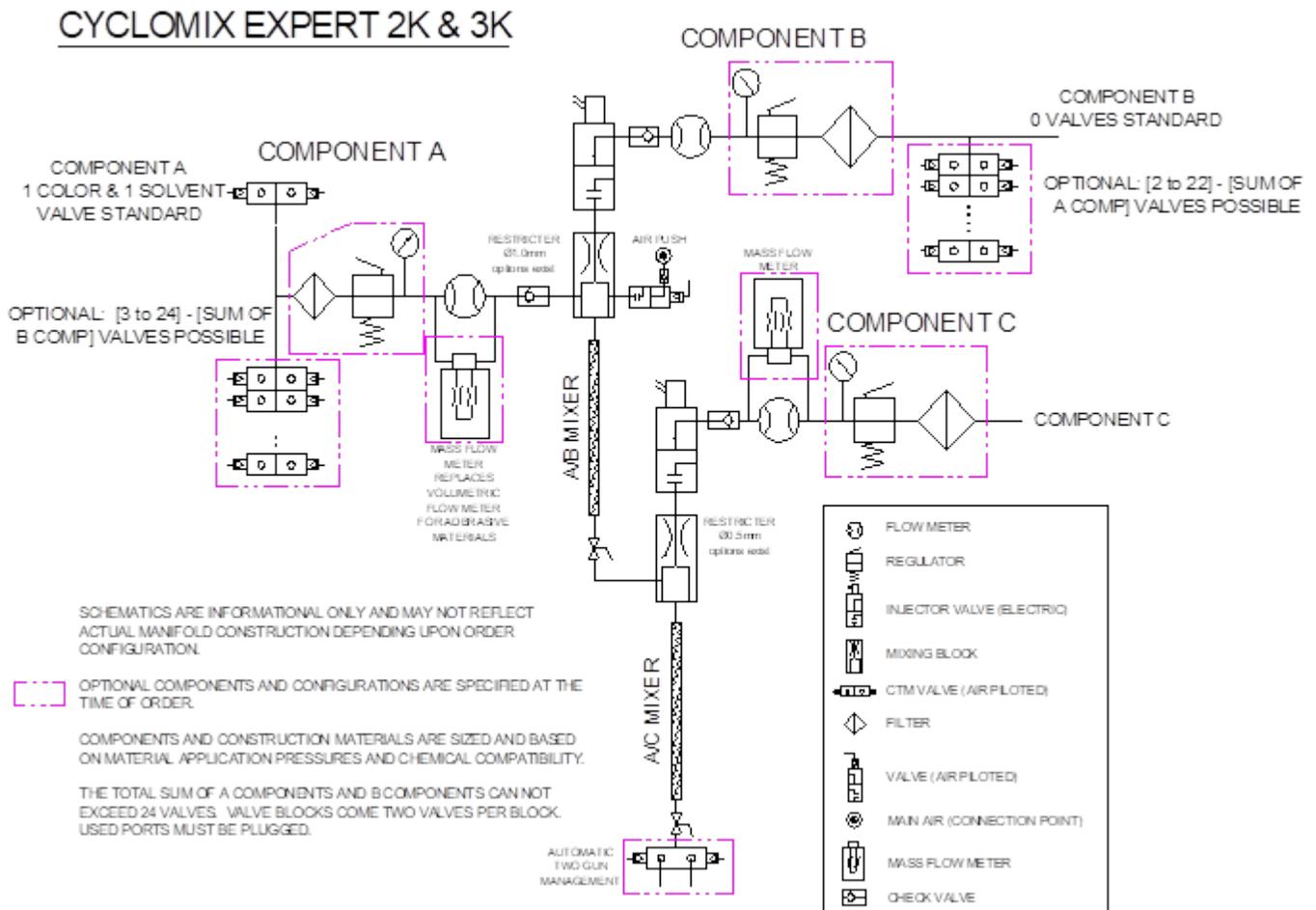
Optional Accessories are designed to enhance the operation by providing remote operator interfaces, and to automate manual tasks such as gun flushing. Options must be purchased and then panel configured through the HMI for some options to work.

- a. Remote Operator Interface - Can be installed on a booth outside wall and operated through a window with a magnet.
- b. Gun Flush Box - Design to operate in the spray area. Can be wall mounted. An untended gun is automatically triggered when the critical pot-life has been reached.
- c. Atomizing Air Manifold – Designed to operate in the spray area. The manifold controls the atomizing air by way of a valve and regulator.
- d. Dump Valves - For use in automatic systems to flush and prime fluid circuits as setup by the recipe management.
- e. Robot/Machine Interface – Simple binary signals can be configured to operate the Cyclomix Expert with automatic systems.
- f. Two Fluid Circuit Management – Distributes the mix manifold output into two independent fluid streams. The fluid streams are managed through the recipe management gun set up.



### 2.1.1 Mix Manifold

The mix manifold is made up three equipment groupings.



1. Mixing Section: The mixing section is the heart of the system and comprises of the volumetric flow meters, injection solenoid valves, mix block and mixing tubes. The mixing section is configured per customer order to meet special requirements.
  - a. A mass flow meter for the A Component for abrasive materials
  - b. Stainless steel mixing elements are available
  - c. Injectors can be configured per the material viscosity
  - d. A mass flow meter for the C Component

The control panel is configured for 2K or 3K systems. 3K systems can mix 2K materials by adjusting the parameters in the recipe management section. 3K and 2K system can also be configured to run a single component material through the recipe management.

For a 2K unit, a ball valve located at the end of the A/B mixing tube is the termination point of the mixing section and mix manifold.

For a 3K unit, a ball valve located at the end of the A/C mixing tube is the termination point of the mixing section and mix manifold.

2. Color Changer Section: The color changers are made up of CTM color changer valves and are configured per the customer requirements regarding the number of;

- |                         |       |               |
|-------------------------|-------|---------------|
| a. A Components         | 1 STD | 2-22 optional |
| b. A Component Solvents | 1 STD | 2-22 optional |
| c. B Components         | 0 STD | 1-22 optional |
| d. B Component Solvents | 0 STD | 1-21 optional |

**Note: The total sum of products cannot exceed 24 products.**

The control panel will be configured for 12 outputs or 24 outputs based upon the number of products. The outputs will be configured at the time of order for the required pilot signals to the mix manifold. As an option the panel can be order with 24 outputs even if fewer than 12 products are on the initial order.

The basic 2K unit is supplied with one CTM valve for the Component A and Component A solvent. The B Component is piped directly to the Component B fluid management connection point or flow meter.

The basic 3K unit is supplied with one CTM valve for the Component A and Component A solvent. The B Component and C Component are piped directly to the Component B and C fluid management connection points, or flow meter respectively.

For 3K units the Component A solvent may be connected from the A Component Color Changer directly to the Component C fluid management input as an option.

Component A color valves are setup to have material supply and return lines which circulate through the color changer valve body.

Component B color valves are setup as dead head material supplies with no returns.

All solvents are setup as dead head material supplies with no returns, except if the Component A flush solvent is being used as the Component C.

3. Fluid Management Section: The Fluid Management Section comprises of fluid regulators, gauges, and filters. Each Component has its own fluid management components and they can be configured for different materials and operating pressures as required by the customer. The configuration of the fluid management section does affect control panel configuration. Options are available for air piloted regulators, but cannot be controlled from the control panel.

The output of each fluid management section is connected by flexible hosing to the corresponding connection point on the mixing section.

The mixing section can be equipped with a “Two Gun Management Manifold” which selects which gun is in operation per the recipe management configuration.

### 2.1.2 Volumetric Flow Meter

The positive displacement gear flow meters are similar in design to the gear pump. The principle of operation is reversed; instead of the gears driving the medium, the medium drives the gears. A non-intrusive hall-effect sensor detects the movement of the gear and as each gear tooth passes the sensor a square wave pulse is produced and a discrete volume of liquid is measured. The resulting pulse train is proportional to the actual flow rate and provides a highly accurate representation of the fluid flow. All meters are designed with highly wear resistant moving parts to provide exceptionally long service life.

**Filtration:** Depends upon model

**Fluid Compatibility:** The materials of construction are stainless steel or high strength aluminum housing, stainless steel gears and either tungsten carbide or stainless steel bearings (depending upon the model). The fluids should be compatible with these materials.

### 2.1.3 Control Panel

The Cyclomix Control Panel is coupled to the Mixing Manifold and configured options by cabling and tubing. The control panel is made up of programmable logic controller, PLC, human machine graphical interface, HMI, necessary electrical and pneumatic control hardware. The HMI communicates with the PLC through an Ethernet hub and displays information per screen to allow the operator to set recipes, display production, consumption, and alarms. The HMI allows the operator to save the consumption data to a USB Flash drive. The control panel can be configured to operate as a stand-alone system with a manual hand gun or be operated from a robot controller sending simple binary signals for recipe selection, priming, flushing, alarm status and placing the unit in production mode.

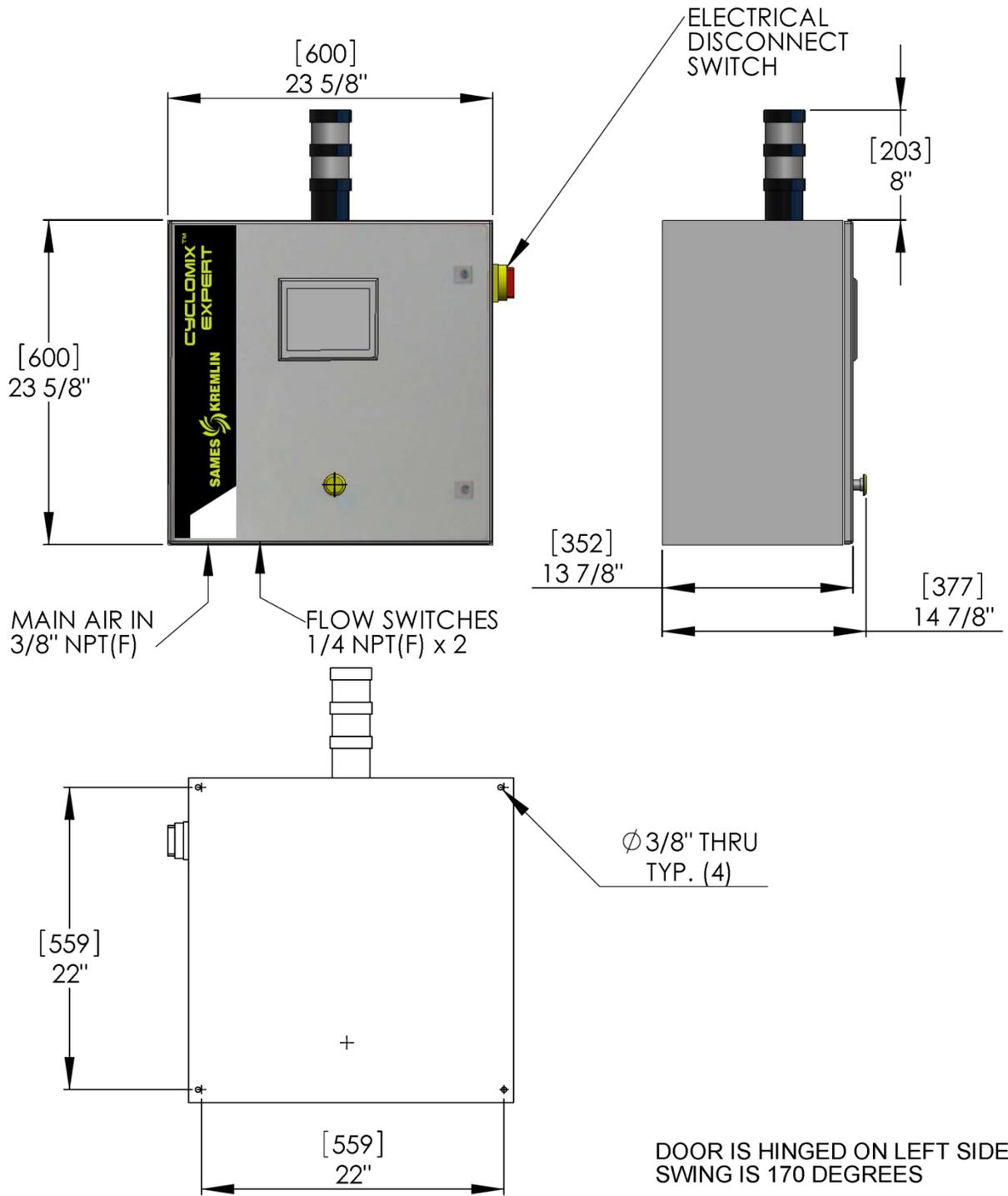
The basic 2K and 3K panel comes complete to operate with 12 products and all optional accessories. Options exist to increase the control panel to 24 products and add isolation barriers if the manifold is going to operate in a hazardous area.

## 3 Specifications

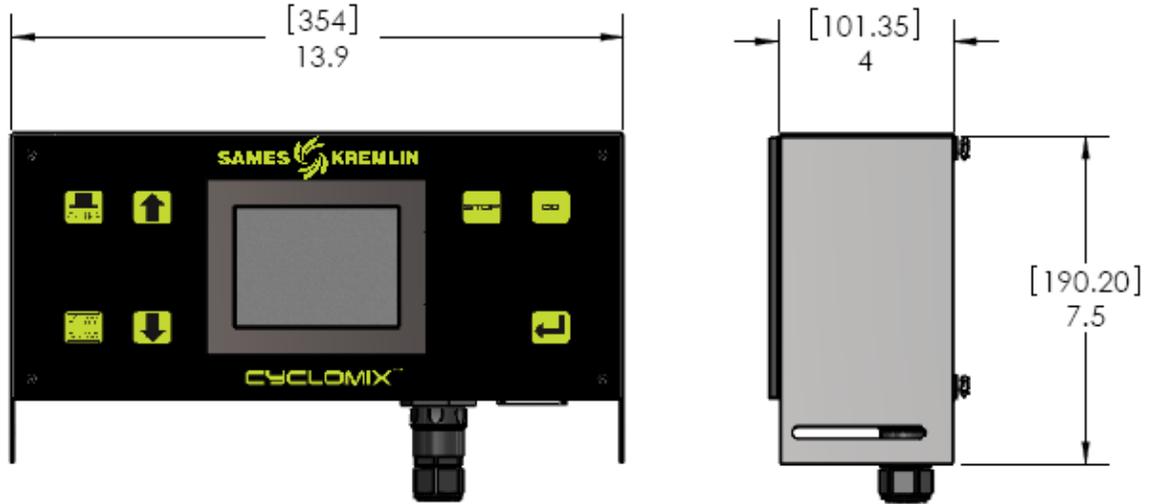
### 3.1 Cyclomix Expert

Component	Description	Specification
Ratio:	A to B; Min/Max	0.6:1 to 20:1
	Percentages	166% to 5%; 0%
Flow Rate:	Min/Max	50 to 2000 cc's/min
Viscosity Range:	Min/Max	30 to 5000 cps
Percent Accuracy:		1%
Number of Products:	Max	24
No. of A Components:	Min/Max	1 to 22 (24 total)
No. of B Components:	Min/Max	1 to 22 (24 total)
No. of A Comp. Solvents:	Min/Max	1 to 22 (24 total)
No. of B Comp Solvents:	Min/Max	1 to 21 (24 total)
No. of C Components:	Min/Max	1
Material Compatibility:	Solvent & Water-based Paints, Acid Catalyst (SS316 Option)	
Voltage:		230V/115V -75W
Compressed Air:	Min/Max	80/90 psi
	Min/Max	[5.5/6 bar]
Particle size:	Max	5 micron
Moisture:	Max	10 ppm
Fluid Pressure:	Min	30 psi [2 bar]
	Max	2900 psi [200 bar]
Weight:	2K	105 lbs. [48kg]
	3K	145 lbs. [66kg]
<b>Control Panel:</b>		
Dimensions:	Outer Panel	23.6" x 23.6" x 9.25"
		600 x 600 x 225mm
Weight:		75 lbs. [34kg]

3.2 Control Panel

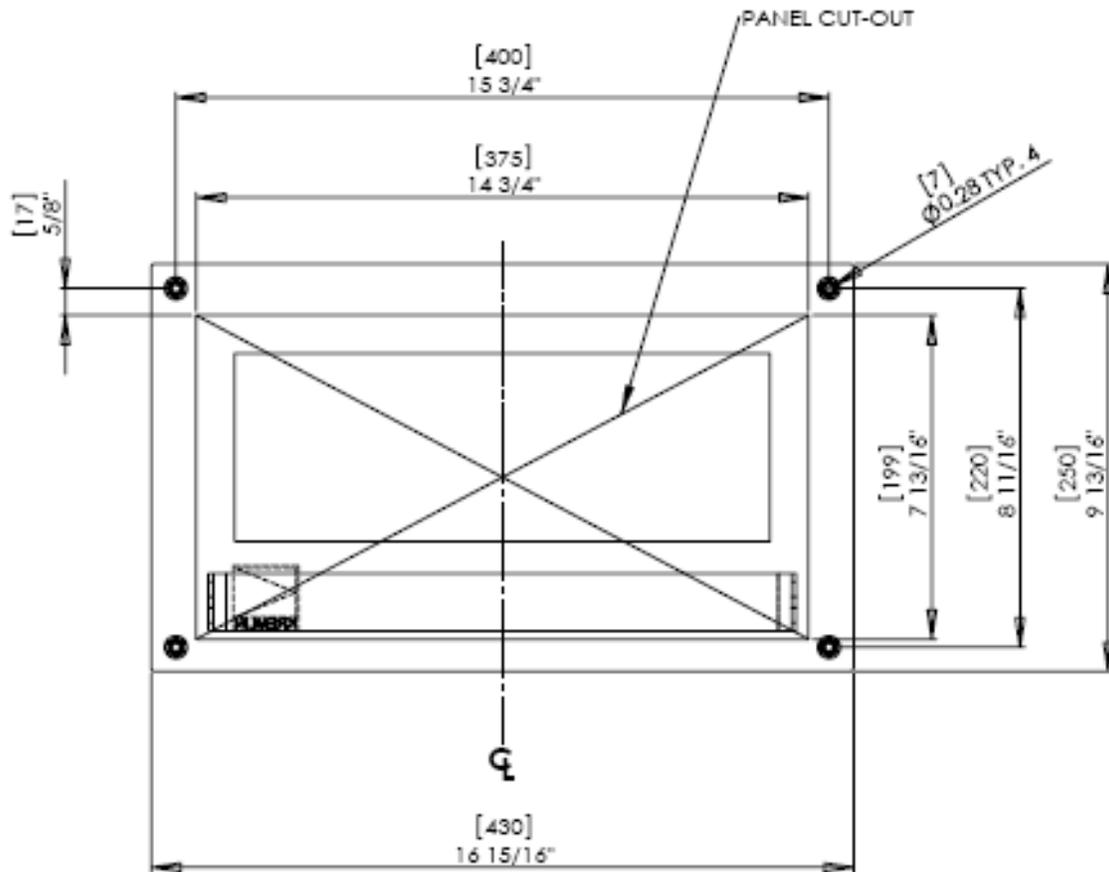


**3.3 Remote Interface Panel**



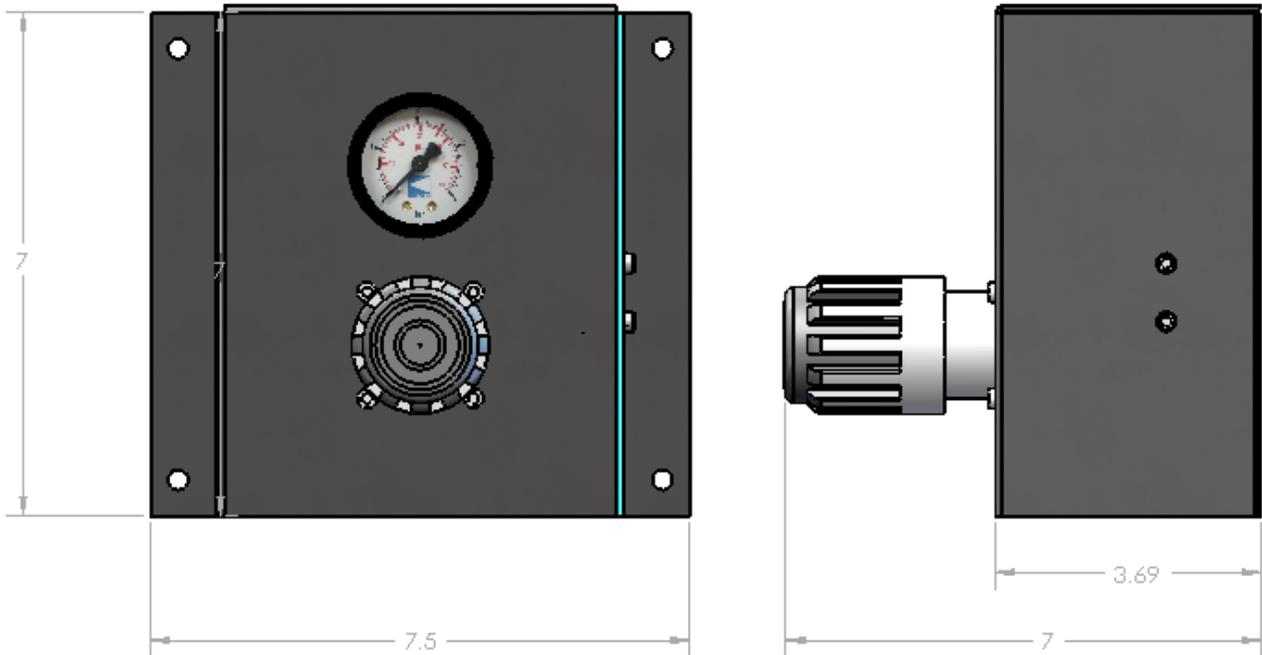
**3.3.1 Optional Booth Panel**

Cut-out dimension.



### 3.4 Atomizing Air Manifold

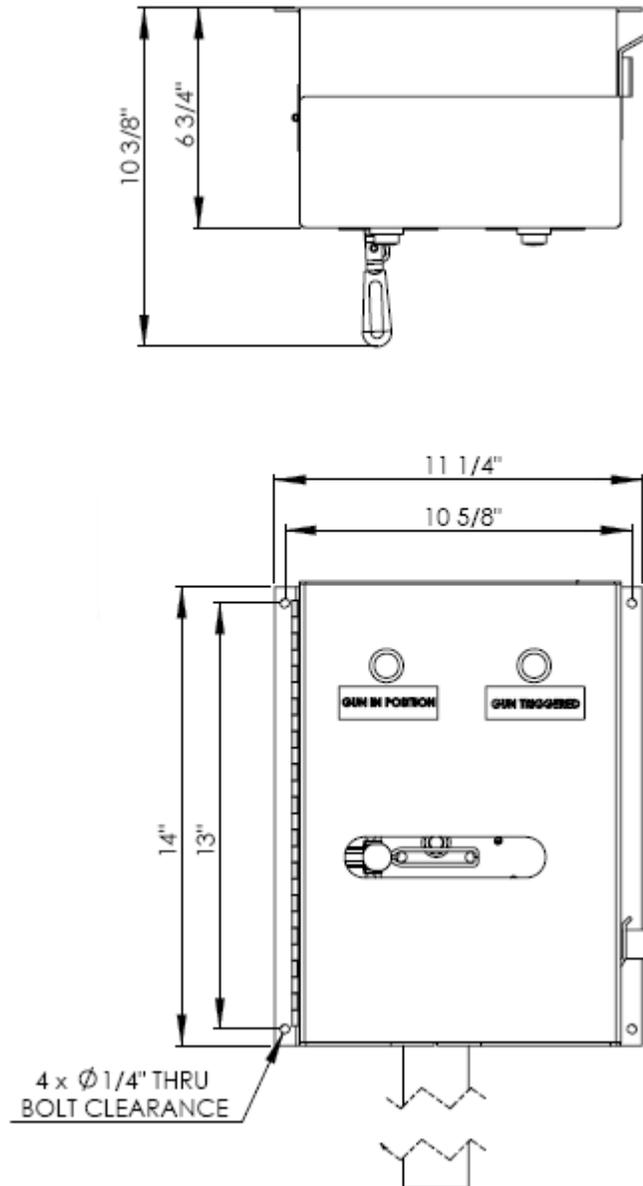
Description	Specification
Air Supply Inlet	5/16 [8mm] OD TUBE
Air Pilot	5/32 [4mm] OD TUBE
Mounting	4 Holes Clearance for 1/4 [6mm] Screws
	6-3/4 x 6" Hole Pattern
Air Outlet	1/4 NPS(M) Stem



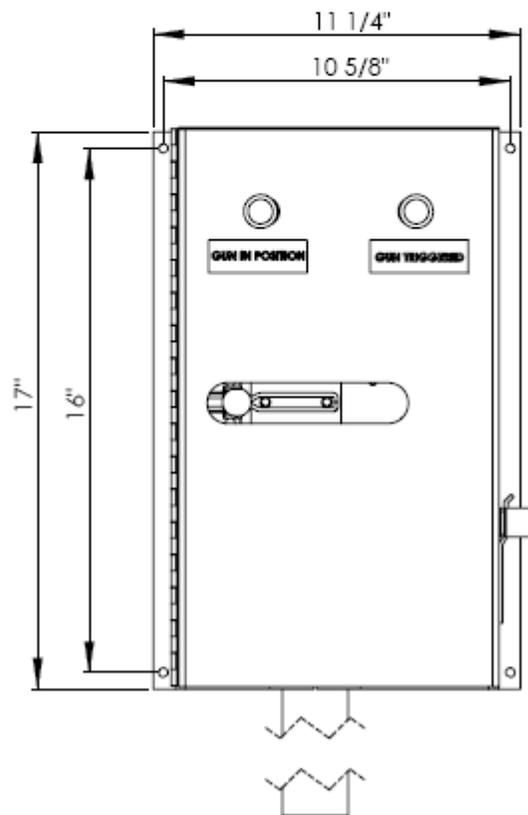
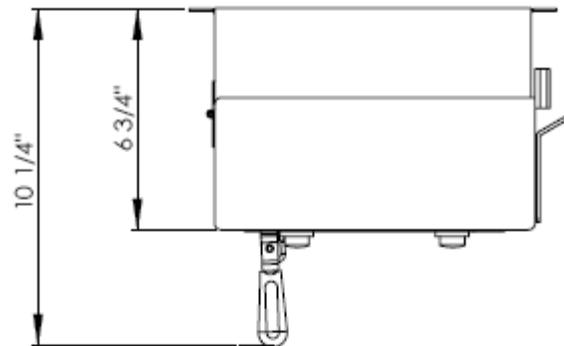
### 3.5 Manual Gun Flush Box

The flush tube supplied with the flush box is 3' in length. The tube may be cut to desired length that avoids splashing.

#### 3.5.1 Non-Electrostatic Gun



3.5.2 *Electrostatic Gun*



## 4 HMI

### 4.1 Home Screen (Main Menu)

The “Home Screen” or main menu can be reached by selecting the “Home”  icon in the lower right hand corner from almost any screen. This is also the first screen to appear upon a system power up if the CYCLE STOP button is not depressed on the face of the panel.

This screen contains the navigation button for the operator to move between the different functions of the Cyclomix Expert. See the table below for the description of the graphic icons and their respective functions.

The home page displays the following information; 1) Status of the Cyclomix Expert; 2) Active Recipe Name; 3) Percentage of Pot Life; 4) Current Date and Time 5) Batch #



The Batch # is a user defined field which the operator can use to track production data. The parameter is numeric only. The batch # is saved with the consumption data.

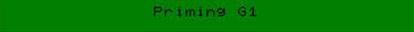
Icon	Nomenclature	Description
	Production Screen	This screen is used to start and stop the operation of the Cyclomix Expert. Flushing operations are also done from this screen.
	Change Recipe Screen	This screen allows the operator to select a new recipe and make it the active recipe. Basic recipe parameters can be viewed on this screen.
	Machine Parameters & Servicing Pages	This section contains three pages by which the operator can set the global operating parameters for the machine. The third page contains navigation buttons to screens that can be used to verify the operation of the machine.
	Recipe Management Pages	This section contains ten pages which outlines all the parameters which can be configured per recipe. For detailed information regarding parameters see appendix titled “Recipe Management Parameters”.
	Calibration Screen	This tool is used to calibrate the different materials and verify the Cyclomix Expert operation.
	Ratio Check Screen	This tool is used to quickly check the Cyclomix Expert is operating within set standards without performing a calibration.
	Batching Screen	This tool allows the operator to dispense a desired amount of material separating the A and B Components for later mixing by hand when required.
	Consumption Screen	This screen displays the amount of material used by component per recipe and the V.O.C emitted. The data can be saved to USB Flash drive in the form of a text file.
	Alarm Page	This screen displays the alarm history.

## 4.2 Production Screen

The operator can enter the Production Screen by selecting the “GO”  icon from the Home Screen. The top of the screen indicates the status of the machine and will display different messages. The second line of the screen tells the operator the name of the active recipe. The screen displays the programmed ratio for the loaded recipe as the set point for both A/B and A/C. The operator can place the machine in the production mode or stop the machine by selecting the two command buttons at the bottom left. 



Upon pressing the start  icon, the status bar will display

 the priming message and which gun is being primed if the current state of the machine was “Production Flush Completed”. Once the priming is completed the status bar will change to  indicating the machine is ready for operation. While the machine is priming the volume of material remaining to be load is displayed next the recipe name. The value displayed is for each gun prime volume. 

Recipe 1	192
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While the machine is in operation or at idle, the pot life timer is displayed by a simple bar graph,

 indicating the percentage of time that has passed. Percentage of time is calculated by the elapse time divided by pot life time. When the pot life timer has reached 100%, the operator is given a specified amount of time to respond, see section titled “Pot Life Timer as Reached 100%”.

The operator can view the graphical display of the calculated ratios by selecting the “Graph”  icon located bottom right hand corner.



This screen shows the A/B and A/C set points in green and the calculated valves in red. The operator is allowed to move backwards in time, viewing the entire paint cycle by pressing the green

 icons.

The operator can move back to the production screen by selecting the back arrow  icon.

To purge the machine the operator has a choice of two buttons, “Production Flush” or “Weekend Flush”. The flushes are completed per the loaded recipe. The flushing sequences differ in the fact that the Weekend Flush will perform the sixth step of the programmed flush sequence, flushing the B component; the Production Flush will not perform the sixth step. The machine status bar will display the following message

 indicating the machine is flushing and which gun is being flushed. The active flush sequence is indicated by a green dot in the upper left corner of the icon. Once the operator and machine has completed, the status bar will change to

. See Section “Flushing Sequence” for detail information regarding the flushing sequence.



Upon making the Cyclomix Expert active and returning to the home screen, the operator will find many functions disabled. Simply return to the product page and select the “STOP” icon.



### 4.3 Change Recipe

From the Home Screen select the “Change Recipe”  icon to display the following screen and to be able to load a new active recipe from memory.

Use the “UP” and “DOWN” arrow keys   to navigate through the recipe list.

Select the “UPLOAD”  icon to load the recipe into active recipe memory for the Cyclomix to perform.

The recipe will be uploaded when the “UPLOAD” icon changes to the “THUMBS UP”  icon. The operator needs to select the “THUMBS UP”  icon while it is displayed in order to load the new recipe. Upon this selection, the recipe parameters will change. After a few seconds the icon will change back to the original icon. If the parameters did not change, the operator did not validate the change within the given time.



The information displayed on the lower half of the screen is for the current active recipe and will change upon loading a new recipe. The parameters cannot be changed on this screen.

The A/B and A/C Mix Ratios are displayed along with the product ID numbers for the A and B components. Also, the operator is allowed to see the number of guns selected for the recipe. The selection is indicated by the small green square located in the upper left hand corner of each gun picture.

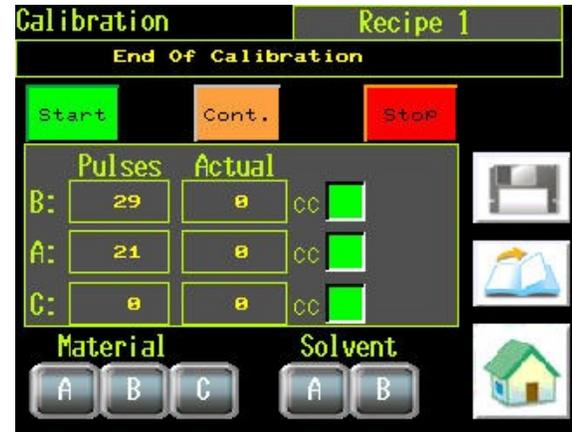


Select the “HOME”  icon, lower right hand corner, to return to the main menu or home screen.

#### 4.4 Calibration

From the Home Page select the Calibration  icon. The operator should ensure the correct recipe is loaded by checking the recipe name. Select the “Change Recipe”  icon if required.

The operator is allowed to load the selected products for A, B & C Components per the active loaded recipe. This is accomplished by selecting the buttons at the bottom of the page under the word “Material”  and holding them until the operator is assured that the product is completely loaded.



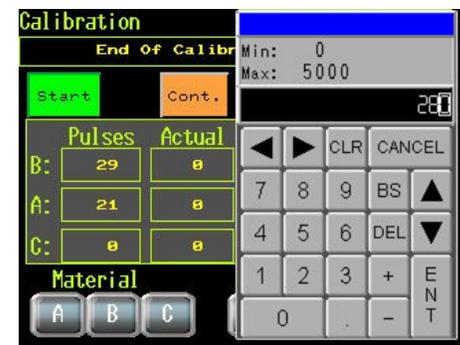
The operator can purge the product with the corresponding solvent by selecting one of the two buttons  under the solvent label and holding them until the material is purged.



To start the calibration the operator will select the command button, “Start” . The display will change its status message; parameters will be zeroed and the panel will dispense 2000 pulse of material and shut off. The unit will wait until the input from the operator to continue the calibration by selecting the  command button. For a 3K unit, the A and C components will be dispensed at the same time if all components are selected. The operator is then required to enter the actual amounts for the B, A, and C components. The “SAVE”  command button icon must be selected to accept the new valves and perform the required calculations. The calibration calculates the volume, cc’s per flow meter pulse.

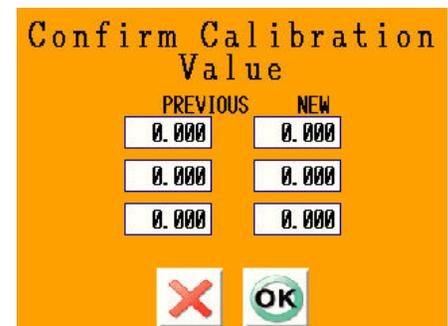


The user is display a confirmation screen which allows the user to review the new parameters and compare them to the old values. Large shift in values should not be accepted without reviewing the information for possible errors. Repeat the calibration if doubt exist.



The “OK” icon will store the new values in the corresponding active recipe. The cancel  button will not store the new values.

The Calibration step should be performed at least three times to minimize any keypad errors or calibration errors.



The operator may choose to skip a component in the calibrations sequence, if the material corresponding for this recipe has already been calibrated and the stored values in the recipe have been edited to the correct numbers. This requires the operator to manually enter the skipped values. This choice can be made by selecting the green square located to the right of the desired component. The component will be skipped during the calibration sequence if the square is red.

	Pulses	Actual		
B:	29	0	CC	<input type="checkbox"/>
A:	21	0	CC	<input type="checkbox"/>
C:	0	0	CC	<input type="checkbox"/>

#### 4.5 Pot Life Timer Reached 100%

While the machine is in operation or at idle, the pot life timer is displayed by a simple bar graph,  indicating the percentage of time that has passed. Percentage of time is calculated by the elapsed time divided by pot life time. When the pot life timer has reached 100%, the status bar will change to red and display  the “Pot Life Alarm” message. The operator is given a programmed amount of time, “Critical Pot life Time”, to respond. If the operator has not responded the machine executes a flushing sequence. The display will change the status bar to read , flushing in progress. The operator is not given any options at this point in time; the mix manifold requires flushing.

The Pot Life Timer is reset every time the machine has measured that enough material has been pushed through the machine and gun to constitute a pot life timer reset. This parameter is set for each recipe.

#### 4.6 Automatic Flush

The Automatic Flush is performed when the operator selects a new recipe for load. The operator is given a small amount of time to make a decision on how to proceed.

The operator's decision may be one of the following;

- Select the Stop  icon will keep the material loaded. If this decision is made after a Pot Life Alarm the operator will have to run a pre-programmed amount material to reset the pot life. This is the Pot Life Reset Volume parameter.
- Select the “OK”  icon to proceed with the automatic flush.



- Select the “SKIP”  icon will require the operator to load the new material pushing out the old material. The operator is responsible to ensure the new material is completely loaded.



**CAUTION:** The operator is responsible to ensure a complete change of material has been loaded and ensure the compatibility of the materials.

#### 4.7 Ratio Check

The Ratio Check screen can be reached by selecting its icon  from the Home screen.

The operator should ensure the correct recipe is loaded by checking the recipe name. Select the “Change Recipe”  icon if required.

The operator is allowed to load the selected products for A, B & C components per the active loaded recipe. This is accomplished by selecting the buttons at the bottom of the page under the word “Material”  and holding them until the operator is assured that the product is completely loaded.

The operator can purge the product with the corresponding solvent by selecting one of the two buttons  under the solvent label and holding them until the material is purged.

The operator starts the Ratio Test by selecting the  icon. The B component is dispensed first and the Cyclomix Expert stops. The operator should record the amount of material dispensed and use these values for future reference along with the product ID number. To continue the operator selects the “Continue”  icon and the A & C components are dispensed. Again, the operator should record these values for future reference, referencing the Component’s Product ID numbers.

At any point in time the operator may select the stop  icon and then hit the continue  icon.

The operator can skip a material but selection the material skip buttons on the “Calibration” screen. The operator should check this screen before commencing with a “Ratio Check”.

Select the “HOME”  icon, lower right hand corner, to return to the main menu or home screen.



#### 4.8 Batching

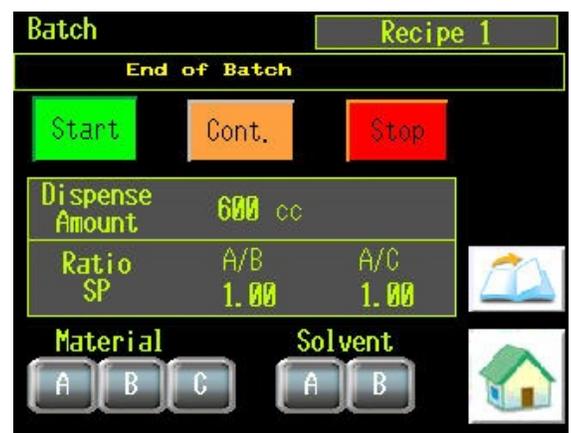
The “Batching” screen can be reached by selecting its icon  from the Home screen.

The operator should ensure the correct recipe is loaded by checking the recipe name. Select the “Change Recipe”  icon if required.

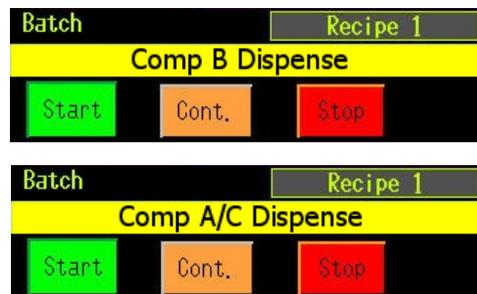
The operator can load the selected products for A, B & C Components per the active loaded recipe. This is accomplished by selecting the buttons at the bottom of the page under the word “Material”  and holding them until the operator is assured that the product is completely loaded.

The operator can purge the product with the corresponding solvent by selecting the two buttons  under the solvent label and holding them until the material is purged.

The operator can enter the total amount of dispensed product by selecting the field and entering the numeric value on the keypad. Select the “ENT” key to exit.



The operator starts the “Batching” operation by selecting the “Start Batch”  icon. The B component is dispensed first and the Cyclomix Expert stops. The operator should ensure the approximate amount dispensed is accurate. Note the amount dispensed is the calculation of the ratio given for the desire total value. To continue, the operator selects the “Continue’  icon and the A & C Components are dispensed. Again, the operator should check these amounts.



At any point in time the operator may stop the operation by selecting the stop  icon and then continue by selecting the “Continue”  icon.

The operator can skip a material but selection the material skip buttons on the “Calibration” screen. The operator should check this screen before commencing with a “Ratio Check”.

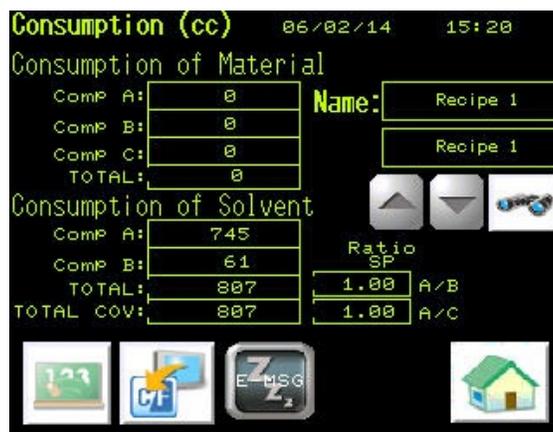
Select the “HOME”  icon, lower right hand corner, to return to the main menu or home screen.

#### 4.9 Consumption

The “Consumption” screen can be reached by selecting its icon  from the Home screen.

The information displayed on this page is for the current loaded recipe. The individual components volumes and solvent volumes are displayed along with the summed total amounts. If the percentage of C.O.V. ratios are entered in the recipe the total C.O.V. emissions will be displayed.

The operator can view other recipe by selecting the increment and decrement buttons . Once the desire recipe is found select the view  icon to view the data.



The “Save”  icon will transfer the data to a USB flash drive. The data will be saved in a text file.

Selecting the “Reset”  icon will zero all values.



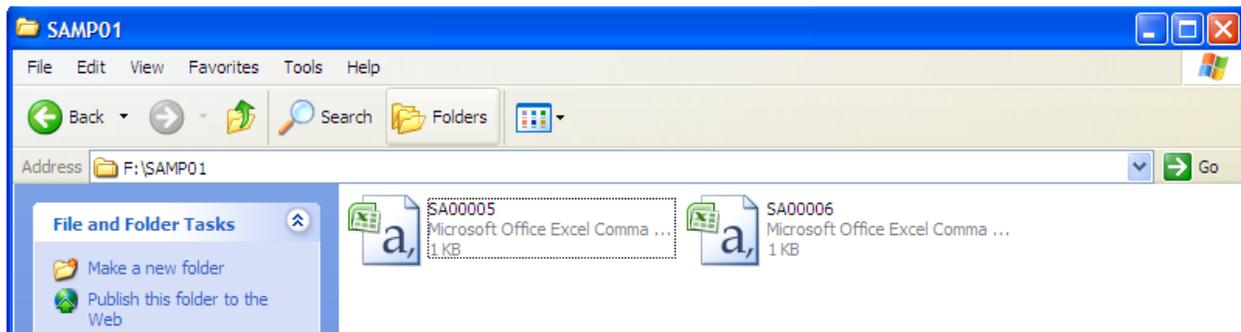
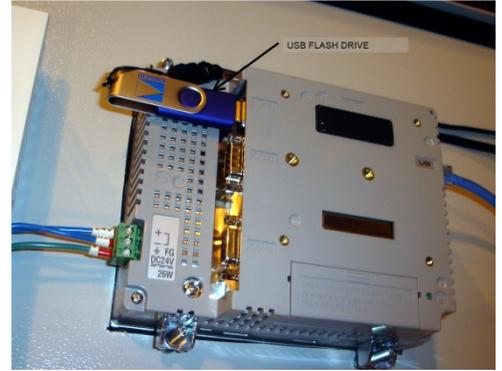
“E-MSG” is an Optional feature, when Messaging is active this button turns it On and Off.

### 4.9.1 USB Flash Drive

The USB Flash drive is located inside the panel on the backside of the HMI unit located in the door. There also may exist a USB port located in the bottom of the panel.

The saved text file will include all the data present on the consumption screen and the corresponding product ID numbers per the given recipe plus the machine number and user batch ID.

The saved files on the USB flash drive can be accessed by any PC with a USB drive port.



The data will be in comma separated variable (.CSV) file and can be opened with any product capable of reading a text file. The data in its simplest form is show below, by opening the file with Microsoft Excel.

Microsoft Excel must be set up to open the file, by importing the (.CVS) file. Additional tools to use are the “Test to Column” function which allows you to separate the large text string into individual columns and format the Date column as you import. The HMI exports the date in a Year/Month/Date format. Change the date column format to display the date as required by the user. Consult Microsoft Excel for additional help regarding these subjects.

Text file opened in Microsoft Excel

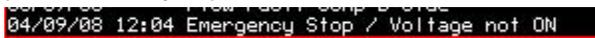
Date	Time	recipe n#	batch#	Comp A #	Comp A Cons.	Comp B #	Comp B Cons.	Comp C	Total Material	Total Solvent	Total VOC	A/B	A/C
8/11/2003	9:29:51	3221	225	1	265	1	198	0	463	405	0	3	0

Select the “HOME”  icon, lower right hand corner, to return to the main menu or home screen.

### 4.10 Alarms

The “Alarm” screen can be reached by selecting its  icon from the Home screen. At any point in time the Alarm screen will be displayed when a fault condition has been met.

If on power up the Alarm screen is displayed the Cycle Stop button on the front of the enclosure is depressed and the entire panel is not yet powered.

 04/09/08 12:04 Emergency Stop / Voltage not ON



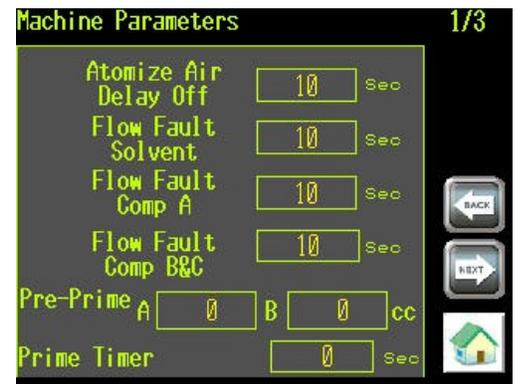
The most recent fault is displayed at the bottom of the list. The operator can use the up and down icons to navigate through the list. Refer to the trouble shooting guide in the user manual for additional help with alarms. The table below contains a brief description of the alarm message. See section regarding alarm troubleshooting guide for in depth information regarding the alarms.

The operator can clear alarms by first selecting any alarm on the screen and then select the Clear  icon. The “Save”  icon will transfer the data to a USB flash drive. The data will be saved in a text file. Select the “HOME”  icon, lower right hand corner, to return to the main menu or home screen.

### 4.11 Machine Parameters

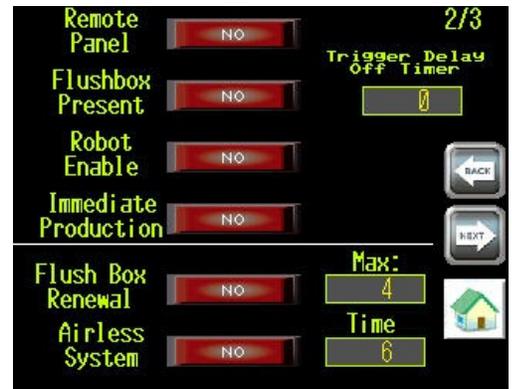
The “Machine Parameters and Tools” screen can be reached by selecting its  icon from the Home screen. The first of three screens are displayed. The operator can move between the screens using the “Back”  and “Next”  arrow keys.

The parameters in these screens govern the entire machine operation and should not be changed unless features are being added or changed.



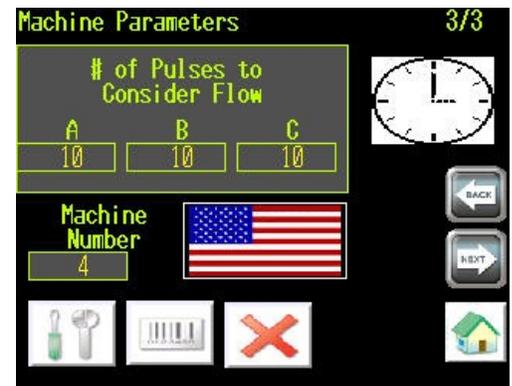
For a complete description of the parameters contained within these screens, see the Machine Global Parameters section of the user’s manual.

The equipment owner can configure the control panel to operate with different accessories. The panel should ship with these parameters set per order. If the Flush boxes are being used the NO  icon will be a green YES  icon.



The end user can enter a unique number in the “Machine Number” field for each machine. The value is saved with the consumption data for later retrieval.

The operator may adjust the current date and time by selecting the clock  icon. The user is prompted to enter the current time and date. The operator can change the language for which the machine is programmed for by selecting the flag representing the language.



The operator can gain access to the machine information by selecting the  icon.

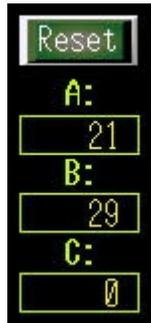
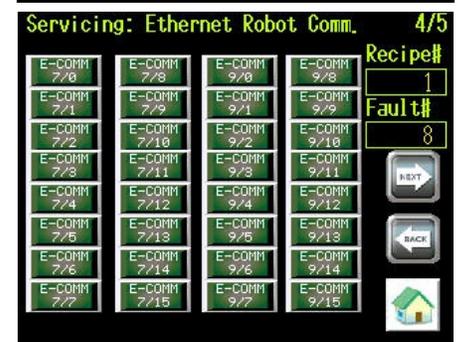
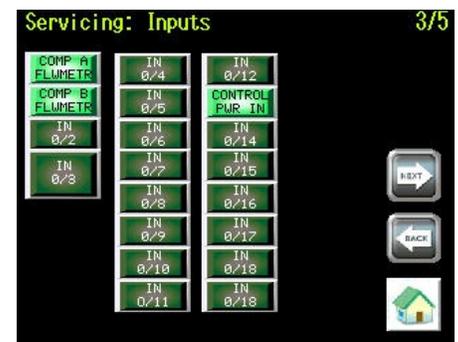
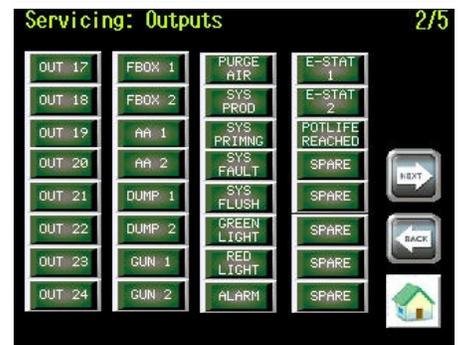
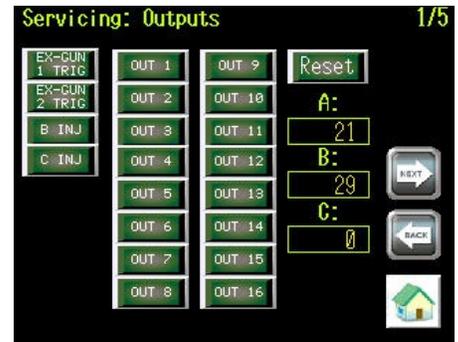
The maintenance personnel can exit out of the Expert HMI program by selecting the  icon, which will close the Expert HMI program and allow trained personnel to adjust Pro-face Interface parameters. This function is password protected by with a level 15 password.

Select the “HOME”  icon, lower right hand corner, to return to the main menu or home screen.

### 4.11.1 Servicing

Maintenance personnel can assess screens to view which outputs and inputs are active and to see if the flow meters are sending pulses. This tool screen is reached by selecting the  icon from the third Machine parameter screen. This is a highly-specialized screen allowing trained personnel to force ON any output. See tables in appendix for older systems, newer systems will have abbreviations corresponding to the pneumatic and electrical devices; with the output active, the PLC address is shown.

The operator can move between the five screens using the “Back”  and “Next”  arrow keys.



The Reset key can be used to zero all flow meter pulse counter values and clear all forced ON outputs.

Outputs that are ON because the program has latched them ON cannot be forced OFF from these screens.

Outputs that are ON are shaded a bright green. 

Select the “HOME”  icon, lower right hand corner to return to the main menu or home screen. Upon exiting the service screen the forced ON outputs will be cleared.

Inputs cannot be forced on; the Input screen allows the user to view active inputs for trouble shooting.

E-COMM allows for when the Ethernet Robot (System PLC) Communication is used. This can give the System PLC the ability to start, stop, flush, and load new recipes. Also relay faults from the Cyclomix Expert back to the System PLC.

The Integer file screen is for viewing parameter assignment for valves.

 **CAUTION:** Forcing ON outputs can produce unexpected results. Only use these tools after carefully studying the electrical and pneumatic schematics and the corresponding digital output and input descriptions. If the mix manifold is disassembled, fluids under high pressure can be discharge from the open connections. Ensure all power sources, electrical, fluid and pneumatic are disabled, or under the control of a trained maintenance personnel.

#### 4.12 Recipe Management Overview

The recipe management system is broken down into different sections by pages;

##### Recipe Management Page 1 (RATIO & POT LIFE SETUP)

- Ratio Name
- Mixing Ratios for A/B and A/C
- Pot Life
- Critical Pot Life Time
- Pot Life Volume Reset

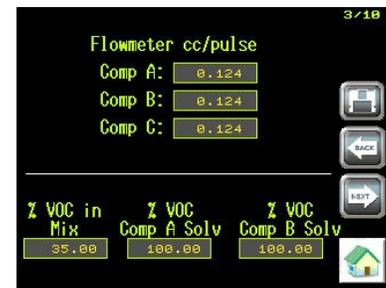


##### Recipe Management Page 2 (RATIO TOLERANCE)

- A/B Min/Max Ratio Tolerance
- A/B Weighted Average "Calc"
- A/B Fault Mask
- A/C Min/Max Ratio Tolerance
- A/C Weighted Average "Calc"
- A/C Fault Mask

##### Recipe Management Page 3 (CALIBRATION & V.O.C. EMISSIONS)

- Calibration Parameters for A, B & C Components
- Percentage of VOC in MIX
- Percentage of VOC in A Solvent
- Percentage of VOC in B Solvent



##### Recipe Management Page 4 (GUN SELECTION & PRIMING)

- Gun Selection
- Gun #1 Priming Volume
- Gun #2 Priming Volume

##### Recipe Management Page 5 (PRODUCT ID ASSIGNMENT & AUTO PURGE)

- Assign Component's Product ID numbers
- Number of Components to Mix
- Gun #1 Automatic Priming Volume or Time
- Gun #2 Automatic Priming Volume or Time

##### Recipe Management Pages 6 & 7 (GUN #1 FLUSHING SEQUENCE)

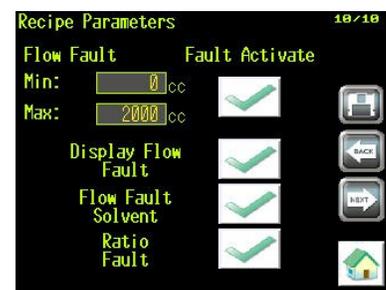
- Parameters assigned to establish Gun #1's flushing sequence

##### Recipe Management Pages 8 & 9 (GUN #2 FLUSHING SEQUENCE)

- Parameters assigned to establish Gun #2's flushing sequence

##### Recipe Management Page 10 (FAULT SETUP)

- Establishes faults that will be monitored during the operation.



#### 4.12.1 Recipe Management

The “Recipe Management” screens can be reached by selecting its icon  from the Home screen. The Recipe Management section contains 10 screens of parameters that can be set and adjust per recipe. Changes made to one recipe do not affect any other programmed recipes. The Cyclomix Expert is capable of handling 50 recipes. The parameters allow the operator to adjust the operation of the machine base upon system configuration and the materials being processed through the machine. The operator first selects the desired recipe by using the increment and decrement arrow  keys. Once the operator has found the recipe the operator must select the view recipe  icon, to display its values. Any changes made should be followed by the selecting the save  icon. The operator can move between the different screens by selecting the Back  and Next  icons. At any point in time the operator can return to the Home Screen by selecting the “HOME”  icon in the lower left hand corner.



The main screen displays the Recipe Name and Index number. The index number is used in the consumption data export for later identification.

Before making any changes, the operator should refer to the detail descriptions for each parameter located in appendix of the user manual and the other sections in this manual.

#### 4.12.2 Ratio Setup and Calculation

The key operating parameters for the Cyclomix are the set points for the A/B and A/C mix ratios. The Cyclomix Expert works on a volumetric ratio principle. All ratios entered on this first screen must be by volume.

By selecting the Expert Ratio Wizard  icon, the operator can enter different ratio parameters and the wizard will perform the desired volumetric ratio calculation.

The Min Comp B and C parameter fields are the smallest volume of material allowed per injection. For best performance, these parameters should be multiples of the flow meter volume per pulse. Typical cc's/pulse is 1.12 for standard volumetric flow meters.



#### 4.12.3 Pot Life Parameters

The pot life is the allowable time that components can be mix before the material is not usable in the spray system. A normal calculation for pot life time is the amount of time it takes for the mixed material's viscosity to double.

The “Critical Pot Life” timer is the amount of time allowed before flushing begins. Using the two timers together allows the first timer to be a warning and second timer to initiate action.

The “Pot Life Reset” is the volume of material required to reset the timer. This parameter is also used for system renewal when this option is available.

#### 4.12.4 Expert Ratio Wizard

The Ratio Wizard is designed to aid the operator in entering the correct volume ratio that the Expert utilizes. If the operator knows the ratio by parts or by percentage the operator should enter these parameters by the wizard page to avoid miscalculations.

To use the Wizard the operator must enable the section for the parameter entry by selecting the red square  turning it green . The known parameters are entered and the

load  icon is selected which will move the corresponding volumetric ratio into the A/B and A/C parameter fields.



The wizard also calculates the Min/Max ratio tolerance parameters. The operator can adjust the percentage of acceptable tolerance for each ratio calculation. When the load icon is selected the parameters on screen 2/10 are updated.

Use the back arrow  to exit the wizard without making any changes.

#### 4.12.5 Ratio Tolerance & Ratio Fault Parameters

Min and Max Ratio Tolerance for the A/B and A/C are user configurable parameters used by the controller to monitor the A/B ratio sample is within the set guidelines specified by the process. For Example:

If a 3.000 A/B ratio with a  $\pm 5\%$  tolerance;

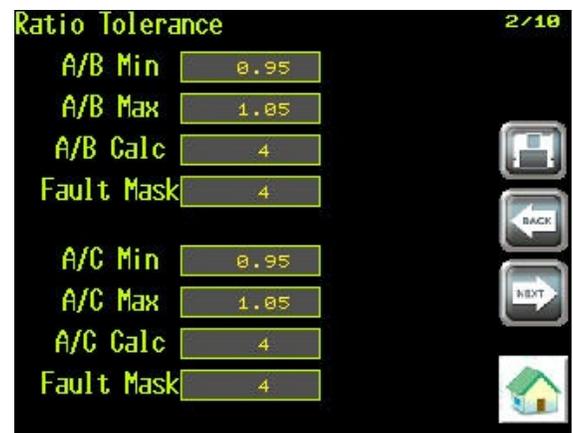
A/B Min would be  $2.85 = 3 - 3 \cdot 0.05$

A/B Max would be  $3.15 = 3 + 3 \cdot 0.05$

These parameters can be calculated by using the Ratio Wizard.

The parameter “A/B Calc” is the number of A/B ratio samples taken after each B Component injection that will be average together to form an average A/B ratio. The resulting averaged value will be compared to the A/B Min and Max parameters to establish an outlying value. Increasing the number ratio samples is a smoothing effect making the data more consistent.

The parameter “Fault Mask” for A/B and A/C is used to determine the allowable number of consecutive outlying values before initiating an A/B or A/C ratio fault.

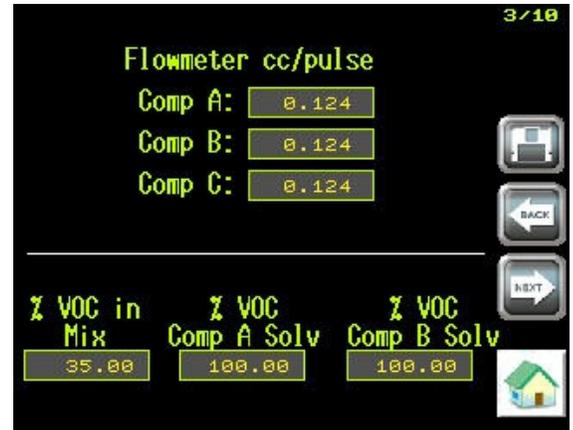


#### 4.12.6 Flow Meter Volume/Pulse

Comp A, Comp B, and Comp C are parameter fields used by the controller to store the calculations from the product calibration screen. The operator can enter a known value, if the calibration step is going to be skipped. See selection regarding Calibration.



**Note:** Entering unknown values without calibration will cause the machine to operate off ratio without alerting the operator.



### Volatile Organic Components, VOC Emissions

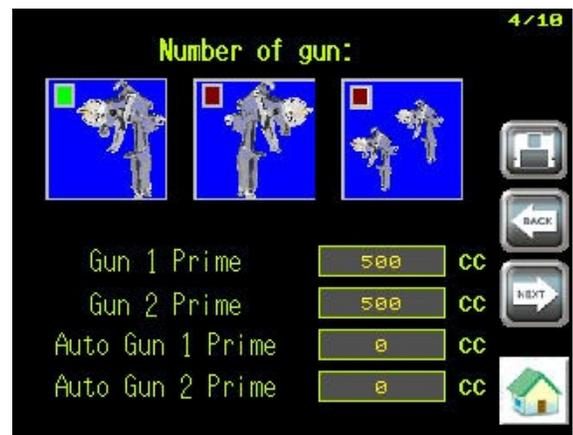
These parameters are input fields for the end user to store percentage of VOC emission for each product. The values are used to calculate the total emission on the consumption page. See section regarding consumption.

#### 4.12.7 Gun Selection

The user can select which gun or if both guns will be used per recipe by selecting the appropriate gun icon.

### Priming

The user can enter the volume of material required to prime each gun circuit by selecting the respective field. This value is total volume of material required and is used when the machine starts production and a flush cycle has been completed. See operating diagrams for further information.

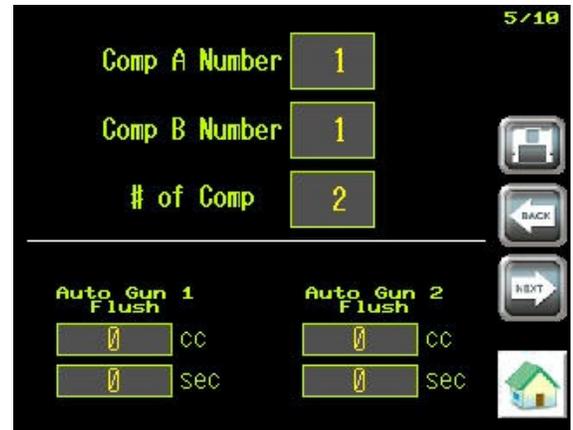


### Automatic Gun Priming

The end user can enter the volume of material to prime guns in an automatic system equipped with a dump valve. This is the volume of material to push while the external gun triggers are enabled for each gun circuit. The “Auto Gun Prime” Valves executed as part of the total volume entered in the “Gun X Prime” parameter. See operating diagrams for further information.

#### 4.12.8 Product ID Assignment

Screen 5, contains the second most important parameters regarding recipe management, the Product ID number assignment. The end user enters a single integer number into the corresponding parameter fields which correlates to which color value will open for the A Comp and B Comp. Also, the desired number of components to be mix is entered in “# of Comp” parameter field. It is possible to have a 2K & 3K machine process single component materials by entering 1, 2 indicates 2K(components) and 3 indicates 3K(components).



It is not possible to run a 3K material and turn the B component off and only run process the C component.

#### Automatic Gun Flush

The parameter fields at the bottom of screen 5 are used to flush gun circuits equipped with dump valves. The Cyclomix expert will flush through a dump valve if installed in the paint delivery circuit. The parameter allows the end user to enter a time or volume parameter to control the amount of material to flow through the guns to complete the 5th step of the flushing sequence. Values not being used are to be set to zero.

After this time or volume of material has elapsed the external gun triggers will be enabled to purge the volume of material between the dump valve and guns.

#### Flushing Sequence

The Cyclomix Expert flush sequence is comprised of six steps per gun where the values per gun can differ because of hose lengths. The Expert will purge gun #1 then gun #2. If Gun #2 is not in operation only gun #1 will be flushed. If Gun #1 is not in operation then gun #2 will be flushed.

Flushing will happen when;

- A new recipe is selected
- The operator selects a flushing cycle from the production screen
- The critical pot life time as been reached

The operator will be alerted when the automatic flush screen is displayed giving the operator a choice of decisions regarding the flushing sequence when a new recipe is being loaded.

There are two types of flush sequences; Production Flush and Weekend Flush. These two sequences differ in the fact that the Weekend Flush will complete the sixth programmed step while the Production flush is complete after finishing the fifth programmed step. Any flushing step can be skipped by entering a zero in the volume or time field depending upon the active parameter unit selected. All the steps except number 4 can be programmed either with a time based  (seconds) or a volume based  (cubic centimeters) parameter. Step four is only time based. All steps, except step 2 can be programmed with a desired solvent. Enter the solvent product ID number in the parameter field **Solvent** .

Pages 6 and 7 cover the parameters for Gun #1 while Gun #2 is covered by pages 8 and 9.



- The 1<sup>st</sup> step flushes the A Component with a designated solvent.
- The 2<sup>nd</sup> step loads the designated B component.
- The 3<sup>rd</sup> step flushes the B Component with a designated solvent.
- The 4<sup>th</sup> step can push with a designated solvent and air chop. The number of solvent and air cycles can be programmed along with the duration of solvent and the duration air. All durations are time based. The solvent is from the A component color changer while the air is entered through the A/B mix block. To skip step 4, enter zero in the number of cycles parameter input field.
- The 5<sup>th</sup> step flushes the A component with a designated solvent.
- The 6<sup>th</sup> step flushes the B component with a designated solvent. This step is recommended when the material cannot be left in the manifold for long periods of time.

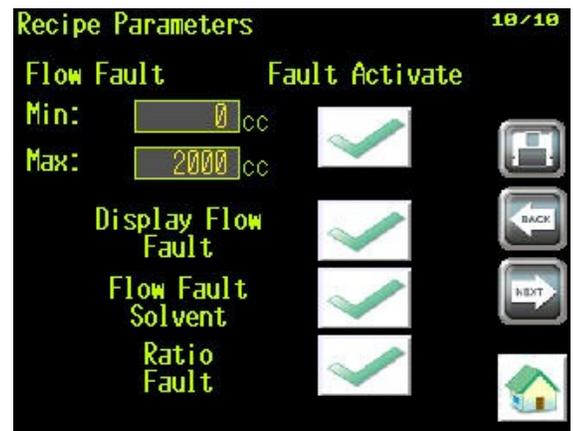
**Note:** This step is only completed during a “Weekend Flush”.

#### 4.12.9 Recipe Fault Management

Faults that are managed by recipe are configured on the 10<sup>th</sup> page of the Recipe Management screens. The Minimum and Maximum Flow Faults are parameter fields that allow end user to configure acceptable values based on their process.

The end user can enable  or disable  this fault from interfering with the operation by selecting “Fault Activate” icon.

The “Display Flow Fault” allows the end user to display a fault on the HMI without faulting the machine. The end user can enable or disable this fault by selecting “Display Fault Activate” icon.



The end user can enable or disable the “Solvent Flow Fault” by selecting its icon.

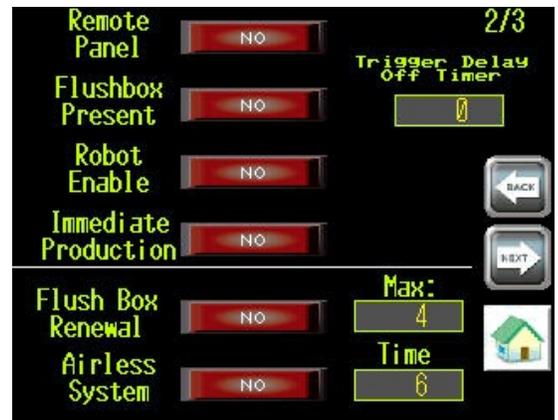
The end user can disable  the “Ratio Fault” by selecting its icon during the machine start up. It is not recommended to leave this fault disabled because it will allow the machine to operate off the desired ratio and give a false sense of security that machine is operating with the set standards.



**Note:** Disabling the “Ratio Fault” Alarm will allow the Cyclomix to operate off ratio without alerting the operator.

### Renewal with Flush Box

Renewal is an operation function that can be used when the optional flush boxes are in use. The system can be left full of mixed material for extended periods of time utilizing this function. When the pot life time is reached the system automatically run material through gun 1 then gun 2 resetting the pot life. The renewal volume for gun 1 is based on the “Pot Life Reset” volume and is repeated for gun 2. This cycle will be repeated until the renewal Max Count has been reached, then the machine will be flushed.



### Airless Operation

When Airless equipment is utilized, the air timer is used to establish a method of enabling the flow faults. The flow meters’ sense flow, resetting the airless timer, keeping the Cyclomix Expert in operation. If the timer is allowed to complete, flow faults will appear. It is recommended keeping this timer below 6 seconds but is dependent upon ratios and flow meters used in the system.

### 4.13 Copying a Recipe

The end user can copy recipes by using the rename function, “Current” parameter field.

- 1) locate the desired recipe you wish to copy by using the increment and decrement arrow  keys
- 2) select the view recipe  icon, to display its values
- 3) move to recipe name you wish to over write, again using arrow  keys
- 4) enter a new name in the “Current” parameter field
- 5) Select the save  icon.



The displayed data will now overwrite the existing date file and you can adjust any parameters as required.

#### 4.14 Password & Levels of Security

Upon system start up the operator is required to enter a password. The default password is 2222. To exit the password screen, the operator must select the “ENT” key.

The ESC key returns to main screen without granting any access rights.



The Cyclomix Expert has three levels of security. The “USER” level is for the day to day operation of the machine.

The “CHIEF” level protects the recipe management section from unauthorized changes. The “MAINTENANCE” level allows the trained personnel to make changes to the machines global parameters and access to the service screen.



**CAUTION:** The service screens should only be accessed by trained maintenance personnel. Unexpected discharge of materials under high pressure and electrical shock can be encountered by untrained personnel. Ensure all power sources, electrical, fluid and pneumatic are disabled, or under the control of a trained maintenance personnel.

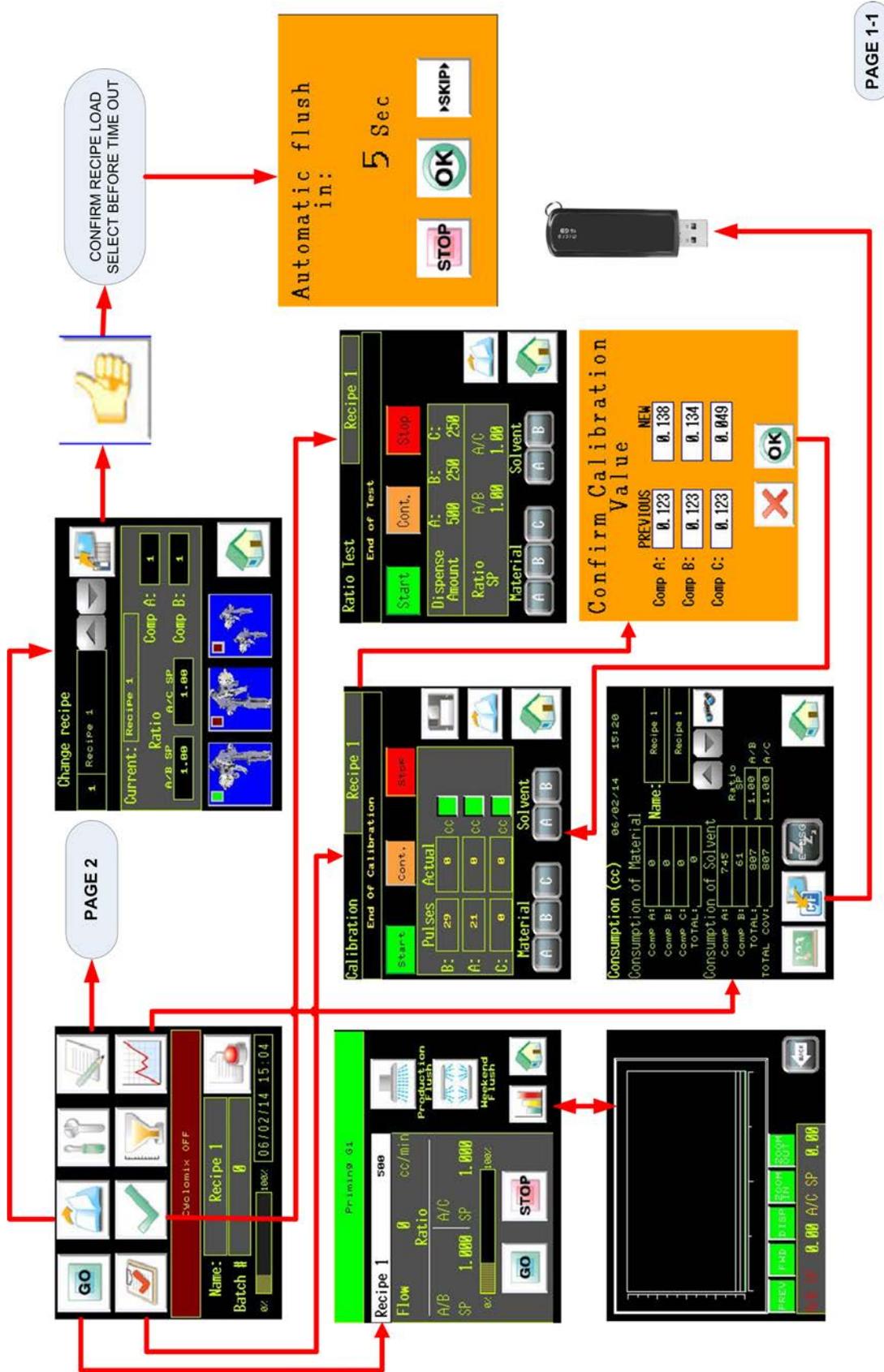


#### SCREENS THAT CAN BE ACCESSED

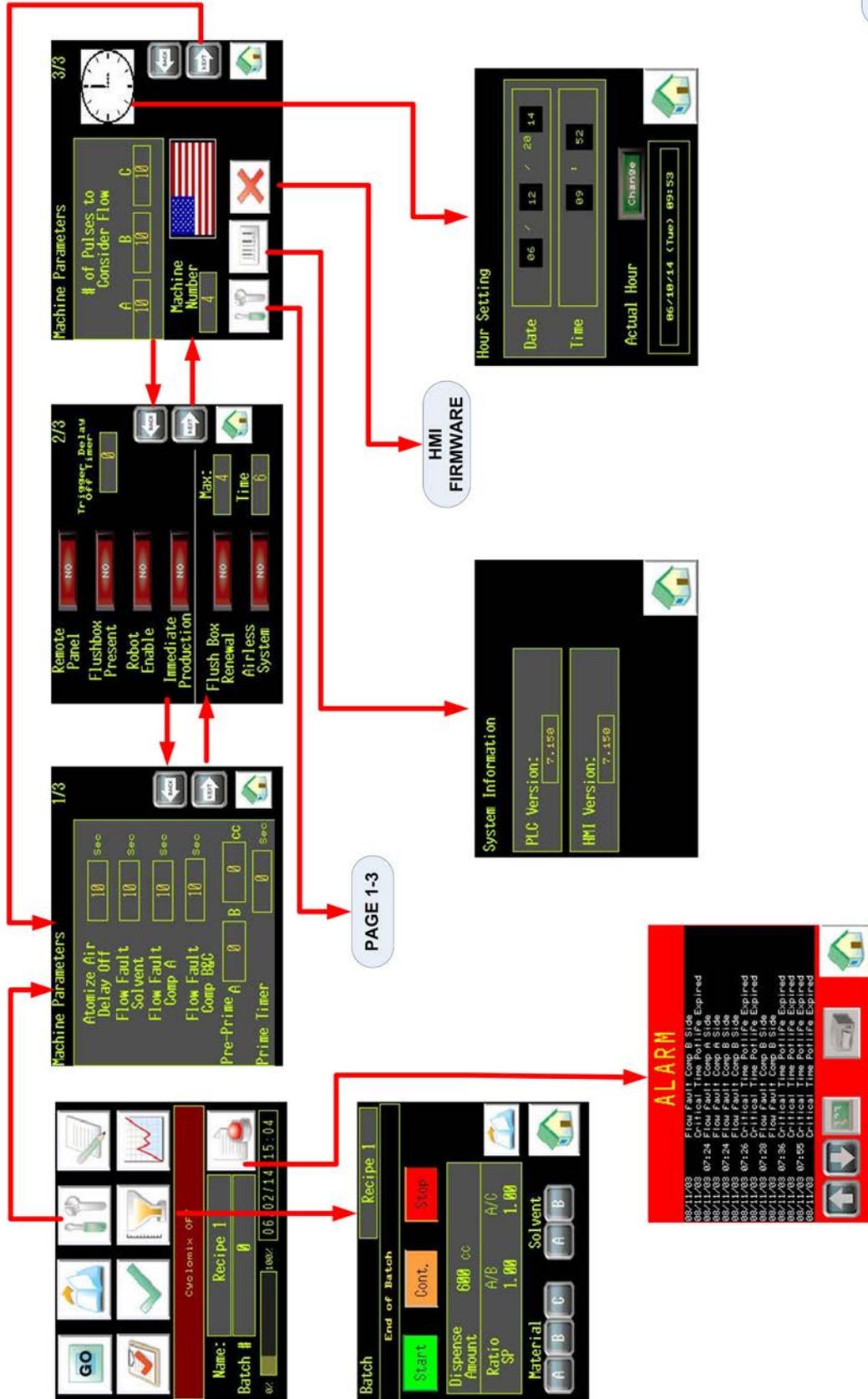
	Calibration	Calibration
	Recipe Management	Recipe Management
Production Screen	Production Screen	Production Screen
Alarm	Alarm	Alarm
Recipe Select	Recipe Select	Recipe Select
Consumption	Consumption	Consumption
		Servicing

4.15 Screen Architecture

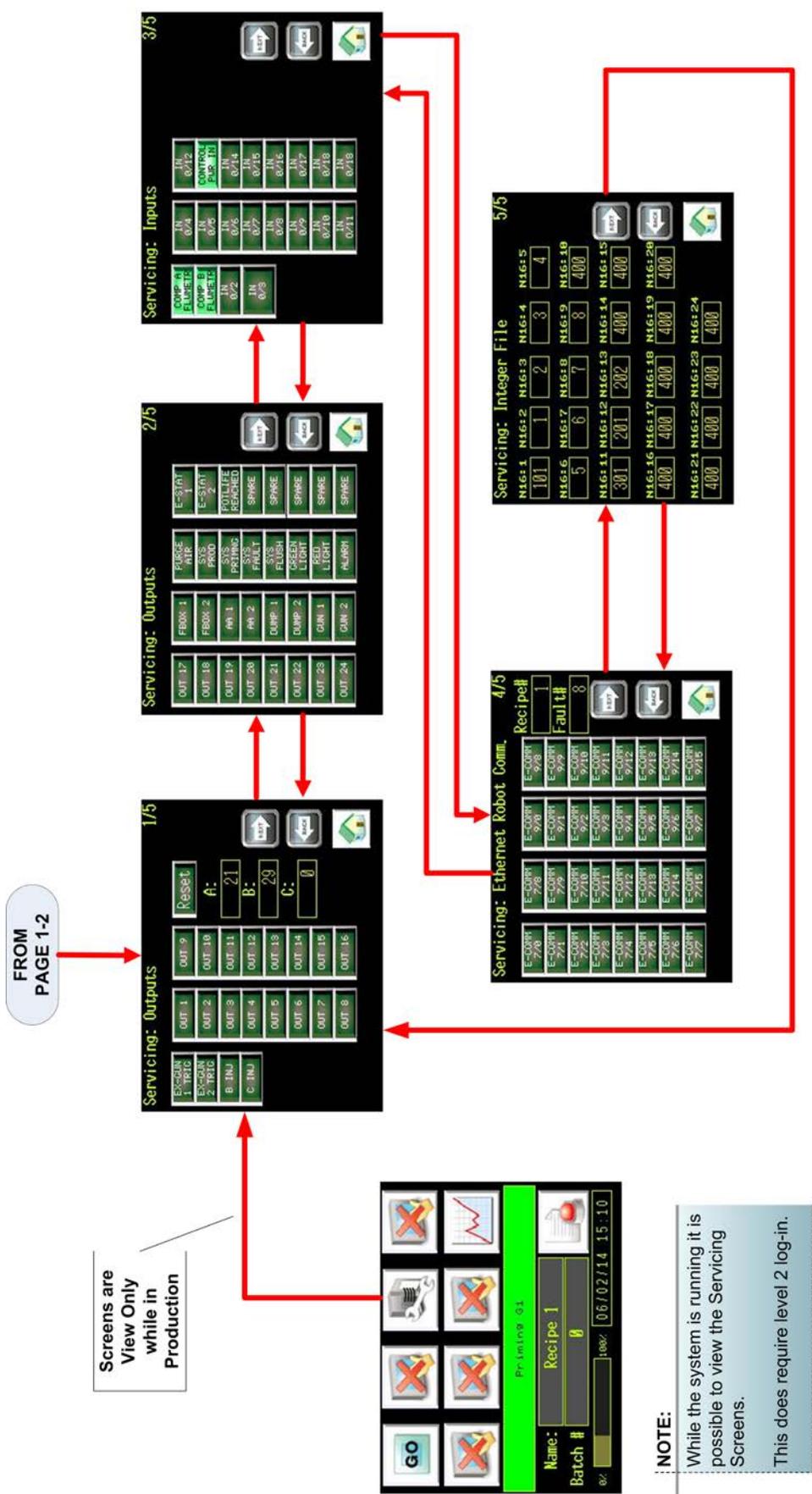
4.15.1 Main Screen



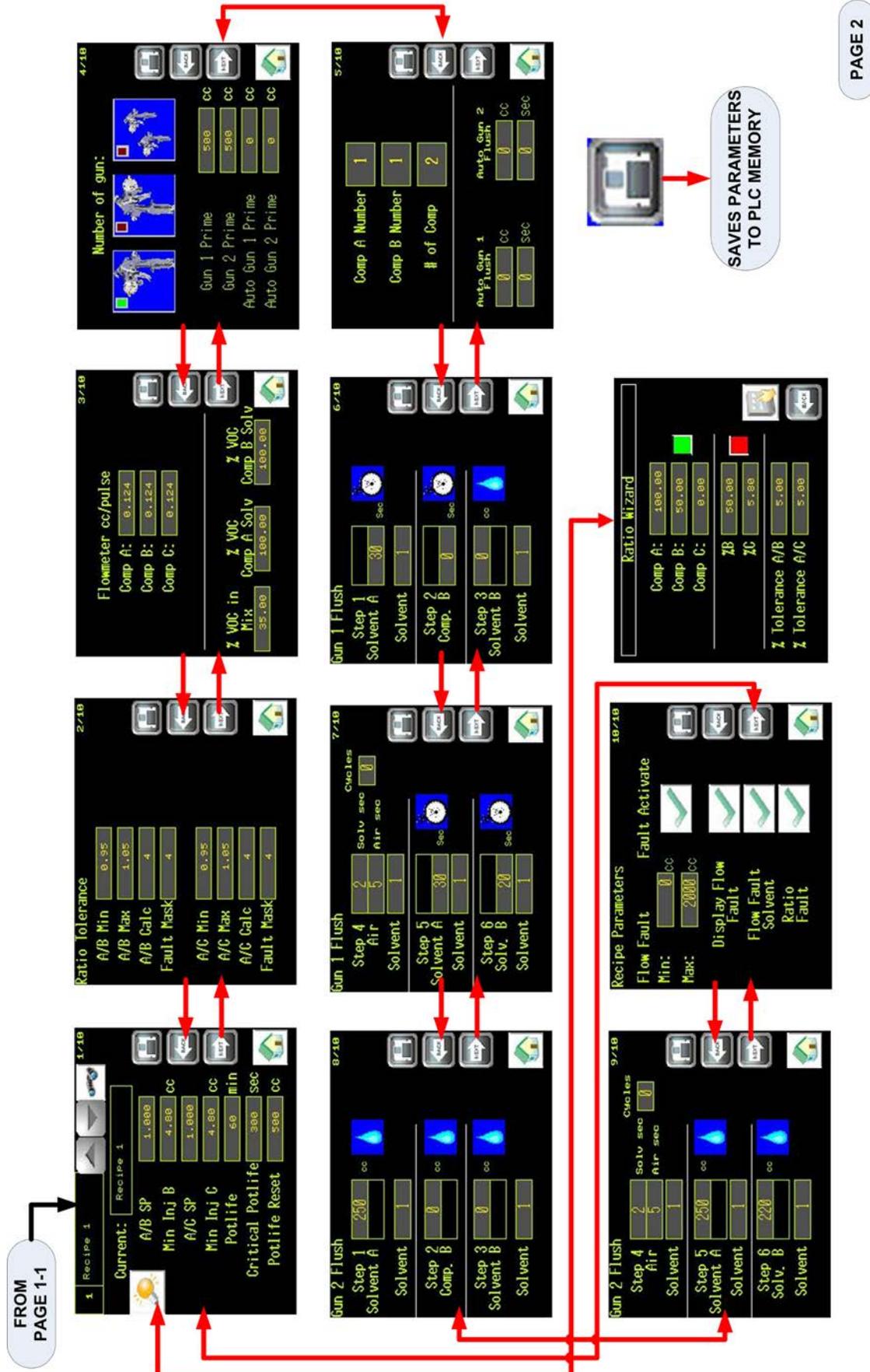
4.15.2 Machine Parameters | Batch | Alarm



4.15.3 Servicing

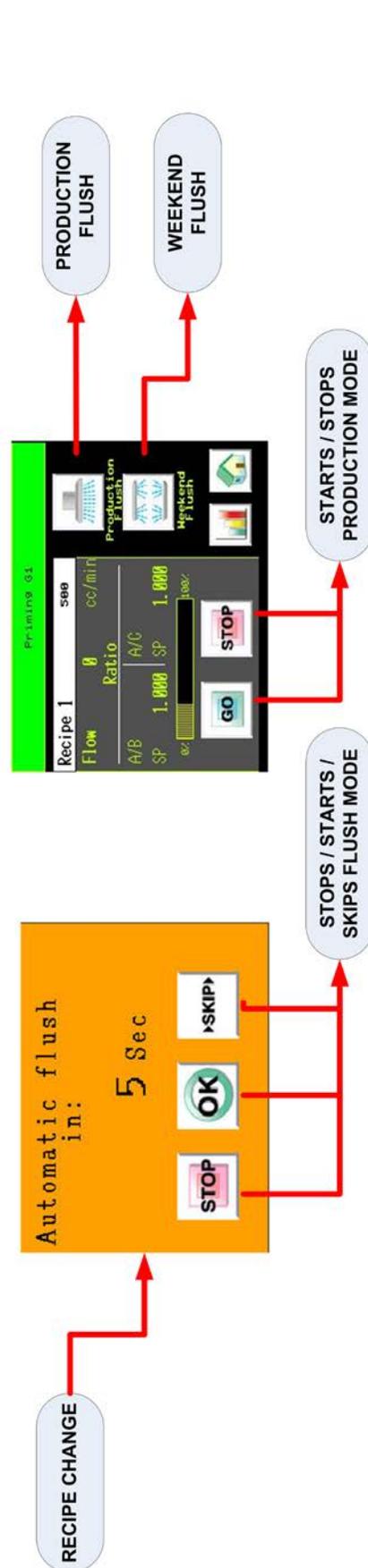
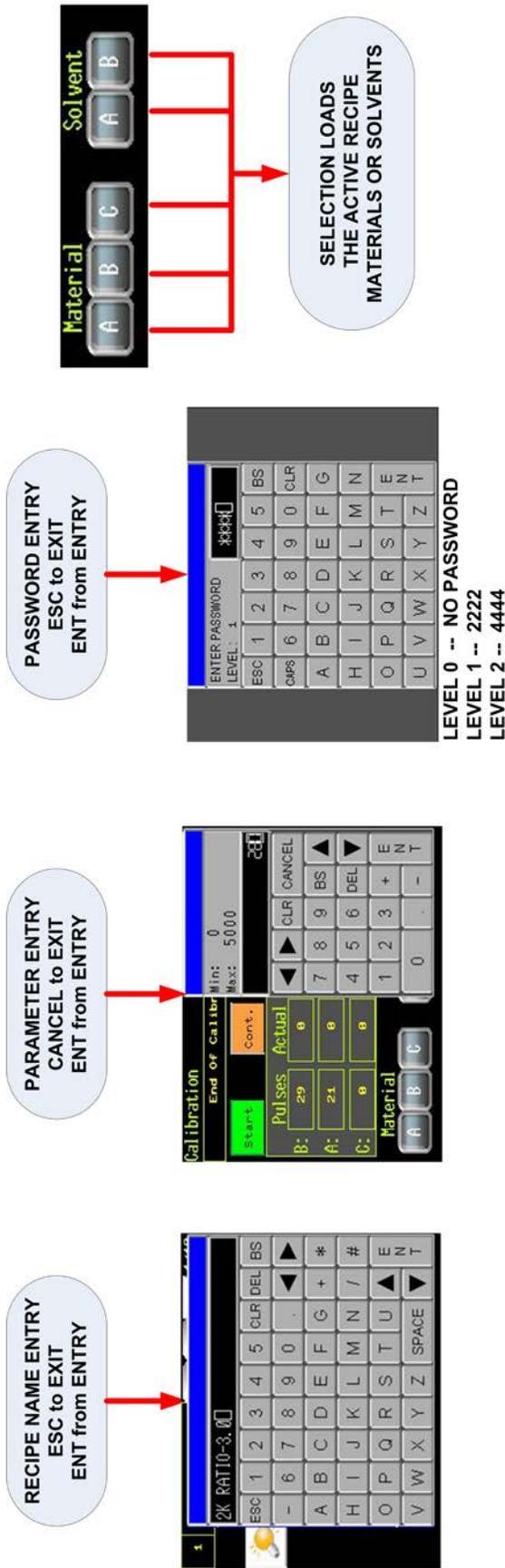


4.15.4 Recipe Management



FROM PAGE 1-1

4.15.5 Fundamentals





The main screen is a similar screen used on the Cyclomix Expert main panel. The screen displays the machine status, pot life status, faults, current active recipe, set point and measured values for A/B and A/C ratios.



## 5.1 Procedures

### 5.1.1 Placing the Cyclomix Expert into the Production Mode

With magnet select of small round area above the icon “GO”. If the unit requires priming the unit will execute a Priming Sequence per the current loaded recipe. If the unit does not enter the production mode after priming, select the icon “GO” again. The Expert main control panel is step up not to immediately enter the production. Reference the Expert’s user manual to change this global parameter. The active recipe is the recipe with the blue background **Recipe 1**.

### 5.1.2 Placing the Cyclomix Expert into the Stop Mode

With magnet select the small round area above the icon “STOP”. The unit will stop and the machine status will display **Cyclomix OFF**.

### 5.1.3 Executing a Production Flush

If the Expert is in Production Mode, **Cyclomix ON** first select the icon “STOP”. Then select the Production Flush icon with a magnet. The unit will start a flushing sequence per the active recipe. The machine status will display a flushing message and a green dot will be display in the upper left corner of the flushing sequence being executed. When the flush is completed, the machine status will display **Flush Completed**.



### 5.1.4 Executing a Weekend Flush

If the Expert is in Production Mode, **Cyclomix ON** first select the icon “STOP”. Then select the Weekend Flush icon with a magnet. The unit will start a flushing sequence per the active recipe. The machine status will display a flushing message and a green dot will be display in the upper left corner of the flushing sequence being executed. When the flush is completed, the machine status will display **Weekend Flush Complete**.

### 5.1.5 Changing Current Active Recipe

The recipe selection field is incremented and decremented by using the magnet on the UP and DOWN arrows. The recipe selection field is the field with the green background . When the desired recipe is displayed, using the magnet select the small round area above the Load Recipe . The unit will display the “Automatic Flush” splash screen.



The operator can take the following actions;

1. Do nothing; when the timer reaches 0 the machine will execute the active recipe’s flush sequence.
2. Selecting the GO ; the flush sequence is executed immediately.
3. Selecting the STOP ; the recipe changer order is cancelled.
4. Selecting the Load Recipe ; for the second time will skip the flushing step and go directly to the priming step for the new recipe.

When the flushing sequencing is completed, the selected recipe will become the current active recipe.



**CAUTION:** The operator is responsible to ensure a complete change of material has been loaded and ensure the compatibility of the materials.

The machine determines which flushing sequence is executed by checking to see if the B Component is being change from the current recipe. If the B Component is changing the machine will execute the “Weekend Flush”.

### 5.1.6 Clearing the Alarm Screen

The Alarm screen will display when the Expert has faulted. Clear the Alarm screen but using the magnet and select the icon “GO” to return to the main page.





## 6 Operation

The Cyclomix Expert can blend most nonabrasive two or three component paints with low to medium viscosities. It is not suitable for paints with pot-life under 15 minutes.

The mixing control is based on volumetric metering. Volumetric flow meters and mass flow meters are used to generate pulses for each material flowing and these pulses are converted to volumes per given time. Convert all mass ratios, parts ratios and percentage ratios to volume ratios. Consult material supplier, if you are unsure how to accomplish these volume ratio calculations with the information for the material product sheets.

The system can be set up to mix two or three components supplied from pressure tanks, feed pumps, or circulating systems.

The Cyclomix Expert is designed to deliver mixed material to low-pressure guns such as conventional, VLP, or HVLP guns at up to 75 psi or to Airmix® guns at pressures up to 2900psi [200bar].

Maximum flow rate allowable is 2 liters/minute.

This manual describes the operation of the Cyclomix Expert machine as well as the mixing process. The Cyclomix operates using 2 or 3 flow meters for 2 and 3 components respectively.

### 6.1 Operating cycle

To begin operation, the spray gun operator inputs the desired mix ratio and other parameters through the touch screen. The next step is to fill the system and prepare it for spraying.

When the gun is triggered for spraying, the two components enter into the Cyclomix mix manifold through two separate feed lines and are precisely monitored by the flow meters. Component A flows continuously when the gun is triggered. It flows through the Cyclomix mix manifold to the gun. The master flow meter monitors this component A and sends electrical pulses to the controller. The controller responds by injecting small shots of component B into A component at a rate that depends on the desired mix ratio, via an injection valve. The slave flow meter monitors component B to maintain the exact ratio.



**Note:** The regulated fluid pressure of Components B and C must always be greater than the pressure of Component A.

### 6.2 Parameter Configuration

1. Global System Parameters - From the HOME screen, select “System Tools” ICON.
2. Recipe Management - From the HOME screen, select “Recipe Management” ICON.

### 6.3 Priming

The machine can be loaded with material by enabling the Production Cycle steps.

### 6.4 Production Mode

1. From the HOME Screen select the “GO” ICON
2. Verify the status of the machine:
  - a. If the machine is in its waiting mode “CYCLOMIX OFF”, start the machine by selecting the “START” button.
  - b. If “FLUSH COMPLETE” is stated on the screen. Verify correct recipe is loaded, if not follow the load recipe steps.

Selecting the “START” button will automatically prime the system with selected recipe, enabling the system to begin spraying once the Priming Steps have been completed. The screen will indicate the status along with the visual indicator lights. While the machine is priming the GREEN indicator light will be flashing. Once the priming sequence is completed the screen will indicate “CYCLOMIX ON” and the GREEN indicator light will be ON.

#### Notes:

Manual Gun Systems - Require the operator to trigger the gun to allow priming and flushing.

Manual Gun Systems with Flush Boxes - Do not require operator involvement if the gun is in the Flush Box and some flush box designs, will indicate if the gun is being triggered from the control panel.

Automatic Gun Systems - Do not require any operator involvement.

### 6.5 Load Recipe

1. Select the “Load Program” button from the HOME screen to display the recipe selection screen.
2. Select the desired recipe by using the UP and DOWN arrow icons.
3. Select “LOAD” ICON when the desired recipe is displayed.
  - a. Operator may cancel flush sequence within the first 10 seconds.

## 6.6 Calibration

1. Ensure correct recipe is selected.
2. From the HOME screen select “Calibration” ICON.
3. Prep the mix manifold by removing the A/B and A/C mixing tubes and installing the ratio test kit.
4. Ensure materials are loaded.
5. Complete the Calibration operation.
6. Flush the A/B mix block.

## 6.7 Flushing

1. From the HOME screen select “GO” icon;
2. If the unit is in Production mode select the “STOP” button.
  - a. Changing Recipe – will automatically flush the system.
  - b. Select the “FLUSH” Button will perform a flush per the parameters loaded in the corresponding recipe management section.
  - c. Select the “WEEKEND” button will perform a flush sequence plus flush the B Component circuit.

The user interface screen will indicate the machine status, along with the indicator lights. The RED and GREEN lights flashing indicate the machine is being flushed. End of Sequence is indicated by “Flush Completed” on the screen and no lights are ON or Flashing.

### Notes:

Manual Gun Systems - Require the operator to trigger the gun to allow priming and flushing.

Manual Gun Systems with Flush Boxes - Do not require operator involvement if the gun is in the Flush Box and some flush box designs, will indicate if the gun is being triggered from the control panel.

Automatic Gun Systems - Do not require any operator involvement.

## 6.8 Ratio Check

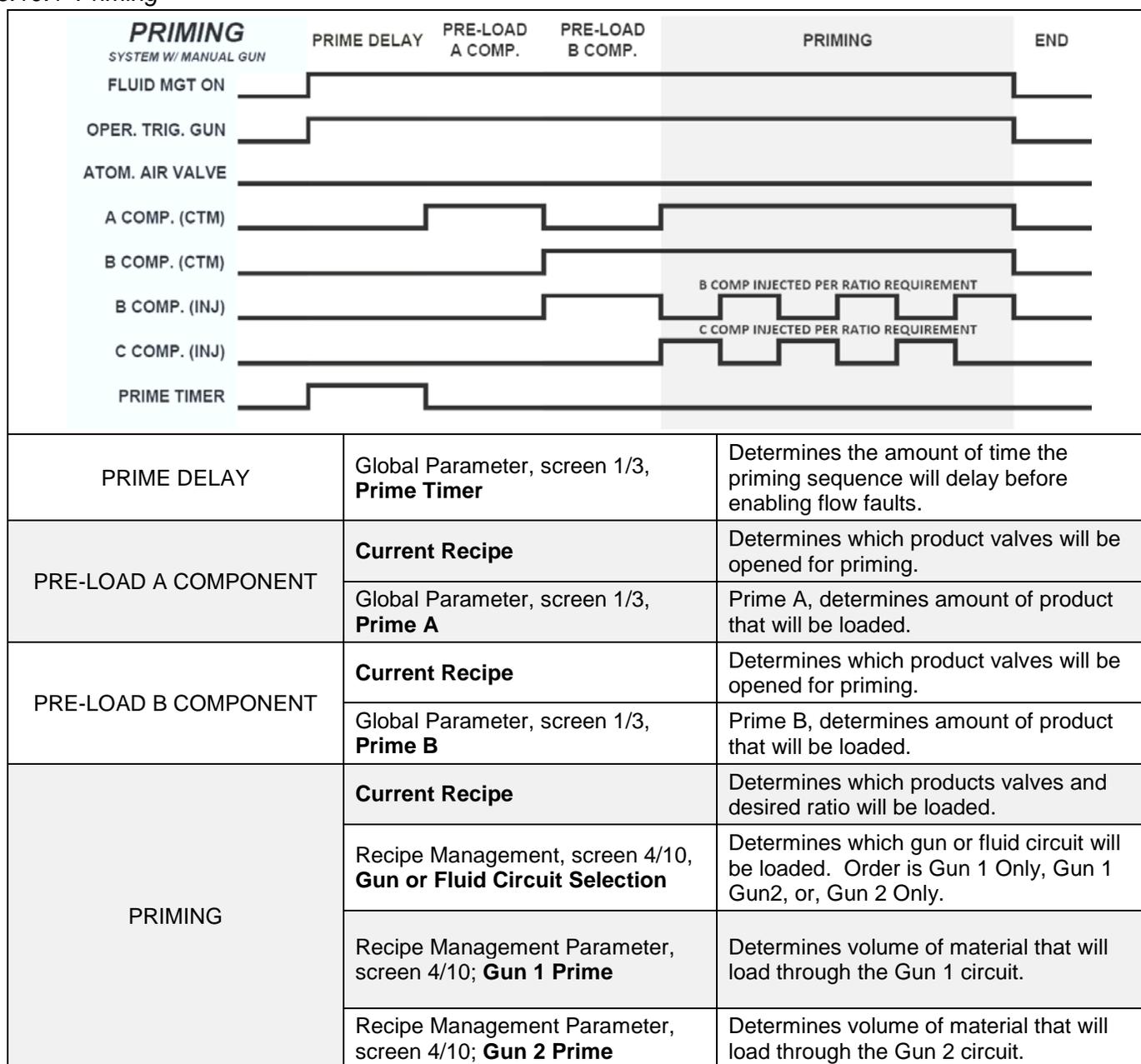
1. Ensure correct recipe is selected.
2. From the HOME screen select “Ratio Check” ICON.
3. Prep the mix manifold by removing the A/B and A/C mixing tubes and installing the ratio test kit.
4. Ensure materials are loaded.
5. Complete the Ratio Check operation.
6. Flush the A/B mix block.

## 6.9 Batching

1. Ensure correct recipe is selected.
2. From the HOME screen select “Batching” ICON.
3. Prep the mix manifold by removing the A/B and A/C mixing tubes and installing the ratio test kit.
4. Ensure materials are loaded.
5. Complete the Ratio Check operation.
6. Flush the A/B mix block.

## 6.10 Operating Diagrams | System with Manual Guns

### 6.10.1 Priming



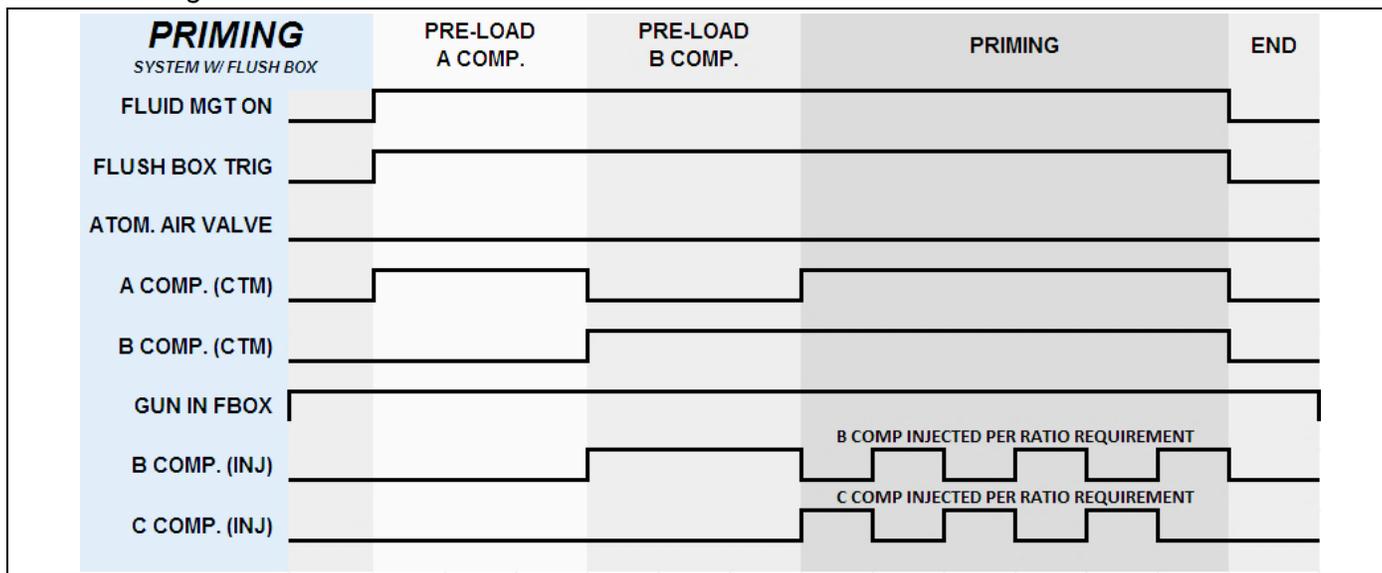


6.10.3 Flushing

		<b>FLUSHING</b>							END
		SYSTEM W/ MANUAL GUN							
		STEP 1 (A SOLV)	STEP 2 (B COMP)	STEP 3 (B SOLV)	STEP 4 (AIR/SOLV)	STEP 5 (A SOLV)	STEP 6 (WEEKEND)		
FLUID MGT ON		[Timeline bar spanning from Step 1 to Step 6]							
OPER. TRIG. GUN		[Timeline bar spanning from Step 1 to Step 6]							
ATOM. AIR VALVE		[Timeline bar spanning from Step 1 to Step 6]							
A SOLV. (CTM)		[Timeline bar from Step 1 to Step 2]		[Timeline bar from Step 3 to Step 4]		[Timeline bar from Step 5 to Step 6]			
AIR VALVE		[Timeline bar from Step 1 to Step 3]			[Timeline bar from Step 4 to Step 5]		[Timeline bar from Step 6 to Step 6]		
B COMP. (CTM)		[Timeline bar from Step 2 to Step 3]		[Timeline bar from Step 4 to Step 5]		[Timeline bar from Step 6 to Step 6]			
B SOLV. (CTM)		[Timeline bar from Step 2 to Step 3]		[Timeline bar from Step 4 to Step 5]		[Timeline bar from Step 6 to Step 6]			
B COMP. (INJ)		[Timeline bar from Step 2 to Step 3]		[Timeline bar from Step 4 to Step 5]		[Timeline bar from Step 6 to Step 6]			
C COMP. (INJ)		[Timeline bar from Step 2 to Step 3]		[Timeline bar from Step 4 to Step 5]		[Timeline bar from Step 6 to Step 6]			
SETUP	<b>Current Recipe</b>	Determines which guns and product valves that will be used for flushing.							
	Recipe Management, screen 4/10, <b>Gun or Fluid Circuit Selection</b>	Determines which gun or fluid circuit will be loaded. Order is Gun 1 Only, Gun 1 Gun2, or, Gun 2 Only.							
STEP 1 (A COMP SOLVENT)	Recipe Management, screens 6 & 8, <b>Time or Volume</b>	Determines if Step 1 will use a time or volume based unit for flushing.							
	Recipe Management, screens 6 & 8/10, <b>Solvent</b>	Determines the A Component Solvent product valve to open for Step 1.							
STEP 2 (B COMP)	Recipe Management, screens 6 & 8, <b>Time or Volume</b>	Determines if Step 2 will use a time or volume based unit for flushing.							
	Recipe Management, screens 6 & 8/10, <b>B COMP</b>	Determines the B Component product valve to open for Step 2.							
STEP 3 (B COMP SOLVENT)	Recipe Management, screens 6 & 8, <b>Time or Volume</b>	Determines if Step 3 will use a time or volume based unit for flushing.							
	Recipe Management, screens 6 & 8/10, <b>Solvent</b>	Determines the B Component Solvent product valve to open for Step 3.							
STEP 4 (AIR / A SOLV CHOP)	Recipe Management, screens 7 & 9/10, <b>Solvent Time</b>	Determines the amount of time that A Component Solvent will flow.							
	Recipe Management, screens 7 & 9/10, <b>Air Time</b>	Determines the amount of time that the Air will flow.							
	Recipe Management, screens 7 & 9/10, <b>Solvent</b>	Determines the A Component Solvent product valve to open for Step 4.							
	Recipe Management, screens 7 & 9/10, <b>Cycles</b>	Determines the number of times the solvent/air chop will repeat.							
STEP 5 (A COMP SOLVENT)	Recipe Management, screens 7 & 9/10, <b>Time or Volume</b>	Determines if Step 5 will use a time or volume based unit for flushing.							
	Recipe Management, screens 7 & 9/10, <b>Solvent</b>	Determines the A Component Solvent product valve to open for Step 5.							
STEP 6 (B COMP SOLVENT) (WEEKEND FLUSH)	Recipe Management, screens 7 & 9/10, <b>Time or Volume</b>	Determines if Step 6 will use a time or volume based unit for flushing.							
	Recipe Management, screens 7 & 9/10, <b>Solvent</b>	Determines the b Component Solvent product valve to open for Step 6.							

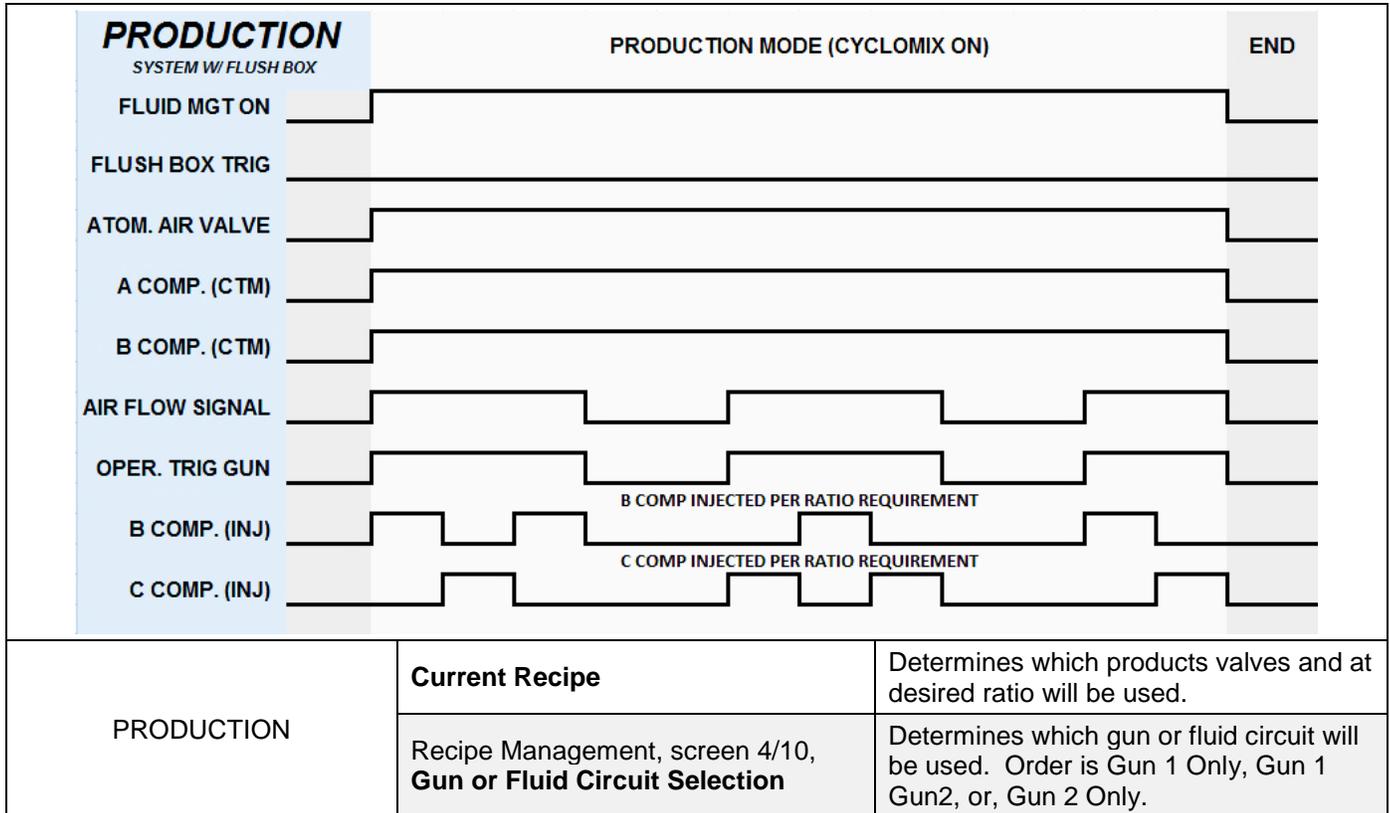
## 6.11 Operating Diagrams | System with Manual Gun & Flush Box

### 6.11.1 Priming

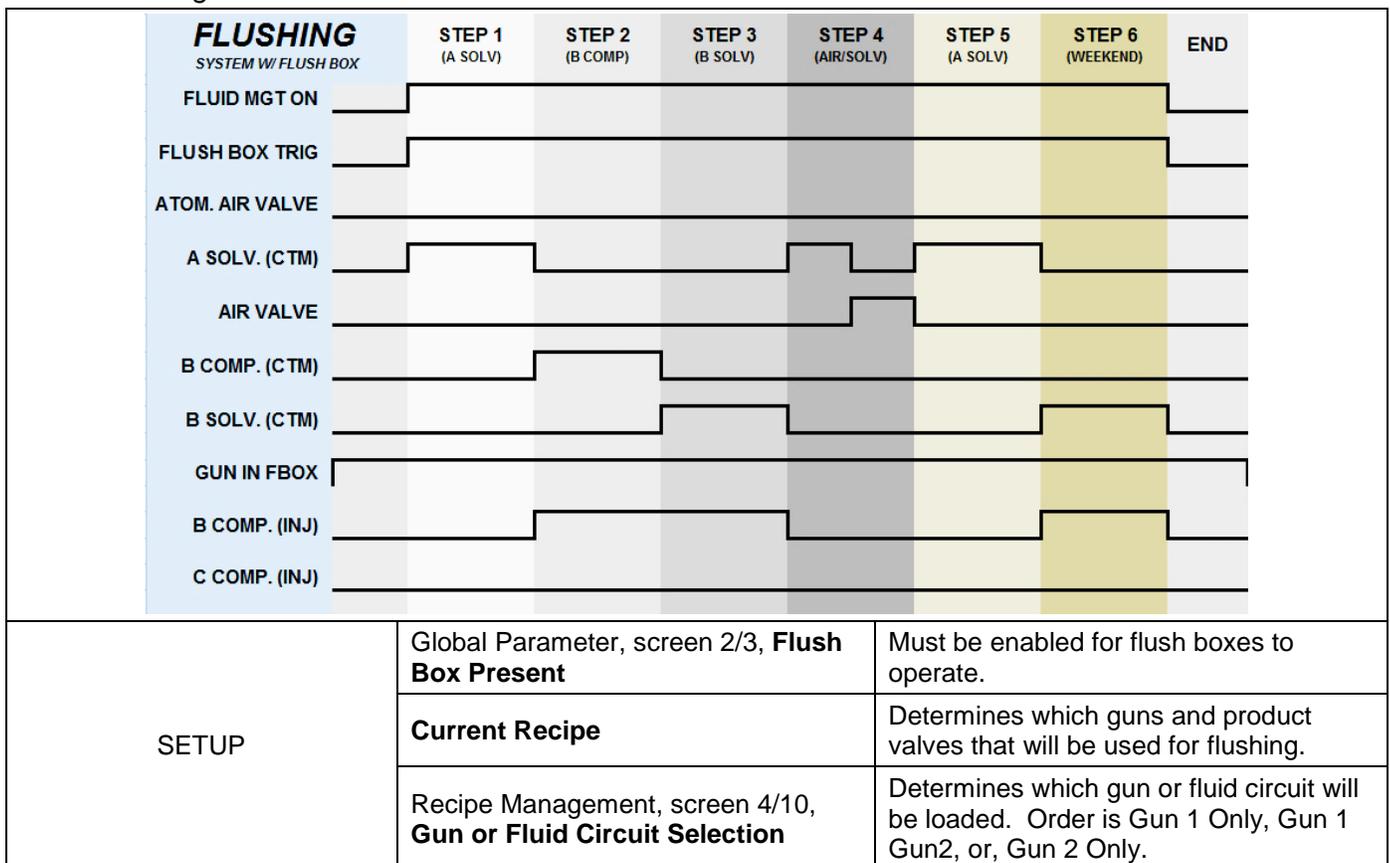


PRE-LOAD A COMPONENT	<b>Current Recipe</b>	Determines which product valves will be opened for priming.
	Global Parameter, screen 1/3, <b>Prime A</b>	Prime A, determines amount of product that will be loaded.
PRE-LOAD B COMPONENT	<b>Current Recipe</b>	Determines which product valves will be opened for priming.
	Global Parameter, screen 1/3, <b>Prime B</b>	Prime B, determines amount of product that will be loaded.
PRIMING	<b>Current Recipe</b>	Determines which products valves to open & ratio.
	Recipe Management, screen 4/10, <b>Gun or Fluid Circuit Selection</b>	Determines which guns or fluid circuits will be loaded. Order is Gun 1 Only, Gun 1 Gun2, or, Gun 2 Only.
	Recipe Management Parameter, screen 4/10; <b>Gun 1 Prime</b>	Determines volume of material that will load through the Gun 1 circuit.
	Recipe Management Parameter, screen 4/10; <b>Gun 2 Prime</b>	Determines volume of material that will load through the Gun 2 circuit.
	Global Parameter, screen 1/3, <b>Prime Timer</b> Set this value to 0 when operating with flush boxes.	Determines the amount of time the priming sequence will delay before enabling flow faults.

6.11.2 Production



6.11.3 Flushing



STEP 1 (A COMP SOLVENT)	Recipe Management, screens 6 & 8, <b>Time or Volume</b>	Determines if Step 1 will use a time or volume based unit for flushing.
	Recipe Management, screens 6 & 8/10, <b>Solvent</b>	Determines the A Component Solvent product valve to open for Step 1.
STEP 2 (B COMP)	Recipe Management, screens 6 & 8, <b>Time or Volume</b>	Determines if Step 2 will use a time or volume based unit for flushing.
	Recipe Management, screens 6 & 8/10, <b>B COMP</b>	Determines the B Component product valve to open for Step 2.
STEP 3 (B COMP SOLVENT)	Recipe Management, screens 6 & 8, <b>Time or Volume</b>	Determines if Step 3 will use a time or volume based unit for flushing.
	Recipe Management, screens 6 & 8/10, <b>Solvent</b>	Determines the B Component Solvent product valve to open for Step 3.
STEP 4 (AIR / A SOLV CHOP)	Recipe Management, screens 7 & 9/10, <b>Solvent Time</b>	Determines the amount of time that A Component Solvent will flow.
	Recipe Management, screens 7 & 9/10, <b>Air Time</b>	Determines the amount of time that the Air will flow.
	Recipe Management, screens 7 & 9/10, <b>Solvent</b>	Determines the A Component Solvent product valve to open for Step 4.
	Recipe Management, screens 7 & 9/10, <b>Cycles</b>	Determines the number of times the solvent/air chop will repeat.
STEP 5 (A COMP SOLVENT)	Recipe Management, screens 7 & 9/10, <b>Time or Volume</b>	Determines if Step 5 will use a time or volume based unit for flushing.
	Recipe Management, screens 7 & 9/10, <b>Solvent</b>	Determines the A Component Solvent product valve to open for Step 5.
STEP 6 (B COMP SOLVENT) (WEEKEND FLUSH)	Recipe Management, screens 7 & 9/10, <b>Time or Volume</b>	Determines if Step 6 will use a time or volume based unit for flushing.
	Recipe Management, screens 7 & 9/10, <b>Solvent</b>	Determines the B Component Solvent product valve to open for Step 6.

## 6.12 Operating Diagrams | System Automatic with Dump Valve

### 6.12.1 Priming

	<b>PRIMING</b> SYSTEM AUTO W/ DUMP VALVE	PRE-LOAD A COMP.	PRE-LOAD B COMP.	PRIMING	END
FLUID MGT ON	[Signal line active from start to end]				
DUMP VALVE	[Signal line active from start to end]				
EXT. GUN TRIG	[Signal line active during Priming phase]				
A COMP. (CTM)	[Signal line active during Pre-load A and Priming phases]				
B COMP. (CTM)	[Signal line active during Pre-load B and Priming phases]				
B COMP. (INJ)	[Signal line active during Priming phase with pulses labeled "B COMP INJECTED PER RATIO REQUIREMENT"]				
C COMP. (INJ)	[Signal line active during Priming phase with pulses labeled "C COMP INJECTED PER RATIO REQUIREMENT"]				
PRE-LOAD A COMPONENT	<b>Current Recipe</b>	Determines which product valves will be opened for priming.			
	Global Parameter, screen 1/3, <b>Prime A</b>	Prime A, determines amount of product that will be loaded through the dump valve.			
PRE-LOAD B COMPONENT	<b>Current Recipe</b>	Determines which product valves will be opened for priming.			
	Global Parameter, screen 1/3, <b>Prime B</b>	Prime B, determines amount of product that will be loaded through the dump valve,			
PRIMING	<b>Current Recipe</b>	Determines which products valves to open & ratio.			
	Recipe Management, screen 4/10, <b>Gun or Fluid Circuit Selection</b>	Determines which guns or fluid circuits will be loaded. Order is Gun 1 Only, Gun 1 Gun2, or, Gun 2 Only.			
	Recipe Management Parameter, screen 4/10; <b>Gun 1 Prime</b>	Determines the total volume of material that will load through the Gun 1 circuit.			
	Recipe Management Parameter, screen 4/10; <b>Gun 2 Prime</b>	Determines the total volume of material that will load through the Gun 2 circuit.			
	Recipe Management Parameter, screen 4/10; <b>Auto Gun 1 Prime</b>	Determines volume of material that will load through the Auto [EXT GUN TRIG] # 1, past the dump valve.			
	Recipe Management Parameter, screen 4/10; <b>Auto Gun 2 Prime</b>	Determines volume of material that will load through the Auto [EXT GUN TRIG] # 2, past the dump valve.			
	Global Parameter, screen 1/3, <b>Prime Timer</b> Set this value to 0 when operating in an automatic system	Determines the amount of time the priming sequence will delay before enabling flow faults.			

6.12.2 Production

<b>PRODUCTION</b> SYSTEM AUTO W/ DUMP		PRODUCTION MODE (CYCLOMIX ON)	END
FLUID MGT ON			
DUMP VALVE			
EXT. GUN TRIG			
A COMP. (CTM)			
B COMP. (CTM)			
AUTO GUNS ON			
B COMP. (INJ)			
C COMP. (INJ)			
PRODUCTION	<b>Current Recipe</b>	Determines which products valves and at desired ratio will be used.	
	Recipe Management, screen 4/10, <b>Gun or Fluid Circuit Selection</b>	Determines which gun or fluid circuit will be used. Order is Gun 1 Only, Gun 1 Gun2, or, Gun 2 Only.	

6.12.3 Flushing

<b>FLUSHING</b> SYSTEM AUTO W/ DUMP VALVE		STEP 1 (A SOLV)	STEP 2 (B COMP)	STEP 3 (B SOLV)	STEP 4 (AIR/SOLV)	STEP 5 (A SOLV)	STEP 6 (WEEKEND)	END
FLUID MGT ON								
DUMP VALVE								
EXT. GUN TRIG								
A SOLV. (CTM)								
AIR VALVE								
B COMP. (CTM)								
B SOLV. (CTM)								
B COMP. (INJ)								
C COMP. (INJ)								
SETUP	<b>Current Recipe</b>	Determines which products valves to open & ratio.						
	Recipe Management, screen 4/10, <b>Gun or Fluid Circuit Selection</b>	Determines which gun or fluid circuit will be loaded. Order is Gun 1 Only, Gun 1 Gun2, or, Gun 2 Only.						
STEP 1 (A COMP SOLVENT)	Recipe Management, screens 6 & 8, <b>Time or Volume</b>	Determines if Step 1 will use a time or volume based unit for flushing.						
	Recipe Management, screens 6 & 8/10, <b>Solvent</b>	Determines the A Component Solvent product valve to open for Step 1.						

STEP 2 (B COMP)	Recipe Management, screens 6 & 8, <b>Time or Volume</b>	Determines if Step 2 will use a time or volume based unit for flushing.
	Recipe Management, screens 6 & 8/10, <b>B COMP</b>	Determines the B Component product valve to open for Step 2.
STEP 3 (B COMP SOLVENT)	Recipe Management, screens 6 & 8, <b>Time or Volume</b>	Determines if Step 3 will use a time or volume based unit for flushing.
	Recipe Management, screens 6 & 8/10, <b>Solvent</b>	Determines the B Component Solvent product valve to open for Step 3.
STEP 4 (AIR / A SOLV CHOP)	Recipe Management, screens 7 & 9/10, <b>Solvent Time</b>	Determines the amount of time that A Component Solvent will flow.
	Recipe Management, screens 7 & 9/10, <b>Air Time</b>	Determines the amount of time that the Air will flow.
	Recipe Management, screens 7 & 9/10, <b>Solvent</b>	Determines the A Component Solvent product valve to open for Step 4.
	Recipe Management, screens 7 & 9/10, <b>Cycles</b>	Determines the number of times the solvent/air chop will repeat.
STEP 5 (A COMP SOLVENT)	Recipe Management, screens 7 & 9/10, <b>Time or Volume</b>	Determines if Step 5 will use a time or volume based unit for flushing.
	Recipe Management, screens 7 & 9/10, <b>Solvent</b>	Determines the A Component Solvent product valve to open for Step 5.
	Recipe Management, screen 5, <b>Auto Gun 1 Flush, Time or Volume</b>	Determines the amount of material or time from Step 5 that will be pushed thru the auto gun 1
	Recipe Management, screen 5, <b>Auto Gun 2 Flush, Time or Volume</b>	Determines the amount of material or time from Step 5 that will be pushed thru the auto gun 2
STEP 6 (B COMP SOLVENT) (WEEKEND FLUSH)	Recipe Management, screens 7 & 9/10, <b>Time or Volume</b>	Determines if Step 6 will use a time or volume for flushing.
	Recipe Management, screens 7 & 9/10, <b>Solvent</b>	Determines the B Component Solvent product valve to open for Step 6.

## 6.13 Workbook Procedures

### 6.13.1 Recipe Management Worksheet

This section is intended to explain the operation of the workbook and how to retrieve files from the USB drive and manipulate the information based upon the defined procedures automated in the workbook. The user should be familiar with Microsoft Excel. The topics of formulas, macro programming and data management will not be discussed in this reference.

**Note:** The workbook is setup to handle one Expert's, fifty (50) recipes.

The initial workbook contains three worksheets titled:

- Setup Recipe Names
- Blank Recipe
- Recipe Log

The recipe log worksheet is where the data is stored once it is retrieved from the USB flash drive. Because the amount of information written to the USB drive is limited only to numeric values, the Recipe Names are referenced by the recipe index number. Using the Recipe Names Setup page the user can enter the same unique names for each recipe.

### Recipe Management (Setup)

#### 1. Select Language

This recipe management tool is setup for multiple languages. To change the language, select the flag; keep selecting the flag until the desired country's language is displayed.

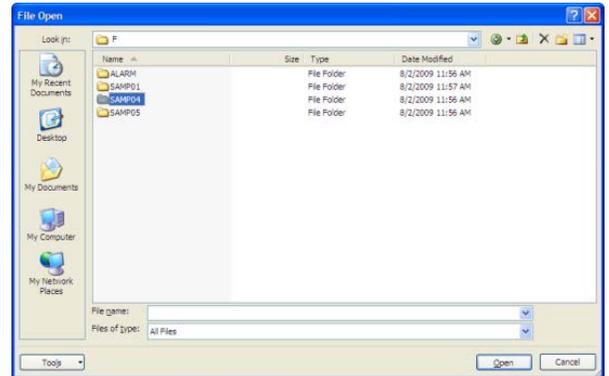
ID	RECIPE NAME	SELECT LANGUAGE
1	RECIPE 1	LANGUAGE
2	RECIPE 2	
3	RECIPE 3	
4	RECIPE 4	
5	RECIPE 5	
6	RECIPE 6	
7	RECIPE 7	
8	RECIPE 8	
9	RECIPE 9	

#### 2. Recipe Name

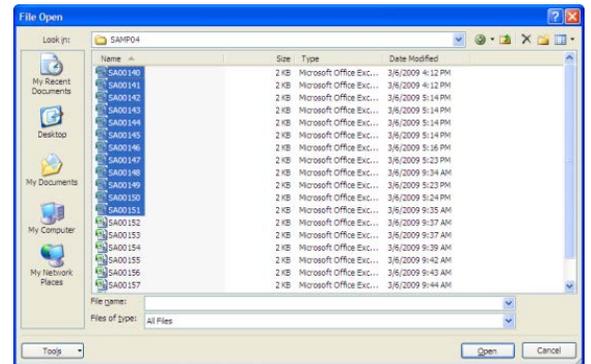
For each recipe, there is a Recipe Index Number. The user can enter the unique name into the Cyclomix Expert; however, the USB flash drive only contains the index number.

## Recipe Management (Get Data)

1. Connect the USB Flash Drive to the computer that contains the Recipe Management Excel file; note the drive letter when the connection is made.
2. Open the Recipe Management File and navigate to the top left corner of the Recipe Log worksheet.
3. Select the command button titled “READ USB DRIVE”. A browsing window will open and allow you to navigate to the drive letter that was noted in the first step. **Note:** This excel file uses macros and active-X controls; you must “Enable this content” when opening this workbook and is dependent upon your personnel security settings.
4. Upon reaching the selected drive, select the folder called “SAMP04”. This folder, plus “SAMP05”, contains the recipe management data.



5. Select all files that you wish to upload from the USB flash drive. They will be highlighted when selected.
6. Select the OPEN button and all files from both folders will be combined and written to the worksheet in the next available row. The procedure handles the data format, data translation and lookup formulas for the recipe name. The file name is also written in the last column of the log.



7. The user is then prompted, (YES / NO) to determine, if the files can be deleted. Select NO, if the files are not to be deleted. Selecting, YES, deletes the files in both folders.

## Using the Recipe Management Log

1. To view a Recipe in Recipe Form
  - a. Select a cell in the row containing the recipe you wish to view in the Recipe Form. Now select the “SELECT / LOAD RECIPE” command button. The underlying macro will now translate and write the data into the Recipe Form calculating the ratio tolerance percentage.

## Using the Blank Recipe Form

The Blank Recipe Form can be used to create a new recipe. The user is prompted with input field notes, parameter ranges and error messages if an invalid parameter is trying to be entered. This form is intended to provide continuity from the offline recipe management tool and the actual Cyclomix Expert.

In the upper right hand corner are some command buttons with embedded macros. Use these command buttons to help build the recipe, trouble shoot the recipe and archive the recipe.

**View Recipe from Log** - This function loads the selected recipe from the recipe log. The selected recipe is the row which contains the active selected cell.

**Clear Form** - This function simply clears the data from the form. It does not erase the recipe in the log.

**Save as New Worksheet** - This function is available from the blank Recipe Form. It can be used to document a current recipe in the log, or used to generate a new recipe for later entry into the Cyclomix Expert.

1. Select the “Save as New Worksheet” button to copy the current worksheet to a new worksheet. The new worksheet will be the Recipe Name entered in the upper field. It will be shortened if required.

**Note:** If this recipe was created from the log, the links between the log and recipe have been removed. This is now an isolated recipe for archive.

**Reset Auto Ratio Tolerance Calculations** - This function sets the A/B and A/C ratio tolerance MIN and MAX values. The minimum and maximum values are based on the desired percentage and the ratio.

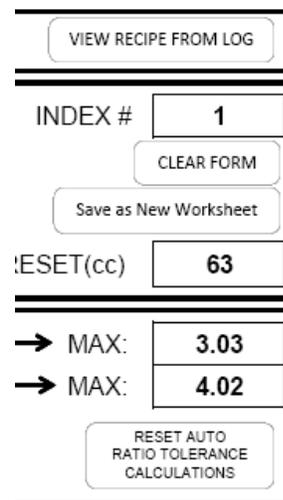
If viewing a recipe from the log, the percentages are calculated based on the values in the recipe log.

Selecting the Reset button will overwrite the values with 5% in the form only. To return to the log values simply select “View Recipe from Log” again.

The user can also change the 5% to a different value by entering a new parameter in those fields by simply selecting the cell.

**Note:** Facts about the Recipe Management

- Some information contained in the log is in decimal format that must be converted to binary. These binary values determine the volume verses time and the fault setup parameters.
- Do not enter any columns in the log. The macro will not recognize the new column.
- The macro looks for the first available empty cell in column B, it does not check whether any additional row values are empty, and will overwrite any values in those cells.



The screenshot shows a software interface for recipe management. At the top is a button labeled "VIEW RECIPE FROM LOG". Below it is a field for "INDEX #" with the value "1" and a "CLEAR FORM" button. A "Save as New Worksheet" button is also present. Below that is a field for "RESET(cc)" with the value "63". Further down are two "MAX:" fields with values "3.03" and "4.02". At the bottom is a button labeled "RESET AUTO RATIO TOLERANCE CALCULATIONS".

### 6.13.2 Consumption Log Worksheet

This section is intended to explain the operation of the workbook and how to retrieve files from the USB drive. The user should be familiar with Microsoft Excel. The topics of formulas, macro programming and data management will not be discussed in this manual.

The workbook is setup to handle seven (7) different machines with fifty (50) recipes for each machine. This allows the user to store all the information in one workbook which will allow the user to manage all the information summed together, by individual machine, or by Recipe.

The initial workbook contains two worksheets titled “Consumption Log” and “Machine-Material Setup”. The consumption log worksheet is where the data is stored once it is retrieved from the USB flash drive. Because the amount of information written to the USB drive is limited to only numeric values, the Recipe Names are referenced by the recipe index number. Using the Machine-Material Setup page the user can enter the same unique names for each recipe. The user can also give names to the individual products used in each machine.

## Consumption Log (Setup)

### 1. Machine Setup

The user can give unique numbers to the individual machines. Because a simple pointing system is being used in this workbook the user must enter the machine’s number into this first table. From that point on, the unique number is used to avoid confusion. Enter the unique number in the right-hand column.

No.	MACHINE #
1	111
2	222
3	333
4	444
5	555
6	666
7	777

### 2. Product Names

The next table is the Product Names; the Expert only uses the Product COMP Number. Here the user can give the names of the individual products by COMP # and Machine. Each Machine has its own setup table.

MACHINE 111		
COMP #	A COMP DESCRIPTION	B COMP DESCRIPTION
1	M1 ACOMP 1	M1 BCOMP 1
2	M1 ACOMP 2	M1 BCOMP 2
3	M1 ACOMP 3	M1 BCOMP 3
4	M1 ACOMP 4	M1 BCOMP 4
5	M1 ACOMP 5	M1 BCOMP 5
6	M1 ACOMP 6	M1 BCOMP 6
7	M1 ACOMP 7	M1 BCOMP 7
8	M1 ACOMP 8	M1 BCOMP 8

### 3. Recipe Names

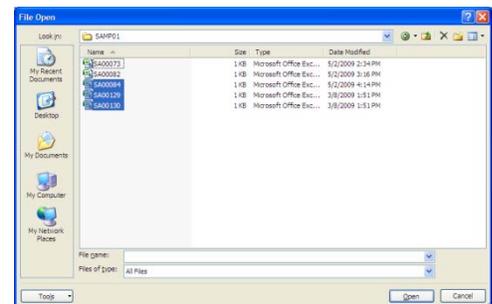
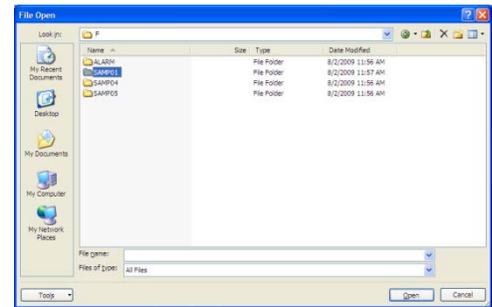
For each Recipe, there is a Recipe Index Number.

The user can enter the unique name into the Cyclomix Expert; however, the USB flash drive only contains the index number. To allow the data management by recipe, enter the recipe for each machine in its corresponding table.

RECIPE INDEX	
INDEX	DESCRIPTION
1	MACHINE 111 RECIPE 1
2	MACHINE 111 RECIPE 2
3	MACHINE 111 RECIPE 3
4	MACHINE 111 RECIPE 4
5	MACHINE 111 RECIPE 5
6	MACHINE 111 RECIPE 6
7	MACHINE 111 RECIPE 7
8	MACHINE 111 RECIPE 8

## Consumption Log (Get Data)

1. Connect the USB Flash Drive to the computer that contains the Consumption Log Excel file; note the drive letter when the connection is made.
2. Open the Consumption Log File and navigate to the top right corner of the Consumption Log worksheet.
3. Select the command button titled “GET USB FILES”. A browsing window will open and allow you to navigate to the drive letter that was noted in the first step. **Note:** This excel file uses macros and active-X controls, you must “Enable this content” when opening this workbook, and is dependent upon your personnel security settings.
4. Upon reaching the selected drive, select the folder call “SAMP01”. This folder contains the consumption data.
5. Select all files that you wish to upload from the USB flash drive. They will be highlighted when they have been chosen.
6. Select the open button and all files will be written to the worksheet in the next available row. The procedure handles the data format and lookup formulas for the recipe name, machine number and product names. The file name is also written in the last column of the log.
7. The user is then prompted, (YES / NO) to determine, if the files can be deleted. Select NO, if the files are not to be deleted.



### **Note:** Facts about Consumption Data Log

- Product Volumes - All COMP A, COMP B and COMP C volumes are stored per recipe. If products are used in multiple recipes, then the user will have to sum the like product names.
- Solvent Volumes - Solvent volumes are stored as total volumes by component A & B for all recipes. Because the solvent products are not calibrated, they will display different values per recipe because they are using the COMP A and COMP B product calibration parameters, respectively.
- If more than one COMP A or COMP B solvent is being used, their volume is a part of the total volume.
- Consumption Log Worksheet - The worksheet is setup with hidden columns; these hidden columns are the product numbers and recipe index number, and govern the display of the information in the column to the right of the hidden column.
- Do not insert any additional columns between A through Y. If this is done the macro writing the data to the worksheet will not know a new column is entered and will overwrite the information.
- The macro looks for the first available empty cell in column B. It does not check that any additional row values are empty and will over write any values in those cells.

## 7 Disassembly and Reassembly



All disassembly procedures require that all sources of energy, electrical, hydraulic, pneumatic have been removed from the system before completing any work.

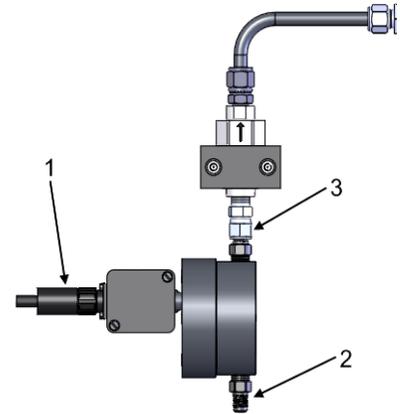
### 7.1 Volumetric Flow Meter

**Disassembly;** Flow meters are removed by first, noting the size, type and direction of flow before disassembly.

- 1 Disconnecting by cable connector,
- 2 Removing the hose connected to the flow meter,
- 3 Loosening the swivel fitting

**Assembly;** Fittings are required to have thread sealant on all tapered threads.

- 1 Install and tighten fittings
- 2 Connect flow meter to swivel fitting tightening nut, note correct orientation of flow
- 3 Connect flow meter's electrical connector to the flow meter ensuring alignment and tightest of connect
- 4 Connect the material supply hose to the flow meter



## 7.2 Mass Flow Meter

**Disassembly;** Flow meter is first removed by;

1

- a) Remove the terminal cover.
- b) Noting wire termination points.
- c) Disconnect the wires.

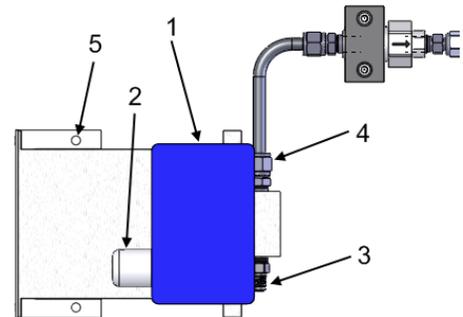
2

- a) Loosen the cable gland nut.
- b) Pull cable free of the terminal box.

3 - Remove the material supply hose.

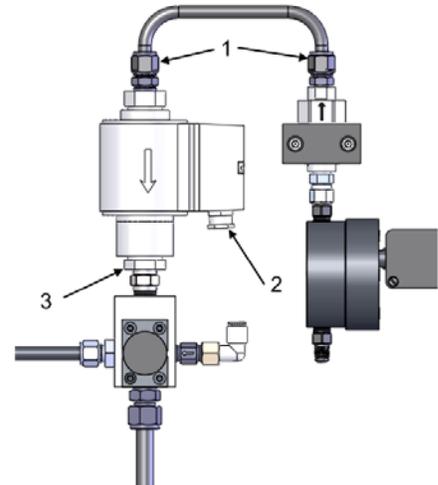
4 - Loosen the material exit fitting.

5 - Remove screws from the flow meter bracket.



**Assembly;** Fittings are required to have thread sealant on all tapered threads.

1. Install fitting and/or connector in the corresponding location noting direction of flow.
2. Connect the flow meter to the tube elbow by tightening the fitting nut.
3. Install screws holding the flow meter to the bracket.
4. Tighten all loose screws and fitting.
5. Connect the material supply hose.
6. Pass cable through the cable gland nut.
7. Terminate wire to corresponding termination points.
8. Tighten cable gland nut.
9. Replace terminal cover.



### 7.3 *Injector Solenoid*

**Disassembly;** Injector valves are dependent upon the type of mix manifold. The injector solenoid valve may be removed by;

1 -

- a) Loosening the swivel fittings.
- b) Pull the u-shape straight up.

2 -

- a) Remove the terminal box cover.
- b) Note wire termination points.
- c) Loosen the cable gland nut.
- d) Pull cable free of the terminal box.

3 - loosen injector from the fitting

Alternate method:

Step 2 is to ensure enough loose cable is present so that the cable does not have to be removed from the terminal box.

**Assembly;** Fittings and connectors are required to have thread sealant on all taper threads.

- 1 Install any fitting per the corresponding location
- 2 Install the injector valve onto the injector block tightening the valve body
- 3 Install the u-shape tube by tightening the fitting nuts
- 4 Push cable through cable gland nut
- 5 Terminate wires on correct terminate points
- 6 Tighten cable gland nut
- 7 Replace cover on terminal box

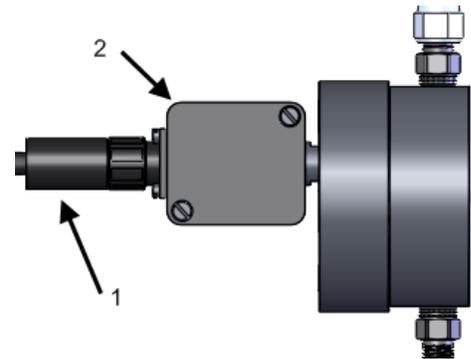
## 7.4 Flow Meter Sensor

**Disassembly;** ATEX sensors have a locking nut, be sure to loosen when removing.

- 1 Remove cable connector.
- 2 Remove sensor by turning it counter-clockwise.

**Assembly;** Two different sensor can be installed in the flow meter ATEX version and a UL version. Check threaded hole before cross threading the sensor into the wrong hole.

- 1 Install sensor until it touches the bottom of the hole. Only tighten with two fingers.
- 2 Connect the cable connector.



**Note:** Over-tightening the sensor will damage the sensor head. Tighten with only two fingers until the sensor is positioned in the bottom of the hole.

## 7.5 Mixing Tube

**Disassembly;** Mix tubes are removed depending on Cyclomix Expert system; Note direction of flow!

### 3K A/B Mix Tube

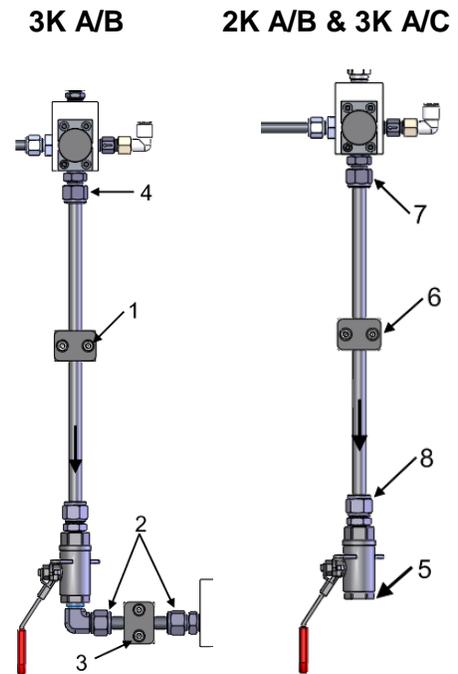
- 1 Loosen screws hold clamp and remove.
- 2 loosen swivel fitting nuts.
- 3 loosen screws hold clamp and remove.
- 4 loosen swivel fitting from injection block.

### 2K A/B Mix Tube 3K A/C Mix Tube

- 1 Disconnect hose from ball valve.
- 2 loosen screws hold clamp and remove.
- 3 loosen swivel fitting from injection block.

**Assembly;** Note direction of flow!

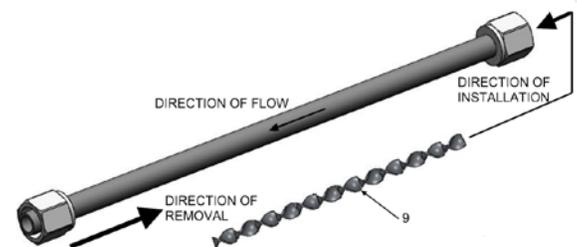
- 1 Assemble the ball valve on to mix tube tightening the fitting nut, locate handle so it crosses the direction of flow when the valve is close.
- 2 Install mix tube on mixing blocks, tightening all fitting nuts.
- 3 Secure clamp by tightening screws.
- 4 Open ball valve if closed.



## 7.6 Mixing Elements

**Disassembly;** Mixing elements may be changed by first removing the mixing tube assembly with the outbound ball valve. See Mix Tube Section.

- 1 Remove ball valve by loosening fitting nut.
- 2 Remove mix element by using a small diameter rod, 1/4" [6mm]. Pushing from the outlet end of the mix tube (end to which arrow is pointing).



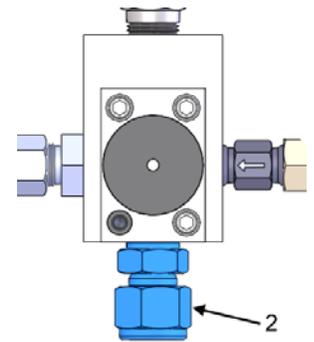
**Assembly;** Note direction of flow! Mix tubes are designed to accept mix elements from the direction of flow, (opposite end of arrow).

- 1 Install as many elements as you can, use a cutting device to trim off extra elements.

## 7.7 Injectors in Mixing Block

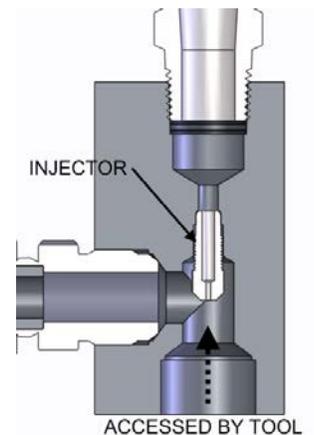
**Disassembly;** Injectors may be changed by first removing the mixing tube assembly with outbound ball valve. Only a partial disassembly is required to gain access to the injector.

- 1 Remove mixing tube assembly.
- 2 Remove fitting.
- 3 Using a 6mm socket or nut driver, remove the injector by turning the tool counter-clockwise.
- 4 Note, injector bore size, options exist.



**Assembly;** Ensure the correct injector bore is being installed. Injectors are to be installed with a thread locking component.

- 1 Install injector with a long thin wall socket or nut driver (6mm hex) turning the tool clockwise, torque 9 ft-lbs.
- 2 Install the fitting connecting the mixing tube to the injector block.
- 3 Connect the mix and complete its installation steps.



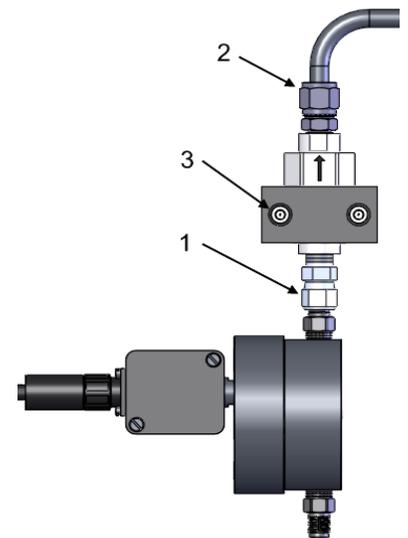
## 7.8 Check Valves

**Disassembly;** Check valves are removed by first, noting the size, type and direction of flow before disassembly.

- 1 Loosen and remove flow meter fitting.
- 2 Loosen fitting nut.
- 3 Loosen screws holding clamp.
- 4 Remove fittings if a repair is going to be conducted or replaced.  
(Fittings may be reused if in good shape)

**Assembly;** Check valves are installed by direction of flow and corresponding fittings. Fittings and connectors are required to have thread sealant on all taper threads.

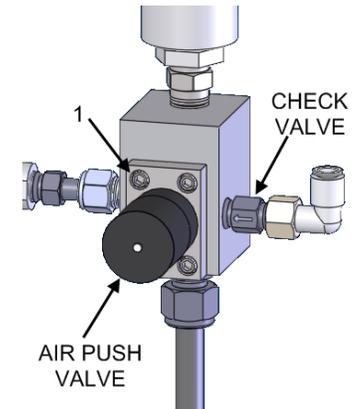
- 1 Install fittings in check valve.
- 2 Connect the check valve to the existing tube elbow.
- 3 Secure the clamp by tightening the screws.
- 4 Connect the flow meter to check valve, tightening the swivel nut.



## 7.9 Air Push Valves

**Disassembly;** The air push valve is incorporate into the A/B mixing block and is made of one valve assembly and a small check valve

- 1 Remove the three screws holding the valve assembly to the mixing block.
- 2 Remove the check valve by disconnecting the air supply, noting direction of flow.



**Assembly;** Ensure all threads and seating surfaces are free of hardened material.

- 1 Install the air push valve by tightening the three screws holding the valve assembly to the mix block.
- 2 Install the check valve noting direction of flow by tightening the valve body clockwise with wrench.



**Note:** The Airmix tip can easily be damaged. Keep the Airmix valve straight while installing or remove cylinder before installing.

## 8 Installation Instructions

The Cyclomix Expert consists, at a minimum, a mixing manifold and control panel connected by a 30-foot cable. Other lengths are available upon request. The mix manifold and control panel must be installed outside of the hazardous locations in a well-ventilated area. If the area is not well ventilated the owner should consider the mix manifold and surrounding area as a hazardous area and install the control panel in accordance with NFPA 33 and order an explosion proof configuration.

The installation will require;

1. Mounting of all equipment/hardware
2. Providing power to the electrical pneumatic control panel
3. Providing compressed air to the electrical control panel, mixing manifold and applicators as required
4. Connecting fluid supply and return lines to the mixing manifold.
5. Connecting the gun fluid circuit to the mixing manifold
6. Connect the control panel to the mix manifold following schematics
  - a) Electrical
  - b) Pneumatic
7. Connect the bonding straps (grounding)
8. Connecting accessories are required.
9. Connecting the Manual Gun – Air Flow Switch

### 8.1 General Mounting of Equipment

Equipment is mounted using standard hardware. The mix manifold can be frame or walled mounted with the provided mounting brackets.

#### 8.1.1 Electrical Connection (Power IN)

Ensure the disconnect switch is OFF before terminating the power cable to the power source following all local codes. The control panel has an autosensing power supply. Wire 110 to 240VAC 50/60 HZ directly to the disconnect switch.

#### 8.1.2 Compressed Air

Compressed air is required to operate the electrical pneumatic panel, and mix manifold. Air drops are also required for manual and automatic guns.

- |                 |                |                            |
|-----------------|----------------|----------------------------|
| • Control Panel | 3/8 NPT(F)     | Main Air Supply            |
| • Air Push      | 5/16" OD Tube  | Mix Manifold Air Push      |
| • Atomizing Air | 1/4 NPT female | Air Flow Switch Air Sensor |

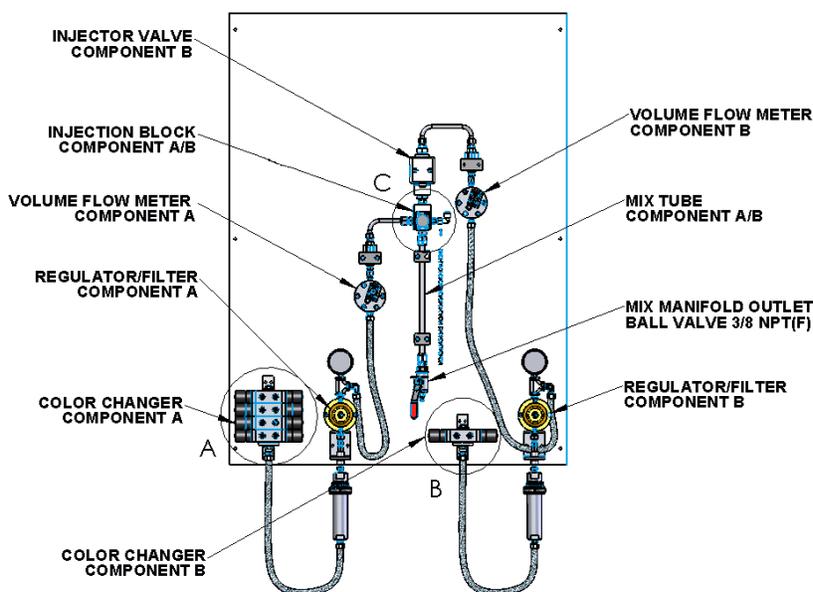
### 8.1.3 Material Fluid Lines

Typically, color change manifolds are laid out with solvent on top and the materials arranged by number from top to bottom, left to right. The standard CTM valve will have two material inlets and outlets per slice. The valves allow for recirculation of material. If recirculation is not required the outlet must be plugged.



**WARNING:** Spare valves must be plugged to prevent unexpected discharge of material under pressure.

1. Connect the Component A flush solvent to the Component A color change manifold. If the solvent is used as the third component this can be piped to the Component C inlet as an option. Reference the Product Configuration Worksheet, “PCW”, and connect the corresponding pilot line, OUT **X**, where X is 1 through 24.
2. Connect the Component A material supply lines to the front of color change manifold dedicated to the Component A materials. Fittings can vary per application but typical supplied fittings are #5 JIC. Reference the PCW, and connect the corresponding pilot line.
3. Connect the Component A material return lines to the rear of the color change manifold dedicated to the Component A materials.
4. Connect the Component B solvent lines to the Component B color change manifold. Typically, Component B solvents are not re-circulated or used anywhere else in the system and valve outlets will be plugged. Reference the PCW, and connect the corresponding pilot line.
5. Connect the Component B material supply lines to the front of color change manifold dedicated to the Component B materials. Typically, Component B materials are not circulated and the valve outlets are plugged. Reference the PCW, and connect the corresponding pilot line.
6. For 3K systems connect Component C to the component C inlet at the flow meter if not the same as the Component A flushing solvent. Inlet may be fluid management or flow meter inlet.



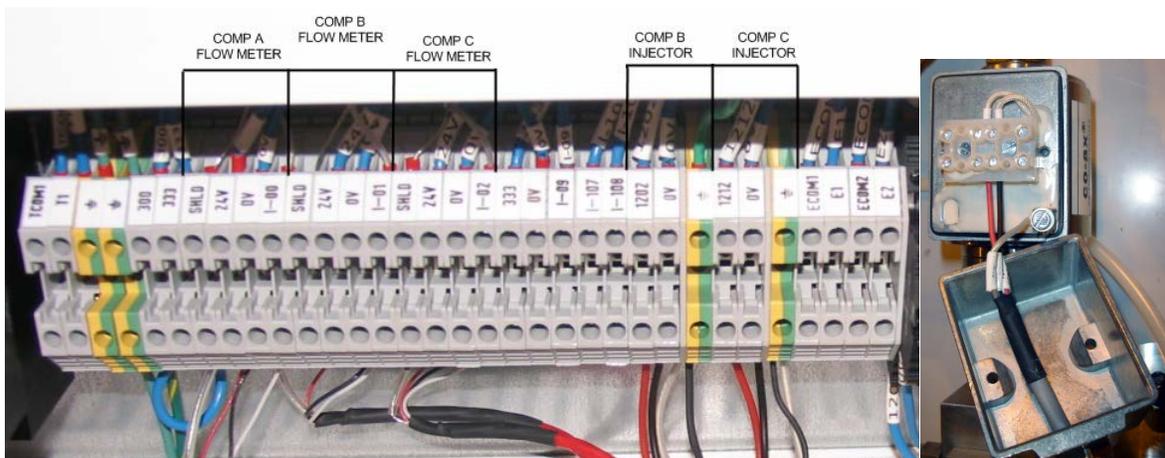
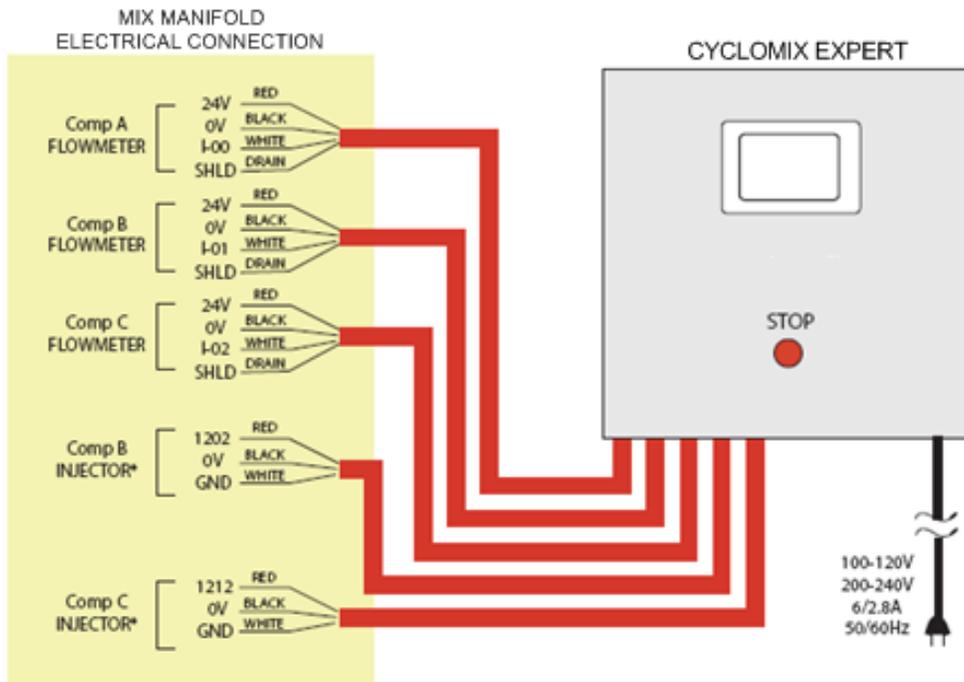
### 8.1.4 Connecting the Gun to the Mix Manifold

The mix manifold has a single outlet for connection to the mix manifold to the gun supply circuit. The outlet for general planning is a ball valve with 3/8 NPT female thread. If an Automatic Two-Gun Management manifold is installed the inlet connection is 1/4 NPT(F) and outlet fittings are typically #5JIC.

## 8.2 Electrical Connections from Control Panel to Mix Manifold

Connect the control cables supplied with the unit to the corresponding terminals in the control panel and to the designated flow meters and injectors on the mix manifold.

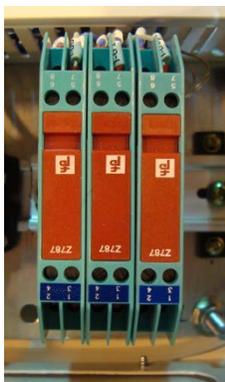
### 8.2.1 Standard Volumetric Flow Meters



### 8.2.2 Standard Flow Meters (Explosion Proof)

The flow meters are connected to the Expert control panel by the way Isolation Barriers. IS Barriers are mounted in an external J-Box. The installer is responsible for locating the J-Box and grounding.

Six foot cables are provided from J-Box to the panel. Thirty foot cables are provided from the flow meter to the J-Box. Barriers are arranged left to right Component A, Component B, Component C. Reference electrical schematics for correct wiring.



Comp	Term	Wire Tag	Color	Barrier
A	1	24V	RED	POWER SUPPLY
	2	0V	BLK	GROUND
	4	I-00	WHT	INPUT SIGNAL (COMP A)
B	1	24V	RED	POWER SUPPLY
	2	0V	BLK	GROUND
	4	I-01	WHT	INPUT SIGNAL (COMP B)
C	1	24V	RED	POWER SUPPLY
	2	0V	BLK	GROUND
	4	I-02	WHT	INPUT SIGNAL (COMP C)
<b>All Shields Are Connected Together</b>				

The preferred flow direction is etched or marked by an arrow on the meter as this is the flow direction in which the meter was calibrated however; the flow meters have bi-directional flow capabilities. Damage will not occur from reverse flow but the meter will count reverse flow as forward flow so to prevent this possibility, an in-line check valve may be a consideration.

The preferred orientation is to mount the meter vertically although horizontal mounting is acceptable if conditions deter vertical orientation. There is no need for straight run piping upstream or downstream of the flow meter.

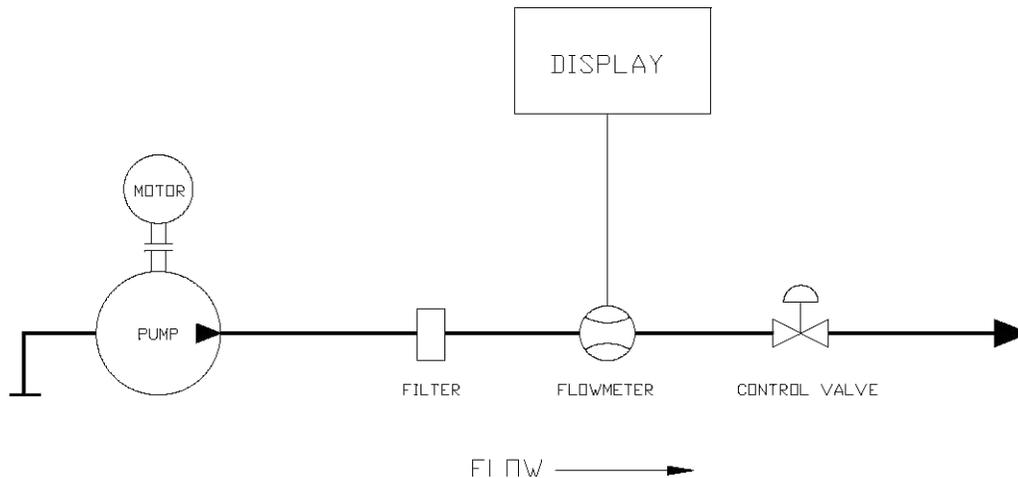
Install the meter upstream from control valves and fluid regulators if possible. Back pressure from control valve is beneficial for stable running.

Eliminate all dirt, debris, and metal shavings from the piping as the liquid must be free from any particles larger than allowed by the manufacturer's specifications. Any recommended filtration should be installed before operation as potential plugging most often occurs at startup.

If possible install a bypass around the meter and flush existing piping with the appropriate solvent before first use.

Review the pickup instructional guide prior to installation. Locate the pickup & wiring away from A/C motors, actuators, heaters, relays excuse only shielded cable and do not take power from the same circuits as other devices. Ensure clean power supplies which utilize a true earth ground. Intrinsic Safety Barriers must be installed if the circuit is intended to be intrinsically safe.

The pickup sensor should only be installed hand tight do not use wrenches or channel locks. Over tightening may cause a dimple to protrude into the meter chamber beneath the pickup and interfere with the free gear rotation.



Maintenance Guides are provided with the meter and are also available from the factory – these should always be reviewed by personnel prior to attempting any maintenance work. The overwhelming majority of down time & repairs are the result of breakages due to improper maintenance actions, lack of training or rough handling.

Never run the meter dry or spin with air only - Gear flow meters are precision engineered flow devices - they should always be maintained in a clean, lubricated condition with the internals wet at all times. Air and water should not be allowed in contact with the internal parts except in short (1-2 second) cycles as part of an automated flush.

Don't use water for flow testing - the viscosity of water is too low to produce accurate results unless the flow rate is elevated and the internals would then have to be dried and lubricated to avoid corrosion or scaling. Using a fluid with a viscosity of approximately 30 cSt such as mineral oil or thinned glycerin is recommended if calibration of the system is necessary - the preferred calibration fluid would be the actual fluid to be metered.

Don't ramp-up flow to a full flow condition instantaneously - Gear flow meters are rugged yet precise instruments which will respond almost instantaneously to changes in fluid flow. Normal pulsating flows will not damage the meter and will merely cause the output to be unsteady however, if flow is repeatedly cycled from zero to full flow instantaneously, fluid shock forces may be significant and may produce premature damage or wear over time. To avoid damage to the system ramp-up to max flow over a few seconds rather than instantaneously & do not inject high flow speeds into an empty meter.

Filtration is recommended to prevent contaminants from entering the meter. Should the meter become plugged, a reduced flow may still be observed from the outlet as fluid pressure will squeeze fluid through the meter – visual flow does not necessarily mean that the meter's gears are turning. If plugging is caused by contaminants then filtering should be installed if plugging is repeatedly caused by particle build up then reviews the cleaning and maintenance procedures in the following section. Because of the vast differences in fluid types and in-plant procedures there may be some trial and error involved in determining the ideal flushing or cleaning regimen.

A calibration factor (K Factor) is established at the factory on a preferred calibrating fluid - this number is usually accurate for a wide variety of fluids and should not usually be changed – it is provided with the meter either on a Calibration Data Sheet or on a tag attached to the meter. Should it be lost, a copy can be obtained from the factory. A calibration verification procedure is detailed later in this document.

Storage - when the flow meter is idle or stored for any extended period of time the internals should be thoroughly cleaned with the appropriate solvent, lubricated with a light oil and the ports capped or plugged to prevent drying

### 8.2.3 Explosion Proof Solenoid Valves (US.EXPRF)

The explosion proof solenoid valve supplied for the US Explosion proof configuration must be wired through a junction box. The valves are supplied with leads that are 6ft long. The installer is responsible for providing seal tight conduit and junction box. The valve is setup for 1/2. It is recommended to route the conduit out of the explosive environment before installing the junction box.

### 8.2.4 Mass Flow Meter Connection to Control Panel

The mass flow meter will be connected to the terminals provided in the control panel. Reference the electrical schematics for the different options available. All other flow meters and injectors will connect to the same terminals as mentioned above.

Mass Flow Meter Terminal #	Wire Color	RHE 14 Transmitter Terminal #
1	BROWN	1
2	BLUE	2
3	RED	3
4	PINK	4
5	ORANGE	5
6	YELLOW	6
7	GREEN	7
8	GRAY	8
9	WHITE	9
Not Connected	SHIELD	10

### 8.3 Bonding the Equipment (Grounding)

The control panel, mix manifold and all accessories must be grounded to a true earth ground. Grounding to the electrical system is not sufficient. All objects in the hazardous location must be grounded per your local electrical codes. Connect approved grounding straps and wiring per local codes.

### 8.4 Pneumatic Connections from Control Panel to Mix Manifold

The control panel and mix manifold will require a compressed air source. The air to the control panel must be dry and oil free. It is recommended the user install a water/oil separator, particle filter of 5 microns and ball valve.

Compressed Air Connections;

- Control Panel                      3/8 NPT(F) Thread
- Mix Manifold (Air Push)    5/16" [8/6mm] OD Tube

In the bottom of the control panel there are several bulkhead tube fitting connection points for the mix manifold color changer equipment & optional accessories. See the pneumatic output table for descriptions and connections to the mix manifold. Pilot signals are 5/32" [4/2.7mm] OD tube.



## 8.5 Connecting Accessories & Options

The following information is for general guidance and may not meet your specific requirements.

### 8.5.1 Air Push

The air push is in the A/B mixing block with an integrated Airmix valve. The air push will require a compressed air source and a pilot signal from the control panel.

- Air Push Compressed Air Supply      5/16" [8/6mm] OD Tube
- Air Push Pilot "PURGE"                5/32" [4/2.7mm] OD Tube

- Pilot Signal Legend

Tag	Device	Description
AIR	Airmix Valve A/B Mix Block	Air Push Pilot Signal

### 8.5.2 Remote Panel

The remote panel is connected to the electrical control panel by way of two cables. The first cable is supplied with the remote panel and needs to be terminated to the 25 pin D shell connector located in the panel. This cable handles the individual inputs from the remote panel to the PLC and the 24vdc power supply to the Remote panel. The second cable is an Ethernet cable and handles the communication to the remote user interface. This remote user interface does not handle inputs but displays the active state to the operator.

- a. Cut a rectangular hole in a booth panel.
- b. Install the booth interface kit. **Note:** The use of a gasket material is required to maintain the non-hazardous location.
- c. Connect the cable with the 25 pin D shell connectors at the Control Panel and Remote Panel.
- d. Connect the Ethernet cable at the Control Panel and Remote Panel.

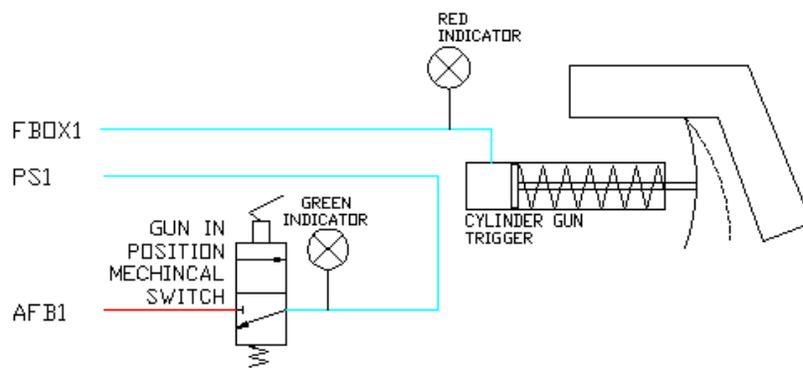


### 8.5.3 Gun Flush Box

Mount the flush box assembly on a booth wall or frame. Ensure the flush box is properly connected to an earth ground using a bounding strap.

A metal pail should be used to capture ejected material and it must connect to an earth ground with a bounding strap.

The flush box is operated by pneumatic signals. Connect the three pilot tubes supplied with the flush box to the control panel. If more than one flush box is in the system ensure that corresponding tubes have not been crossed. The three pilot signal tubes are run inside a 1/2 OD nylon tube for protection and secured to the flush box. Installation should find a method of securing the 1/2 OD tube near the control panel to prevent pulling stress on the pilot signals.



- Pilot Signal Legend

Tag	Device	Description	Number
AFB1	Flush Boxes	Air Signal Pilot	# 1
PS 1		Gun In Position Signal	
FBOX1		Gun Trigger Pilot	
AFB2		Air Signal Pilot	# 2
PS 2		Gun In Position Signal	
FBOX2		Gun Trigger Pilot	

### 8.5.4 Dump Valve

Dump valves are operated by pneumatic signals from the control panel. Connect the corresponding pilot tube from the control panel to the respective dump valve.

Connect the inlet and outlet of the dump valves to the corresponding gun circuits.

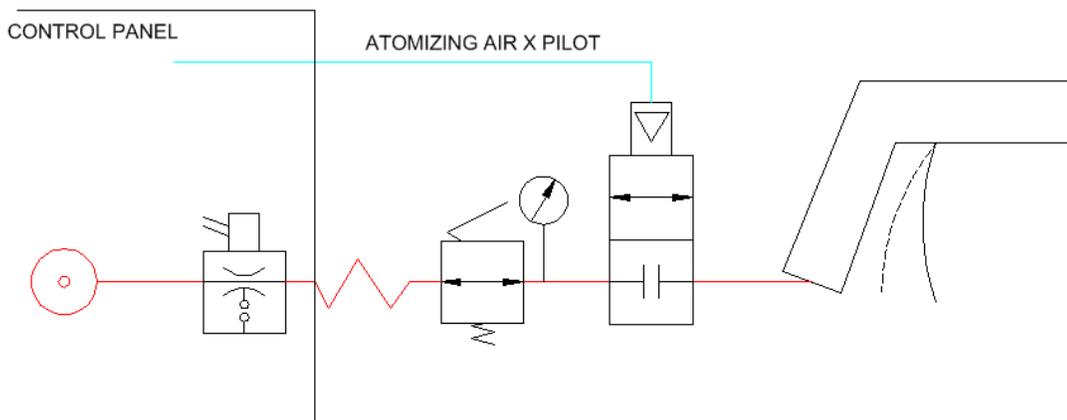
- Pilot Signal Legend

Tag	Device	Description	Number
DUMP1	Dump Valve	Dump Valve Pilot	# 1
DUMP2			# 2

### 8.5.5 Atomizing Air Manifold & Air Flow Switch -- Connecting a Manual Gun

The Air Flow switches are located in the control panel. The user must connect the manual gun atomizing airline to the control panel. The airline then is connected to the Regulator at the Atomizing Air Manifold.

The output of the manifold is where the final line to the gun is located.



Tag	Device	Description	Number
AA 1	AA Manifold	Atomizing Air Manifold	# 1
AAIR1			# 2
AA 2	AA Manifold	Atomizing Air Manifold	# 1
AAIR2			# 2

### 8.5.6 Automatic Two Fluid Circuit Management Valve

The 2-fluid circuit management valve is operated by pneumatic signals. Connect the corresponding pilot signal tubes from the control panel to the respective gun valve.

- Pilot Signal Legend

Tag	Device	Description	Number
GUN1	CTM Valve	Auto Two Gun Management	# 1
GUN2			# 2

The valve can be located on the exit of the mix manifold are remotely located. Connect the mix manifold to the inlet of the valve and the corresponding gun circuit lines to the outlet fittings.

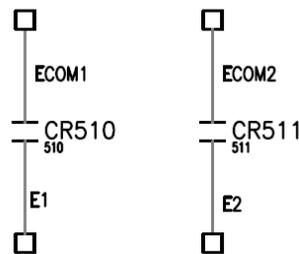
### 8.5.7 Electrostatic Manual Gun Interlock Contacts

The control panel is equipped with two contact relays which will control electrostatic high voltage enable for two units. The Electrostatic Controller must be connected to these interlock relays to disable the high voltage when the manual gun is in a flush box and the gun is being triggered, either for priming, pot life renewal or flushing.

Locate the dedicated terminals inside the control cabinet. See electrical drawing for additional information.



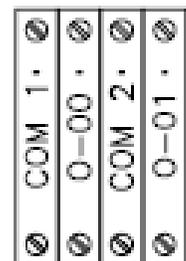
**ELECTROSTATIC INTERLOCKS**



### 8.5.8 External Gun Triggers

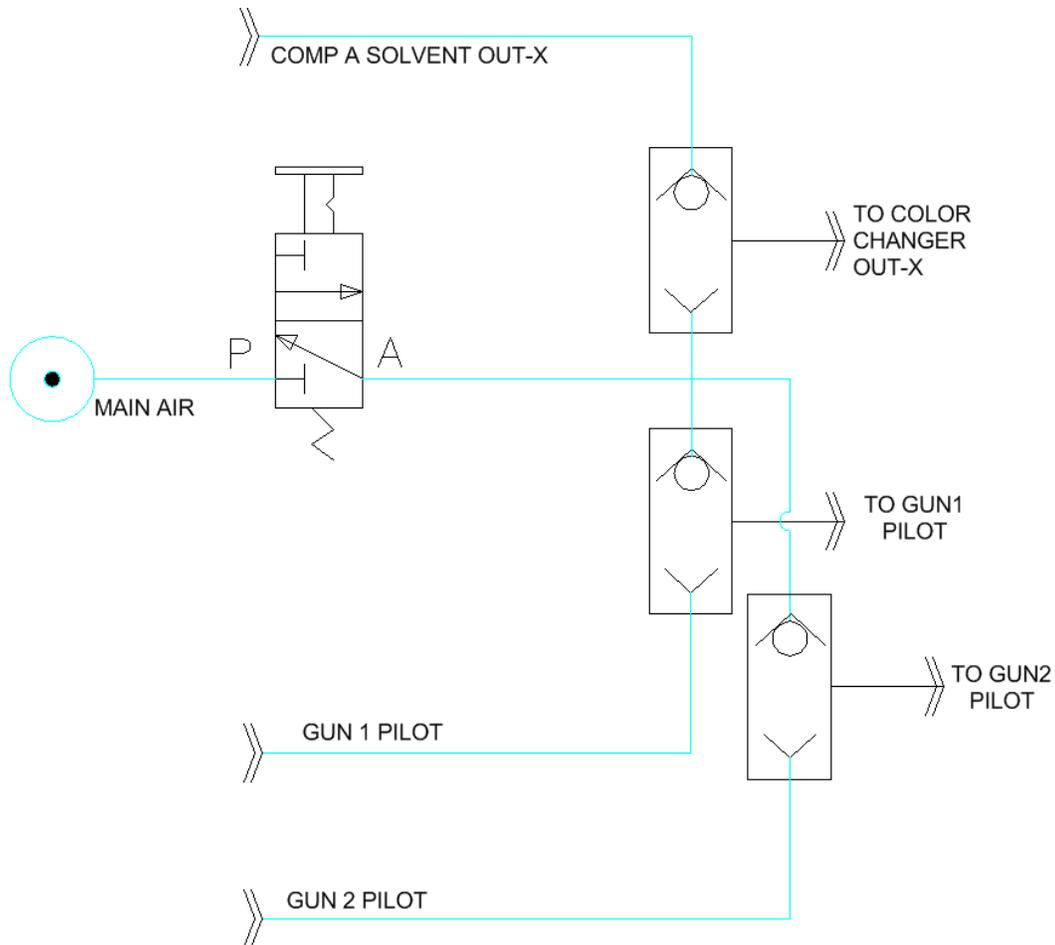
The external gun triggers allow the Expert to work with an automatic machine by telling the automatic machine that the guns need to be primed or flushed depending on the operational cycle. The external gun trigger is an independent contact relay and both require supply and return.

**External Gun Triggers**



### 8.5.9 Manual Flush Button

The manual flush button is incorporated onto the mixing manifold and must have an air supply for the pilot button to work. The output of the XOR valve must be connected to the desired flush solvent in case of a power outage or the machine cannot be purged by a normal means. This assumes that there is enough stored energy in the compressed air system to run the solvent supply pump and pilot the color change valve. The second input for the XOR valve is from the control panel and is the designated assigned output number for this solvent. Systems equipped with Auto Two-Fluid Circuit Management Valves require additional XOR valves to pilot the valves open in order to purge the mix manifold.



## 8.6 Robot Communication

Robot communication uses the same inputs as the Remote Panel to control operation. For recipe selection, the end user is expected to wire directly to the PLC five binary inputs. The binary inputs are used to form a decimal word with values from 1 to 31 corresponding to the recipe index numbers 1-31, respectively. The Expert also has binary status output bits assigned which the end user can use to verify the status of the Cyclomix Expert.

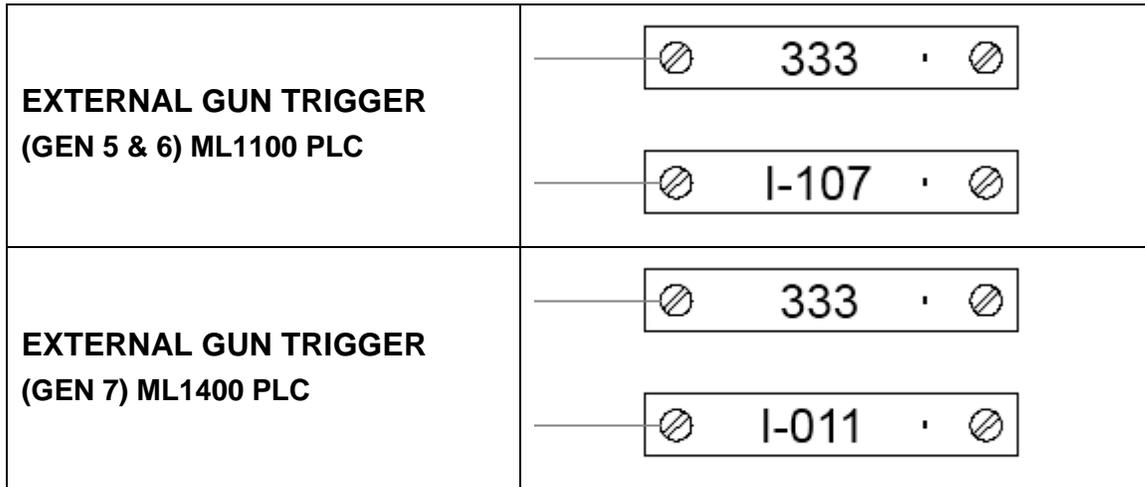
ROBOT COMMUNICATION		
ADDRESS	DESCRIPTION	NOTES
OUT 0/00	EXTERNAL GUN TRIGGER GUN CIRCUIT #1	DRY CONTACT
OUT 0/01	EXTERNAL GUN TRIGGER GUN CIRCUIT #2	DRY CONTACT
OUT 0/02	B COMP INJECTOR VALVE CONTACT RELAY	24VDC
OUT 0/03	C COMP INJECTOR VALVE CONTACT RELAY	24VDC
OUT 3/01	BINARY STATUS "SYSTEM IN PRODUCTION"	
OUT 3/02	BINARY STATUS "SYSTEM PRIMING"	
OUT 3/03	BINARY STATUS "SYSTEM FAULTED"	
OUT 3/04	BINARY STATUS "SYSTEM FLUSHING"	
OUT 3/10	POT LIFE WARNING	
IN 0/03	REMOTE WEEKEND FLUSH	
IN 0/04	BINARY 1 ROBOT	FIVE BITS FORM A WORD BINARY TO DECIMAL CONVERSION FOR RECIPE SELECTION (1-31)
IN 0/05	BINARY 2 ROBOT	
IN 0/06	BINARY 3 ROBOT	
IN 0/07	BINARY 4 ROBOT	
IN 0/08	BINARY 5 ROBOT	
IN 0/14	REMOTE START	
IN 0/15	REMOTE STOP	
IN 0/16	REMOTE PRODUCTION FLUSH	
IN 0/17	REMOTE RECIPE DECREMENT	
IN 0/18	REMOTE RECIPE LOAD	
IN 0/19	REMOTE RECIPE INCREMENT	

### 8.6.1 Bit Setting for Recipe Selection

1/00	1/01	1/02	1/03	1/04		RECIPE INDEX #
0	0	0	0	1		1
0	0	0	1	0		2
0	0	0	1	1		3
0	0	1	0	0		4
0	0	1	0	1		5
0	0	1	1	0		6
0	0	1	1	1		7
0	1	0	0	0		8
0	1	0	0	1		9
0	1	0	1	0		10
0	1	0	1	1		11
0	1	1	0	0		12
0	1	1	0	1		13
0	1	1	1	0		14
0	1	1	1	1		15
1	0	0	0	0		16
1	0	0	0	1		17
1	0	0	1	0		18
1	0	0	1	1		19
1	0	1	0	0		20
1	0	1	0	1		21
1	0	1	1	0		22
1	0	1	1	1		23
1	1	0	0	0		24
1	1	0	0	1		25
1	1	0	1	0		26
1	1	0	1	1		27
1	1	1	0	0		28
1	1	1	0	1		29
1	1	1	1	0		30
1	1	1	1	1		31

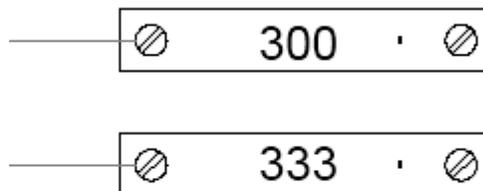
### 8.6.2 Remote Gun Trigger

For the Expert to operator with a machine, a gun trigger signal is required. The preferred method of wiring is to take the 24vdc (333) from the control panel and pass it through a set of normally open dry contacts, returning the signal to the PLC input. This signal will replace the atomizing air flow switch wired from 333 to I-107, (I-011 respectfully).



### 8.6.3 Interlock

An interlock is provided that can be used to interrupt the 24vdc power to the EXPERT's PLC inputs and outputs. If this circuit is used; power on 300 must be passed through other systems relays and returned to terminal 333.



If the interlock is not used, the end user is expected to place a jumper wire between the two terminals after verifying their incoming power. Kremlin Rexson removes the jumper at final inspection to prevent accidental power ups.



**Note:** The Cyclomix Expert will not operate without a jumper between terminals 300 and 333.

## 9 Machine I/O | Parameters

### 9.1 Digital Outputs

Address	Description	Notes
OUT 0/00	External Gun Trigger Gun Circuit #1	Dry Contact
OUT 0/01	External Gun Trigger Gun Circuit #2	Dry Contact
OUT 0/02	B Comp Injector Valve Contact Relay	24vdc
OUT 0/03	C Comp Injector Valve Contact Relay	24vdc
OUT 1/00	Solenoid Valve, User Config. #1	Expert Basic Supplied with 12 Product Configuration
OUT 1/01	Solenoid Valve, User Config. #2	
OUT 1/02	Solenoid Valve, User Config. #3	
OUT 1/03	Solenoid Valve, User Config. #4	
OUT 1/04	Solenoid Valve, User Config. #5	
OUT 1/05	Solenoid Valve, User Config. #6	
OUT 1/06	Solenoid Valve, User Config. #7	
OUT 1/07	Solenoid Valve, User Config. #8	
OUT 1/08	Solenoid Valve, User Config. #9	
OUT 1/09	Solenoid Valve, User Config. #10	
OUT 1/10	Solenoid Valve, User Config. #11	
OUT 1/11	Solenoid Valve, User Config. #12	
OUT 1/12	Solenoid Valve, User Config. #13	
OUT 1/13	Solenoid Valve, User Config. #14	
OUT 1/14	Solenoid Valve, User Config. #15	
OUT 1/15	Solenoid Valve, User Config. #16	
OUT 2/00	Solenoid Valve, User Config. #17	
OUT 2/01	Solenoid Valve, User Config. #18	
OUT 2/02	Solenoid Valve, User Config. #19	
OUT 2/03	Solenoid Valve, User Config. #20	
OUT 2/04	Solenoid Valve, User Config. #21	
OUT 2/05	Solenoid Valve, User Config. #22	
OUT 2/06	Solenoid Valve, User Config. #23	
OUT 2/07	Solenoid Valve, User Config. #24	
OUT 2/08	Flush Box #1 Gun Trigger Solenoid	
OUT 2/09	Flush Box #2 Gun Trigger Solenoid	
OUT 2/10	Atomization Air #1 Gun Solenoid Disable	
OUT 2/11	Atomization Air #2 Gun Solenoid Disable	
OUT 2/12	Dump Valve #1 Solenoid	
OUT 2/13	Dump Valve #2 Solenoid	
OUT 2/14	Gun #1 Circuit Selection Solenoid	
OUT 2/15	Gun #2 Circuit Selection Solenoid	
OUT 3/00	Air Purge Valve Solenoid	
OUT 3/01	Binary Status "System In Production"	
OUT 3/02	Binary Status "System Priming"	

Address	Description	Notes
OUT 3/03	Binary Status "System Faulted"	
OUT 3/04	Binary Status "System Flushing"	
OUT 3/05	Green Light	
OUT 3/06	Red Light	
OUT 3/07	Audible Alarm	
OUT 3/08	E-Stat Interlock Gun #1	
OUT 3/09	E-Stat Interlock Gun #2	
OUT 3/10	Pot Life Warning	

## 9.2 Digital Inputs

Address	Description	Notes
IN 0/00	Flow Meter Pulse Component A	
IN 0/01	Flow Meter Pulse Component B	
IN 0/02	Flow Meter Pulse Component C	
IN 0/03	Remote Weekend Flush	
IN 0/04	Binary 1 Robot	Five Bits Form a Word. Binary to Decimal Conversion for Recipe Selection
IN 0/05	Binary 2 Robot	
IN 0/06	Binary 3 Robot	
IN 0/07	Binary 4 Robot	
IN 0/08	Binary 5 Robot	
IN 0/09	Gun IN Flush Box #1	
IN 0/10	Gun IN Flush Box #2	
IN 0/11	Air Flow Switch Gun #1	Auto Gun Triggered
IN 0/12	Air Flow Switch Gun #2	Auto Gun Triggered
IN 0/13	Cycle/Machine Stop - Power IN	Panel Door Push Button
IN 0/14	Remote Start	
IN 0/15	Remote Stop	
IN 0/16	Remote Production Flush	
IN 0/17	Remote Recipe Decrement	
IN 0/18	Remote Recipe Load	
IN 0/19	Remote Recipe Increment	

### 9.3 Pneumatic Pilots and Supplies

Tag ID	Description	Termination Point	
AA 1	Atomization Air Valve Pilot#1	AA Control Valve 1	
AA 2	Atomization Air Valve Pilot#2	AA Control Valve 2	
AFB1	Flush Box Pilot Supply #1	Flush Box 1	
FBOX1	Gun Trigger, Flush Box Pilot #1		
PS 1	Gun IN Position Pressure Switch Pilot#1		
AFB2	Flush Box Pilot Supply #2	Flush Box 2	
FBOX2	Gun Trigger, Flush Box Pilot #2		
PS 2	Gun IN Position Pressure Switch Pilot#2		
DUMP1	Dump Valve Pilot #1	Dump Valve 1	
DUMP2	Dump Valve Pilot #2	Dump Valve 2	
AIR	Air Push Valve Pilot	A/B Mixing Block	
GUN 1	Two Fluid Circuit Manifold Pilot#1	Two Gun Manifold	
GUN 2	Two Fluid Circuit Manifold Pilot#2	Two Gun Manifold	
SPARE	Spare Valve	N/A	
OUT1	<p>User Configured Product Outputs</p> <p>See Product Assignment &amp; Configuration Worksheet &amp; Tables</p>	#1	Color Management Valve Stacks
OUT2		#2	
OUT3		#3	
OUT4		#4	
OUT5		#5	
OUT6		#6	
OUT7		#7	
OUT8		#8	
OUT9		#9	
OUT10		#10	
OUT11		#11	
OUT12		#12	
OUT13		#13	
OUT14		#14	
OUT15		#15	
OUT16		#16	
OUT17		#17	
OUT18		#18	
OUT19		#19	
OUT20		#20	
OUT21		#21	
OUT22		#22	
OUT23		#23	
OUT24		#24	
AAIR1	Atomizing Air Supply #1	CP, Gun Manifold 1	
AAIR2	Atomizing Air Supply #1	CP, Gun Manifold 2	

## 9.4 Product Configuration Assignments

Configurable Output Number	PLC Integer Address	Configurable Output Number	PLC Integer Address
Out 1	N16:1	Out 13	N16:13
Out 2	N16:2	Out 14	N16:14
Out 3	N16:3	Out 15	N16:15
Out 4	N16:4	Out 16	N16:16
Out 5	N16:5	Out 17	N16:17
Out 6	N16:6	Out 18	N16:18
Out 7	N16:7	Out 19	N16:19
Out 8	N16:8	Out 20	N16:20
Out 9	N16:9	Out 21	N16:21
Out 10	N16:10	Out 22	N16:22
Out 11	N16:11	Out 23	N16:23
Out 12	N16:12	Out 24	N16:24

### 9.4.1 Integer Settings

COMP A	Integer Setting	COMP A Solvents	Integer Setting	COMP B	Integer Setting	COMP B Solvents	Integer Setting
COMP A 1	1	A Solvent 1	101	COMP B 1	201	B Solvent 1	301
COMP A 2	2	A Solvent 2	102	COMP B 2	202	B Solvent 2	302
COMP A 3	3	A Solvent 3	103	COMP B 3	203	B Solvent 3	303
COMP A 4	4	A Solvent 4	104	COMP B 4	204	B Solvent 4	304
COMP A 5	5	A Solvent 5	105	COMP B 5	205	B Solvent 5	305
COMP A 6	6	A Solvent 6	106	COMP B 6	206	B Solvent 6	306
COMP A 7	7	A Solvent 7	107	COMP B 7	207	B Solvent 7	307
COMP A 8	8	A Solvent 8	108	COMP B 8	208	B Solvent 8	308
COMP A 9	9	A Solvent 9	109	COMP B 9	209	B Solvent 9	309
COMP A 10	10	A Solvent 10	110	COMP B 10	210	B Solvent 10	310
COMP A 11	11	A Solvent 11	111	COMP B 11	211	B Solvent 11	311
COMP A 12	12	A Solvent 12	112	COMP B 12	212	B Solvent 12	312
COMP A 13	13	A Solvent 13	113	COMP B 13	213	B Solvent 13	313
COMP A 14	14	A Solvent 14	114	COMP B 14	214	B Solvent 14	314
COMP A 15	15	A Solvent 15	115	COMP B 15	215	B Solvent 15	315
COMP A 16	16	A Solvent 16	116	COMP B 16	216	B Solvent 16	316
COMP A 17	17	A Solvent 17	117	COMP B 17	217	B Solvent 17	317
COMP A 18	18	A Solvent 18	118	COMP B 18	218	B Solvent 18	318
COMP A 19	19	A Solvent 19	119	COMP B 19	219	B Solvent 19	319
COMP A 20	20	A Solvent 20	120	COMP B 20	220	B Solvent 20	320
COMP A 21	21	A Solvent 21	121	COMP B 21	221	B Solvent 21	321
COMP A 22	22	A Solvent 22	122	COMP B 22	222		

### 9.4.2 Product Configuration Worksheet

Use this page as a record of your configured outputs for your products. See previous page for possible variable assignments.

CUSTOMER REFERENCE	PRODUCT VALVE NUMBER	PNEUMATIC PILOT	PILOT LINE TAG	PRODUCT NAME DESCRIPTION	PLC ADDRESS	ADDRESS VALUE
		OUT 01			N16:1	00400
		OUT 02			N16:2	00400
		OUT 03			N16:3	00400
		OUT 04			N16:4	00400
		OUT 05			N16:5	00400
		OUT 06			N16:6	00400
		OUT 07			N16:7	00400
		OUT 08			N16:8	00400
		OUT 09			N16:9	00400
		OUT 10			N16:10	00400
		OUT 11			N16:11	00400
		OUT 12			N16:12	00400
		OUT 13			N16:13	00400
		OUT 14			N16:14	00400
		OUT 15			N16:15	00400
		OUT 16			N16:16	00400
		OUT 17			N16:17	00400
		OUT 18			N16:18	00400
		OUT 19			N16:19	00400
		OUT 20			N16:20	00400
		OUT 21			N16:21	00400
		OUT 22			N16:22	00400
		OUT 23			N16:23	00400
		OUT 24			N16:24	00400

## 9.5 Global Setup Parameters

Name	Description	Unit	Allowable Values
Atomization Air Delay Off	The amount of time the atomization air is to remain on after a fault.	Time (Seconds)	0-9999
Flow Fault Solvent	The amount of time to elapse before the expert announces a flow faults for component a or b solvent circuit.	Time (Seconds)	0-9999
Flow Fault Comp A	The amount of time to elapse before the expert announces a flow fault for the component circuit.	Time (Seconds)	1-9999
Flow Fault Comp B & C	The amount of time to elapse before the expert announcing a flow fault for the b or c components.	Time (Seconds)	1-9999
Prime Comp A	Amount of material that is required to prime/load the component a circuit.	VOLUME (Ccs)	0-9999
Prime Comp B	Amount of material that is required to prime/load the component b circuit.	VOLUME (Ccs)	0-9999
Prime Timer	Amount of time to elapse before enabling flow faults	Time (Seconds)	1-9999
Remote Panel	Allows the expert to be operated from a remote reed panel.	Boolean	Icon Change Yes/No
Flush Box Present	Allows the expert to load/flush/prime and renew material to a manual gun if the flush box is present.	Boolean	Icon Change Yes/No
Trigger Off Delay Time	Allows the machine to be trigger on by an external trigger that is too short in duration.	Time (Seconds)	0-999
Robot Enable	Allows the expert to be controlled form an external plc, robot controller or machine controller.	Boolean	Icon Change Yes/No
Immediate Production	Determines if the machine will enter production mode after primer or wait for additional command	Boolean	Icon Change Yes/No
Flush Box Renewal	Determines if the expert will renew the material to the gun or flush the guns.	Boolean	Icon Change Yes/No
Flush Box Max # Of Renewals Value	Number of times the machine will allow the renewal of material	Integer	0-999
Airless System	Allows the expert to operate in an airless system without the flow switch inputs for sensing gun trigger.	Boolean	Icon Change Yes/No
Airless System Time Out	The amount of time before the expert is put in the rest mode when not sensing material flow.	Time (Seconds)	0-9999
Component A No. Of Pulses to Consider Flow	The number of check valve pulses to be consider before triggering alarm for the A component.	Integer	0-20000

Name	Description	Unit	Allowable Values
Component B No. Of Pulses to Consider Flow	The number of check valve pulses to be consider before triggering alarm for the B component.	Integer	0-20000
Component C No. Of Pulses to Consider Flow	The number of check valve pulses to be consider before triggering alarm for the C component.	Integer	0-20000
Machine Number	This parameter allows the machine to be assigned a unique number so it can be tracked in the consumption data log	Integer	1-19999

### 9.6 Batch Parameters

Name	Description	Unit	Allowable Values
Dispense Amount	Amount of material operator wishes to dispense into cup	Volume (CCs)	0-5000

### 9.7 Calibration Parameters

Name	Description	Unit	Allowable Values
Comp B Actual	Amount of B component dispense for the given number of pulses	Volume (Ccs)	0-5000
Comp A Actual	Amount of A component dispense for the given number of pulses	Volume (Ccs)	0-5000
Comp C Actual	Amount of C component dispense for the given number of pulses	Volume (Ccs)	0-5000
Comp B Checkbox	Allows the operator to skip the B component step in the calibration, ratio test and batching operations	Boolean	Icon Color Change Red/Green
Comp A Checkbox	Allows the operator to skip the A component step in the calibration, ratio test and batching operations	Boolean	Icon Color Change Red/Green
Comp C Checkbox	Allows the operator to skip the C component step in the calibration, ratio test and batching operations	Boolean	Icon Color Change Red/Green

## 9.8 Recipe Management Parameters

### 9.8.1 Screen 1 of 10

Name	Description	Unit	Allowable Values
Current	Name of the active recipe being edited or created.	Alphanumeric + Symbols	14 Char Length
A/B SP	Ratio of Component B to Component A Setpoint.	No Unit of Measure	3 Place Decimal
MIN INJ B	The least amount of Component B to flow per injection.	Volume (Ccs)	2 Place Decimal
A/C SP	Ratio of Component C to Component a Setpoint.	No Unit Of Measure	3 Place Decimal
MIN INJ C	The least amount of Component A to flow per injection.	Volume (Ccs)	2 Place Decimal
Pot Life	The value of time that cannot be exceeded when mixed material is not being used.	Time (Minutes)	1-999
Critical Pot Life	Amount of time that the operator is given to take action before a system flush is conducted.	Time (Seconds)	1-9999
Pot Life Reset	Amount of material to pass before resetting pot life timer.	Volume (Ccs)	1-9999

### 9.8.2 Screen 2 of 10

Name	Description	Unit	Allowable Values
A/B Min Ratio Tolerance	Minimum ratio allowed before triggering a ratio fault alarm.	No Unit of Measure	2 Place Decimal
A/B Max Ratio Tolerance	Maximum ratio allowed before triggering a ratio fault alarm.	No Unit of Measure	2 Place Decimal
A/B Calculated Ratio Tolerance	The number of Component B to Component A injections to be averaged before displaying the ratio.	Integer	1-10
Fault Mask Ratio Tolerance	The number of consecutive A/B injections allowed exceed the min/max limits before triggering a ratio fault.	Integer	1-10
A/C Min Ratio Tolerance	Minimum ratio allowed before triggering a ratio fault alarm.	No Unit of Measure	2 Place Decimal
A/C Max Ratio Tolerance	Maximum ratio allowed before triggering a ratio fault alarm.	No Unit of Measure	2 Place Decimal
A/C Calculated Ratio Tolerance	The number of Component C to Component A injections to be averaged before displaying the ratio.	Integer	1-10
Fault Mask Ratio Tolerance	The number of consecutive A/C injections allowed exceeding the min/max limits before triggering a ratio fault.	Integer	1-10

9.8.3 Screen 3 of 10

Name	Description	Unit	Allowable Values
Flow Meter CCs / Pulse Comp A	The volume of material per pulse of the corresponding check valve.	No Unit of Measure	3 Place Decimal
Flow Meter CCs / Pulse Comp B	The volume of material per pulse of the corresponding check valve.	No Unit of Measure	3 Place Decimal
Flow Meter CCs / Pulse Comp C	The volume of material per pulse of the corresponding check valve.	No Unit of Measure	3 Place Decimal
Percentage of VOC In Mix	The percentage of volatile organic compounds in the mix material.	Percentage	0.00-100.00%
Percentage of VOC In A Solvent	The percentage of volatile organic compounds in the Component A solvent.	Percentage	0.00-100.00%
Percentage of VOC In B Solvent	The percentage of the volatile organic compounds in the Component B solvent.	Percentage	0.00-100.00%

9.8.4 Screen 4 of 10

Name	Description	Unit	Allowable Values
Select Gun #1 Only	Select the gun or guns to spray this recipe.	Option Button	Icon Change
Select Gun #2 Only			
Select Guns #1 & #2			
Gun #1 Prime Volume	Amount of mixed material required to fill the line to gun #1.	Volume (CCs)	0-32000
Gun #2 Prime Volume	Amount of mixed material required to fill the line to gun #2.	Volume (CCs)	0-32000
Auto Gun #1 Prime Volume	Volume of material required for priming the Auto guns with the external trigger for gun circuit #1.	Volume (CCs)	0-32000
Auto Gun #2 Prime Volume	Volume of material required for priming the Auto guns with the external trigger for gun circuit #2.	Volume (CCs)	0-32000

9.8.5 Screen 5 of 10

Name	Description	Unit	Allowable Values
Component A Number	Select the desired comp a product number to correspond with this recipe.	Integer	1-24
Component B Number	Select the desired comp b product number to correspond with this recipe.	Integer	1-24
No. Of Components	Select the number of components this recipe will manage.	Integer	1 , 2, 3
Auto Gun #1 Flush Volume	The volume of solvent required to flush the auto gun circuit #1.	Volume(CCs)	0-10000
Auto Gun #1 Flush Time	The time of solvent required to flush the auto gun circuit #1.	Time (Seconds)	0-10000
Auto Gun #2 Flush Volume	The volume of solvent required to flush the auto gun circuit #2.	Volume(CCs)	0-10000
Auto Gun #2 Flush Time	The time of solvent required to flush gun circuit #2.	Time (Seconds)	0-10000

9.8.6 Screen 6 of 10

Name	Description	Unit	Allowable Values
Gun #1 Flush Step 1 Time/Volume Icon	Select time or volume as the desired unit of measure for Step 1 flush sequence.	Boolean	Icon Change
Gun #1 Flush Step 1 A Comp Solvent	Set the desired amount of solvent for the Step 1 Component A solvent flush sequence.	Time (Seconds) Or Volume(CCs)	0-32000
Gun #1 Flush Step 1 A Comp Solvent No.	Select the desired Component A solvent number to perform Step 1 of the flush sequence.	Integer	1-24
Gun #1 Flush Step 2 Time/Volume Icon	Select time or volume as the desired unit of measure for Step 2 flush sequence.	Boolean	Icon Change
Gun #1 Flush Step 2 B Component	Set the desired amount of Component B for the Step 2 of the flush sequence.	Time (Seconds) Or Volume(CCs)	0-32000
Gun #1 Flush Step 3 Time/Volume Icon	Select time or volume as the desired unit of measure for Step 3 flush sequence.	Boolean	Icon Change
Gun #1 Flush Step 3 B Comp Solvent	Set the desired amount of solvent for the Step 3 Component B solvent flush sequence.	Time (Seconds) Or Volume(CCs)	0-32000
Gun #1 Flush Step 3 B Comp Solvent No.	Select the desired Component B solvent number to perform Step 3 of the flush sequence.	Integer	1-24

9.8.7 Screen 7 of 10

Name	Description	Unit	Allowable Values
Gun #1 Flush Step 4 Solvent Push	Set the amount of time for the solvent valve to open for the Step 4 air/solvent push.	Time (Seconds)	0-32000
Gun #1 Flush Step 4 Air Push	Set the amount of time for the air valve to open for the Step 4 air/solvent push.	Time (Seconds)	0-32000
Gun #1 Flush Step 4 Solvent No.	Select the desired solvent number to be used for the air/solvent push.	Integer	1-24
Gun #1 Flush Step 4 No. Of Cycles	Select the number of cycles the air/solvent push will complete.	Integer	0-99
Gun #1 Flush Step 5 Time/Volume Icon	Select time or volume as the desired unit of measure for Step 5 flush sequence.	Boolean	Icon Change
Gun #1 Flush Step 5 A Comp Solvent	Set the desired amount of solvent for the Step 5 Component A solvent flush sequence.	Time (Seconds) Or Volume(CC's)	0-32000
Gun #1 Flush Step 5 A Comp Solvent No.	Select the desired Component A solvent number to perform Step 5 of the flush sequence.	Integer	1-24
Gun #1 Flush Step 6 Time/Volume Icon	Select time or volume as the desired unit of measure for Step 6 flush sequence.	Boolean	Icon Change
Gun #1 Flush Step 6 B Component	Set the desired amount of solvent for the Step 6 Component B solvent flush sequence.	Time (Seconds) Or Volume(CC's)	0-32000
Gun #1 Flush Step 6 B Component No.	Select the desired Component B solvent number to perform Step 6 of the flush sequence.	Integer	1-24

9.8.8 Screen 8 of 10

Name	Description	Unit	Allowable Values
Gun #2 Flush Step 1 Time/Volume Icon	Select time or volume as the desired unit of measure for Step 1 flush sequence.	Boolean	Icon Change
Gun #2 Flush Step 1 A Comp Solvent	Set the desired amount of solvent for the Step 1 Component A solvent flush sequence.	Time (Seconds) Or Volume(CC)	0-32000
Gun #2 Flush Step 1 A Comp Solvent No.	Select the desired Component A solvent number to perform Step 1 of the flush sequence.	Integer	1-24
Gun #2 Flush Step 2 Time/Volume Icon	Select time or volume as the desired unit of measure for Step 2 flush sequence.	Boolean	Icon Change
Gun #2 Flush Step 2 B Component	Set the desired amount of Component B for the Step 2 of the flush sequence.	Time (Seconds) Or Volume(CC)	0-32000
Gun #2 Flush Step 3 Time/Volume Icon	Select time or volume as the desired unit of measure for Step 3 flush sequence.	Boolean	Icon Change
Gun #2 Flush Step 3 B Comp Solvent	Set the desired amount of solvent for the Step 3 Component B solvent flush sequence.	Time (Seconds) Or Volume(CC)	0-32000
Gun #2 Flush Step 3 B Comp Solvent No.	Select the desired Component B solvent number to perform Step 3 of the flush sequence.	Integer	1-24

9.8.9 Screen 9 of 10

Name	Description	Unit	Allowable Values
Gun #2 Flush Step 4 Solvent Push	Set the amount of time for the solvent valve to open for the Step 4 air/solvent push.	Time (Seconds)	0-32000
Gun #2 Flush Step 4 Air Push	Set the amount of time for the air valve to open for the Step 4 air/solvent push.	Time (Seconds)	0-32000
Gun #2 Flush Step 4 Solvent No.	Select the desired solvent number to be used for the air/solvent push.	Integer	1-24
Gun #2 Flush Step 4 No. Of Cycles	Select the number of cycles the air/solvent push will complete.	Integer	0-99
Gun #2 Flush Step 5 Time/Volume Icon	Select time or volume as the desired unit of measure for Step 5 flush sequence.	Boolean	Icon Change
Gun #2 Flush Step 5 A Comp Solvent	Set the desired amount of solvent for the Step 5 Component A solvent flush sequence.	Time (Seconds) Or Volume(CCs)	0-32000
Gun #2 Flush Step 5 A Comp Solvent No.	Select the desired Component A solvent number to perform Step 5 of the flush sequence.	Integer	1-24
Gun #2 Flush Step 6 Time/Volume Icon	Select time or volume as the desired unit of measure for Step 6 flush sequence.	Boolean	Icon Change
Gun #2 Flush Step 6 B Component	Set the desired amount of solvent for the Step 6 Component B solvent flush sequence.	Time (Seconds) Or Volume(CCs)	0-32000
Gun #2 Flush Step 6 B Component No.	Select the desired Component B solvent number to perform Step 6 of the flush sequence.	Integer	1-24

### 9.8.10 Screen 10 of 10

Name	Description	Unit	Allowable Values
Flow Fault Min	Select the desired value for the minimum flow.	Material Volume (CCs)	0-32000
Flow Fault Max	Select the desired value for the maximum flow.	Material Volume (CCs)	0-32000
Fault Enabled	Allows all faults to be ignored if disabled.	Boolean	Icon Change
Display Flow Fault	Disables the flow fault alarm.	Boolean	Icon Change
Solvent Flow Fault	Disables the solvent flow fault alarm.	Boolean	Icon Change
Ratio Fault	Disables the ratio fault alarm.	Boolean	Icon Change

### 9.9 Recipe Consumption Data Parameters

Name	Description	Unit
DATE	The Year/Month/Date the recipe is saved	YYYY/MM/DD
TIME	The Hour/Minute/Second the recipe is saved	HH:MM:SS
MACHINE #	Machine Number indicating the customer specified number	INTEGER (1-999999)
BATCH #	User Batch Number indicating the customer specified number	INTEGER (1-999999)
RECIPE #	Recipe index number which corresponds to the recipe name	INTERGER (1-50)
COMP A #	Corresponding Component A assigned number for the given recipe	(1-22)
COMP A (VOL)	Volume of material for the A Component	VOLUME (cc's)
COMP B #	Corresponding Component B assigned number for the given recipe	(1-21)
COMP B (VOL)	Volume of material for the B Component	VOLUME (cc's)
COMP C (VOL)	Volume of material for the C Component	VOLUME (cc's)
TOTAL VOLUME	Total volume of material	VOLUME (cc's)
A SOLV (VOL)	The volume of the A Solvent	VOLUME (cc's)
B SOLV (VOL)	The volume of the B Solvent	VOLUME (cc's)
TOTAL SOLV	The total volume of Solvent	VOLUME (cc's)
TOTAL VOC	The percentage of the total volume of VOC	% VOC
A/B	The A/B ratio set point for the given recipe	3 PLACE DECIMAL
A/C	The A/C ratio set point for the given recipe	3 PLACE DECIMAL

## 10 Maintenance

### 10.1 Flow Meter

The following are guidelines for paint operations.

Before installing, operating or attempting maintenance on a flow meter read the appropriate Maintenance Guide. As with any precision engineered device, the equipment should always be operated and maintained in accordance with the manufacturer's instructions.

Flow Meters are designed to flow liquids which assist in cooling and lubrication. Meters should always be closed to air except when air is part of an automated purge cycle – in this case the air segments are typically under 1-2 seconds and are interspersed with lubrication solvent to achieve a scrubbing effect – the air segments are short enough that the meter doesn't dry out. Do not dry paint lines using only pressurized air as this will lead to premature wear.

At the end of a shift or overnight it is strongly recommended that cleaning solvent or DI water with appropriate cutting agent be left in the meter, under pressure, to soak. This helps keep un-flushed residual paint from drying and helps subsequent start-ups. Opening a meter after a flush cycle will help determine if the meter is being cleaned thoroughly by the purge.

Regular cleaning cycles with solvent or DI water may be necessary to effect color changes or to prevent some coatings from depositing on critical internal parts. Designing and maintaining a flush procedure which keeps the meter internals clean & wet is critical to optimum performance & minimum maintenance. Cleaning cycles will vary due to differences in coatings, equipment, & cleaning fluids used and some testing may be prudent to determine the most efficient method. Cleaning cycles using D/I water only may require more flushing than those using additives due to the superior cutting ability of solvents. If bells or small orifices restrict adequate purge through the meter, an auxiliary dump valve of 1/4" or 3/8" may be installed after the meter to maximize thru-flow.

Full flow meter breakdown instructions are included in the Maintenance Guide. When a meter is removed from the line during maintenance, paint should not be allowed to dry inside. The internals should be cleaned immediately, lubricated and the fluid ports capped. Clean the carbide surfaces at the point where the gear rotates on the shaft. Paint build up here may occur as a thin smear and be difficult to see but will cause friction and accelerate additional paint build up later when the gears are reinstalled. Spin the gears by hand to verify free and easy rotation of gear on shaft and apply a suitable lubrication fluid before closing the meter. After tightening the bolts, a short squirt of shop air will briefly spin the gears which should be easily audible. When re-installing the sensor tighten, lightly, only to a hand tight torque. Do not use a wrench on the pickup as over tightening may cause damage.

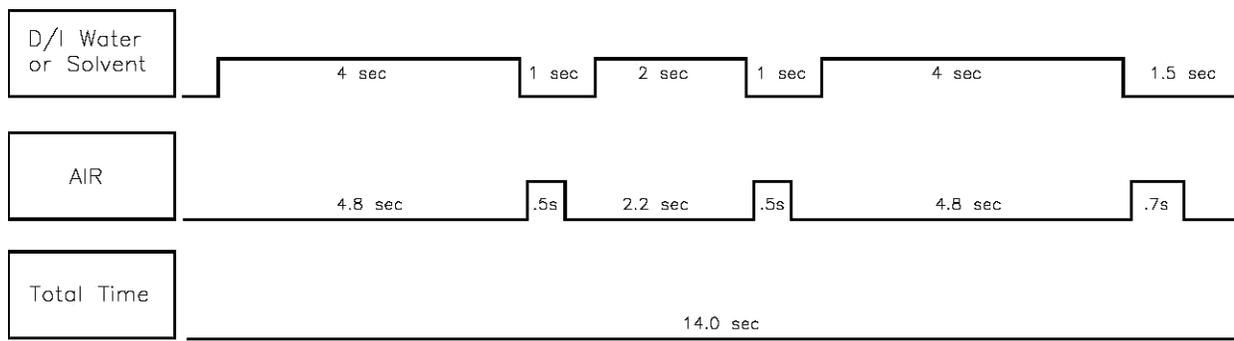
In the event of plugging, the meter will pass a reduced volume of fluid with an increased back pressure and no frequency output. Care during installation is important as this is the most likely time that contaminants such as tape or metal shavings can enter the meter. Filters should be in line to prevent oversized particles from entering the flow meter.

In the event the meter needs to be returned to the factory for further evaluation flush the meter in place and cap the ports.

<b>DO:</b>	<p>Leave flushing solvent in the lines overnight or during extended off -times. This keeps internals wet, preventing residual paint from drying, helping start ups</p>
	<p>Follow the Maintenance Guide instructions when opening and cleaning a meter. During cleaning separate the gears from the shafts. On carbide bearings, clean inside the center of the gear bearing and on the outer surface of the shafts at the point where the gear rotates on the shaft. Apply a suitable lubricating fluid before closing the meter. After tightening the bolts, a short squirt of shop air will briefly spin the gears which should be easily audible.</p>
	<p>Install and maintain filters. The recommended filter should be installed to eliminate potential plugging. Should plugging occur, the meter will still pass fluid but with no signal output.</p>
	<p>Check electrical compatibility between the meter's output signal and the input of the PLC. If signals are not being detected at start up, first check wiring and electrical compatibility.</p>
	<p>Verify reliable grounding of electrical parts, as per installation guidelines, and a dedicated power supply is recommended. Voltage spikes on shared power lines, negligent grounding, and sloppy wiring will likely produce erratic readings and chronic maintenance the control valve will provide back pressure which is beneficial to stable flow control.</p>
	<p>Install the meter immediately upstream of the regulator or control valve. The control valve provides back pressure which stabilizes the flow.</p>
<b>DON'T</b>	<p>Allow air into the flow meter. Always keep the meter internally wet.</p>
	<p>Dry paint lines using pressurized air. Flow meters are designed to flow liquids. Meters should be closed to air except when air is part of an automated purge cycle. Do not dry lines after purging.</p>
	<p>Allow materials to dry inside the meter. When a meter is removed from the line during maintenance the internals should be cleaned immediately, lubricated and the fluid ports capped</p>
	<p>Over tighten the pickup sensor beyond hand tight when installing the pickup sensor turn it in lightly to a hand tight torque. Do not use a wrench on the pickup as over tightening may cause a dimple of metal under the sensor nose to protrude into the gear cavity &amp; interfere with the gear's rotation.</p>
	<p>Use water or solvent for calibration or test purposes. Water or solvent may not turn the gears at low flow and may leave the impression that the meter is not functioning. A calibration factor (k-factor) is issued with the flow meter which is valid for most fluids except water or equivalent viscosities.</p>

**10.1.1 Typical Automated Cleaning Cycle**

At the beginning of the cleaning cycle, clean with DI water for a significant period of time before introducing any air at all into the system - for example the first thing the meter should see after push out is a relatively long blast of solvent or DI water for at least 3 seconds or more depending on the coating. In the middle of the cleaning cycle, short (0.5 sec) air blasts will maximize the scrubbing effect. At the end of the cleaning cycle, finish with solvent or DI water instead of air. The intention is to put enough purge fluid into the system at this time to have the meter soaking in clean flush fluid at the end of the cycle. When there are gaps in the line or when line stops occur after a color change following this procedure will keep the meter from potentially freezing up. In general, the meter should never see air for more than a few seconds and should never be run dry. Note: If new paint and purge fluid mixing is a problem the fill cycle can start with a short 1 second shot of air to separate the purge fluid and the paint.



During line shutdowns such as overnight and over weekends meters should be flushed and left filled with solvent, under pressure, to allow any residue that may have built up to soak and dissolve.

Filtration is recommended to prevent contaminants from entering the meter. Should the meter become plugged a reduced flow will still be observed from the nozzle or outlet as fluid pressure will squeeze fluid through the meter.

### 10.1.2 Calibrations

Each flow meter is calibrated and given a 'K Factor' using a standard calibrating fluid at the factory. This number is accurate for all fluids, with most viscosities, except the most water-like. There should be no need to change this except for the very lowest viscosities close to 1.0 cP.

If flow readings are too high If the display shows significantly more than the volume actually dispensed or shows flow when there is definitely no flow - this most likely indicates an electrical noise problem. In such cases turn off nearby motors or heaters or relays, check cable shielding and establish a clean ground independent of other electrical devices before repeating accuracy tests. If the problem continues it may be necessary to relocate the offending device

If flow readings are too low If the display shows significantly less than the volume actually dispensed then most likely the meter has a high slippage factor and the fluid is by-passing the gears and the k-factor may require adjustment.

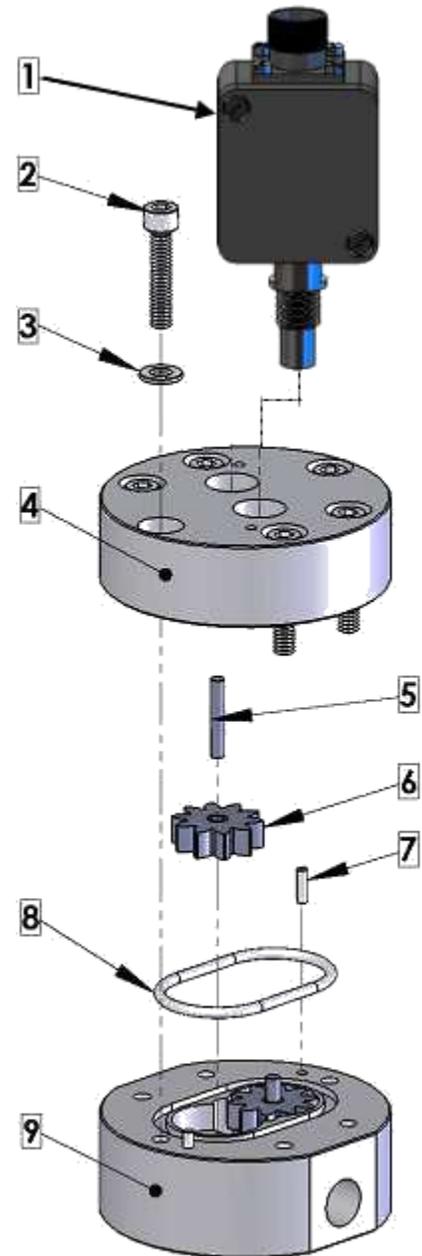
If it is necessary to adjust the existing k-factor: Trigger at least 500ml of your sample fluid, in a steady stream, at approximately the desired flow rate, into a graduated beaker. Compare the volume in the beaker to the volume on the display. Do not time the operation merely measure the volume dispensed. Repeat the sample 3 times and take an average. If the result is outside an acceptable margin, adjust the K Factor by the % difference between the average beaker sample and the average displayed total. If the error is not corrected clean the meter thoroughly and repeat the procedure. Do not use water for this test.

If it is necessary to re-calculate a new k-factor: You will first need a data collecting instrument to count pulses produced by the meter. A display may be used in totalize mode provided the KFT is set to count each pulse (KFT = 10000). Trigger at least 500ml of your sample fluid, in a steady stream, at approximately the desired flow rate, into a graduated beaker. Divide the number of pulses by the volume dispensed and the result is your new k-factor in the units of your sample...in the example above the k-factor units would be impulses/ml.

### 10.1.3 Bushing Style

Cleaning, inspecting or repairing a Bushing Style volumetric flow meter is easily accomplished by following the procedures below.

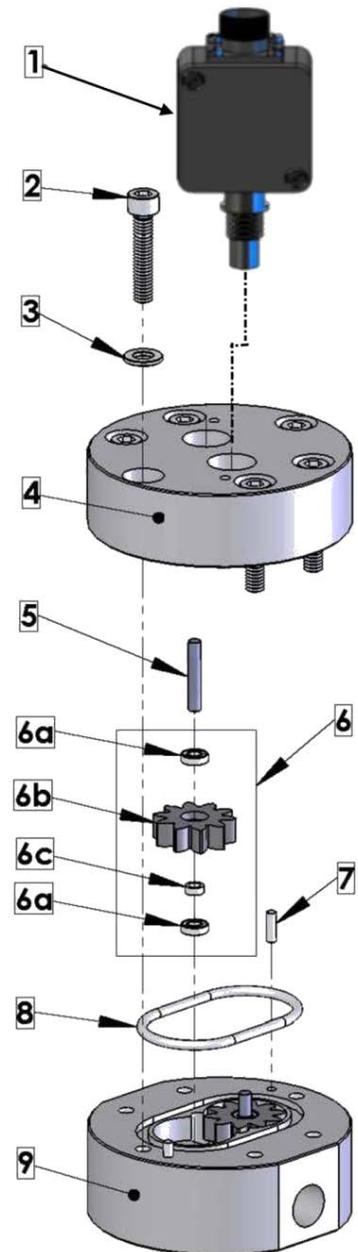
1. Remove the Sensor (1) from the flow meter body Upper Housing (4). Using a 3mm hex key, loosen the 2 mounting screws inside the sensor.
2. Use M6 Bolts (2), loosen them using a 5mm hex key. Keep the 2 opposing bolts near the Locating Pins (7) engaged by a few threads to avoid stress on the shafts and the locating pins during housing separation. Please note the orientation of the Upper and Lower housings with respect to each other so that the meter is reassembled the same way.
3. Holding the Upper Housing (4), gently tap on the top of the 2 opposing bolt heads to separate the Upper Housing (4) from the Lower Housing (9). Do NOT use chisels or screwdrivers to split and pry apart the housings. This can cause damage to the meter bodies and meter internal parts.
4. After separation, remove, clean and inspect the gears (6) and shafts (5). Clean out the O-ring groove, shaft holes and meter cavity.
5. After cleaning all parts completely, the Gears (6), Shafts (5) and Locating Pins (7) can be reinserted. Check for free and easy rotation of the gears.
6. Replace the O-Ring (8). Teflon o-rings should always be replaced. Viton o-rings can be reused if they are not damaged.
7. During reassembly keep the meter housings as parallel as possible. Make sure the housings are orientated the same way they were prior to disassembly.
8. Replace the Washers (3) and the Bolts (2). Torque the bolts to 15Nm 11ft\*lbs for the M6 bolts. Do not force the meter housings together. Do NOT use a hammer or other such device. Over tightening will not cause damage to the meter, but may fatigue the bolts and/or restrict the operation if internal surfaces are not completely clean.
9. After reassembly, gently blow air through the meter so the gears spin. This should be clearly audible given a moderate background noise level.
10. Clean any debris from the pickup holes before remounting the sensor (1) to the Upper Housing (4). Use a 3mm hex key to tighten the mounting screws in the sensor to mount the sensor on the housing. Note that there is a correct and incorrect orientation for the sensor to be mounted on the flow meter. The orientation is noted by the sensor's connector with respect to the outlet port of the flow meter.



### 10.1.4 Bearing Style

Cleaning, inspecting or repairing a Bearing Style volumetric flow meter is easily accomplished by following the procedures below.

1. Remove the Sensor (1) from the flow meter body Upper Housing (4). Using a 3mm hex key, loosen the 2 mounting screws inside the sensor.
2. Use M6 Bolts (2), loosen them using a 5mm hex key. Keep the 2 opposing bolts near the Locating Pins (7) engaged by a few threads to avoid stress on the shafts and the locating pins during housing separation. Please note the orientation of the Upper and Lower housings with respect to each other so that the meter is reassembled the same way.
3. Holding the Upper Housing (4), gently tap on the top of the 2 opposing bolt heads to separate the Upper Housing (4) from the Lower Housing (9). Do NOT use chisels or screwdrivers to split and pry apart the housings. This can cause damage to the meter bodies and meter internal parts.
4. After separation, remove, clean and inspect the gear assemblies (6) and shafts (5). Clean out the O-ring groove, shaft holes and meter cavity. **IMPORTANT:** The gear assembly consists of two bearings (6a), the Gear (6b), and a Bearing Spacer (6c). These parts are loosely fitted and can fall out. These parts are matched together and careful attention **MUST** be made to their orientation and location as they **MUST** be replaced the exact way they as they were removed.
5. After cleaning all parts completely, the Gear Assemblies (6), Shafts (5) and Locating Pins (7) can be reinserted. Check for free and easy rotation of the gears.
6. Replace the O-Ring (8). Teflon o-rings should always be replaced. Viton o-rings can be reused if they are not damaged.
7. During reassembly keep the meter housings as parallel as possible. Make sure the housings are orientated the same way they were prior to disassembly.
8. Replace the Washers (3) and the Bolts (2). Torque the bolts to 15Nm 11ft\*lbs for M6 bolts. Do not force the meter housings together. Do NOT use a hammer or other such device. Over tightening will not cause damage to the meter, but may fatigue the bolts and/or restrict the operation if internal surfaces are not completely clean.
9. After reassembly, gently blow air through the meter so the gears spin. This should be clearly audible given a moderate background noise level.
10. Clean any debris from the pickup holes before remounting the sensor (1) to the Upper Housing (4). Use a 3mm hex key to tighten the mounting screws in the sensor to mount the sensor on the housing. Note that there is a correct and incorrect orientation for the sensor to be mounted on the flow meter.



## 10.2 Preventive

The general preventative maintenance is outlined below. For detailed information refer to the Reliability and Maintainability Worksheet (R&M) supplied with documentation.

Period	Task
Shift	<ol style="list-style-type: none"> <li>1. Inspect product supply from mix manifold to applicator.</li> <li>2. Perform a ratio test on two selected colors</li> <li>3. Track ratio test values color for future reference</li> </ol>
Daily	<ol style="list-style-type: none"> <li>1. Inspect mix manifold for leaks</li> <li>2. Inspect product supply lines from pumps to mix manifold</li> <li>3. Inspect and clean filters on the all Fluid Management Components</li> <li>4. Download consumption information on USB Flash Drive</li> <li>5. Reset consumption totals on HMI</li> </ol>
Weekly	<ol style="list-style-type: none"> <li>1. Calibrate all colors.</li> <li>2. Track calibration numbers for future reference</li> <li>3. Inspect static mix element for creep and wear, replace at interval indicated</li> </ol>
Monthly	<ol style="list-style-type: none"> <li>1. Replace static mixer elements.</li> </ol>
Quarterly	<ol style="list-style-type: none"> <li>1. Inspect &amp; rebuild fluid regulators</li> </ol>
Bi-Annually	<ol style="list-style-type: none"> <li>1. Inspect mix manifold for blockage and foreign objects</li> <li>2. Inspect check valves</li> <li>3. Inspect injector valves</li> <li>4. Inspect CTM color change valves. Clean and repair as required.</li> </ol>

## 11 Troubleshooting

### 11.1 System Guide

	Problem	Cause	Solution
1	The Cyclomix is on and performing one of the following functions; Priming, Flushing or Production but there is no fluid flow at the gun.	<ol style="list-style-type: none"> <li>1) The pumps are not on or out of material.</li> <li>2) The Comp A CTM color change valve is not open.</li> <li>3) The inlet fluid filter plugged.</li> <li>4) The Comp A regulator is not allowing material to pass.</li> <li>5) Static mixers are plugged.</li> <li>6) The ball valve on the outlet of the static mixer is closed.</li> <li>7) The fluid hose from the static mixer to the gun is blocked.</li> <li>8) The air to the controller is off.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the Comp A and solvent supply. Fill if needed. Make sure the air is on and set at the correct pressure. Check the pumps to make sure they are working. Check and make sure all the ball valves feeding the Comp A CTM valves are open. Check and clean all filters.</li> <li>2) Check the air gauge on the controller. 80 psi of air is required to operate the valves. Check the tubing for kinks or sharp bends. Make sure the correct valves have been selected in the recipe menu pages 5/10 and 6/10. Also check the Product Configuration Work Sheet to verify the correct outputs</li> <li>3) Check and clean inlet filter as needed.</li> <li>4) Adjust Comp A fluid regulator. Check the regulator. Clean, repair or replace as needed.</li> <li>5) Check the static mixer. Clean or replace as needed.</li> <li>6) Open the ball valve at the outlet of the static mixer.</li> <li>7) Check the fluid hose, gun filter and gun for blockage. Clean or please as needed.</li> <li>8) Make sure the controller as at least 80 psi at the gauge.</li> </ol>
2	The power switch is turn on. But the controller does not power up.	<ol style="list-style-type: none"> <li>1) The voltage coming into the controller is off.</li> <li>2) The circuit breakers in the controller are off.</li> <li>3) The power supply in the controller is set for 220V.</li> <li>4) The system interlock is connected but the booth exhaust fan is not running.</li> <li>5) The system interlock is not connected.</li> <li>6) PLC in program mode.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check with an electrician before turning the power on. (115v AC)</li> <li>2) Check the power coming in. If it is ok then reset the circuit breakers.</li> <li>3) Check the power supply and switch it from 220v to 110v. The switch is located in the front of the power supply.</li> <li>4) Turn the exhaust fan on in the booth then power up the controller.</li> <li>5) When not using an interlock a jumper wire must be installed across contact 300 and 333 on the terminal strip.</li> <li>6) Put the PLC into the run mode. This can be done by using the display on the PLC.</li> </ol>

	<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
3	Air is detected in the mixed fluid stream.	<ol style="list-style-type: none"> <li>1) Comp A or Comp B pump is sucking in air.</li> <li>2) The air chop valve located on the mixing block is leaking air.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the both Comp A and B supply containers and fill as needed. Check the suction assemblies on both Comp A and B pumps. Look for loose fittings, damaged hoses or fitting with no pipe dope or Teflon tape. Tighten, replace or re-tape as needed.</li> <li>2) Check the needle and seat of air chop valve. Clean, repair or replace as needed.</li> </ol>
4	The Cyclomix is in the Off or Flush complete mode but there still is material coming out of the spray gun when triggered.	<ol style="list-style-type: none"> <li>1) The solenoid valve is stuck on.</li> <li>2) The Comp A side CTM color change valve is open.</li> <li>3) The Comp A side CTM color change valve is leaking.</li> </ol>	<ol style="list-style-type: none"> <li>1) Remove the air line from the CTM valve. If air is blowing. Turn the main power off and check the air line again. If the air is still blowing then clean or replace the valve. If the air shut off then turn the power back on. Go into the servicing menu and make sure all the outputs are turned off. Check the wiring. Check the outlet on the PLC to see if the light is on. If the output light is off but there are 24 VDC on the output replace the PLC.</li> <li>2) Remove the air line from the CTM valve. If the valve is still open check the piston spring. Replace as needed.</li> <li>3) Check the needle and seat of the CTM valve. Clean, repair or replace as needed.</li> </ol>

## 11.2 General Alarm Descriptions

Alarm Tag	Tag Description
Cycle Stop / Voltage not ON	The panel is not yet powered up because the “Cycle Stop” button is engaged on the door of the enclosure.
Flow Fault Comp A Side	Air flow switch signal is energized but the controller is not receiving pulses from the A Component flow meter.
Flow Fault Comp B Side	Air flow switch signal is energized but the controller is not receiving pulses from the B Component flow meter.
Flow Fault Comp C Side	Air flow switch signal is energized but the controller is not receiving pulses from the C Component flow meter.
Critical Pot Life Time Expired	The pot life timer has reached 100% and the critical pot life timer has also expired.
Ratio A/B Fault Low Limit	The calculated A/B value is less than the specified A/C Min Ratio Tolerance value.
Ratio A/B Fault High Limit	The calculated A/B value is higher than the specified A/C Max Ratio Tolerance value.
Ratio A/C Fault Low Limit	The calculated A/C value is less than the specified A/C Min Ratio Tolerance value.
Ratio A/C Fault High Limit	The calculated A/C value is higher than the specified A/C Max Ratio Tolerance value.
Solvent Flow Fault Comp A	The Component A is being flushed but the controller is not receiving pulses from the A Component flow meter.
Solvent Flow Fault Comp B	The Component B is being flushed but the controller is not receiving pulses from the B Component flow meter.
Maximum Flow Rate Exceeded	The combined total flow rate for all components is higher the specified Flow Fault Max value.
Below Minimum Flow Rate	The combined total flow rate for all components is lower the specified Flow Fault Min value.
CPU Battery Low Replace Soon	The CPU battery in the PLC voltage has dropped below an acceptable value. Internal to the PLC operation.
Below Minimum Flow Rate - display only	With the Display Flow Fault ON, the unit will indicate that the minimum flow rate is lower than the specified Flow Fault Min value.
Above Maximum Flow Rate - display only	With the Display Flow Fault ON, the unit will indicate that the maximum flow rate is higher than the specified Flow Fault Max value.
B COMP Injector Leak Detected	The controller is receiving pulses from the B Component flow meter when the B Component Injector is closed.
C COMP Injector Leak Detected	The controller is receiving pulses from the C Component flow meter when the C Component Injector is closed.
INJECTORS OFF WATCHDOG TIMER	Required to keep injectors from getting hot while system is in production and stalled waiting for gun trigger with either the 2K or 3K injectors ON. Flow is stopped with injectors open for 30sec.

### 11.2.1 HMI Alarms

	Alarms	Causes	Solutions
1	Ratio A/B Fault - Low Limit	<p>The minimum ratio tolerance for A/B has been reached. (Too Much Comp B)</p> <ol style="list-style-type: none"> <li>1) The Ratio Tolerance setting is wrong.</li> <li>2) Comp B fluid pressure too high.</li> <li>3) Min Comp B (injection volume) is set too low or too high.</li> <li>4) The Comp B Injector valve is always open.</li> <li>5) The Comp B injector valve seat is leaking.</li> <li>6) The Comp B injector restrictor is missing or too large.</li> <li>7) Not enough Comp A</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the Ratio Tolerance for A/B Min: Make sure it is set according to the ratio. (Usually within 5% ± of the ratio).</li> <li>2) Adjust the Comp B fluid pressure down or raise the Comp A fluid pressure up until the correct ratio is achieved.</li> <li>3) Check Min Comp B setting. Adjust as needed. (Note: The setting should be a multiple of the Comp B Flow meter CC/pulse setting.)</li> <li>4) Check Comp B injector valve make sure it is not frozen with dried catalyst. Look for any damaged or broken parts. Clean and repair as needed. Check the voltage at the valve (or solenoid valve if used). There should be zero volts when the valve is closed. (24 VDC when the valve is energized)</li> <li>5) Check the Comp B injector needle and seat for leaks. Clean and replace parts as needed.</li> <li>6) Check and make sure the Comp B restrictor is in place. The standard restrictor is 1.0 mm. Change to a smaller restrictor if necessary.</li> <li>7) Check Comp A Pressure. Check Comp A feed system for material. Make sure the pump is working and the air pressure is set correctly. Check and make sure all ball valves feeding Comp An are open. Check and clean all filters.</li> </ol>
2	Ratio A/B Fault – High Limit	<p>The maximum ratio tolerance for A/B has been reached. (Not enough Comp B.)</p> <ol style="list-style-type: none"> <li>1) The Ratio Tolerance setting is wrong.</li> <li>2) Comp B fluid pressure too low.</li> <li>3) The Comp B injector restrictor is partially plugged or damaged.</li> <li>4) The Comp B injector restrictor is too small.</li> <li>5) Min Comp B (injection volume) is set too low.</li> <li>6) The Comp B fluid feed system is blocked or out of material.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the Ratio Tolerance for A/B Max: Make sure it is set according to the ratio. (Usually within 5% ± of the ratio)</li> <li>2) Adjust the Comp B fluid pressure up until the correct ratio is achieved.</li> <li>3) Check the Comp B injector restrictor clean or replace as needed.</li> <li>4) Check the Comp B restrictor size. The standard is 1.0 mm. If viscosity is too high change to a larger restrictor.</li> <li>5) Check Min Comp B setting. Adjust as needed. (Note: The setting should be a multiple of the Comp B Flow meter CC/pulse setting.)</li> <li>6) Check Comp B pressure. Check Comp B feed system for material. Make sure the pump is working and the air pressure is set correctly. Check and make sure all ball valves feeding Comp B are open. Check and clean all filters.</li> </ol>

	Alarms	Causes	Solutions
3	Ratio A/C Fault - Low Limit	<p>The minimum ratio tolerance for A/C has been reached. (Too much Comp C)</p> <ol style="list-style-type: none"> <li>1) The Ratio Tolerance setting is wrong.</li> <li>2) Comp C fluid pressure too high.</li> <li>3) Min Comp C (injection volume) is set too low or too high.</li> <li>4) The Comp C Injector valve is always open.</li> <li>5) The Comp C injector valve seat is leaking.</li> <li>6) The Comp C injector restrictor is missing or too large.</li> <li>7) Not enough Comp A/B.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the Ratio Tolerance for A/C Min: Make sure it is set according to the ratio. (Usually within 5% ± of the ratio)</li> <li>2) Adjust the Comp C fluid pressure down until the correct ratio is achieved.</li> <li>3) Check Min Comp C setting. Adjust as needed. (Note: The setting should be a multiple of the Comp C Flow meter CC/pulse setting.)</li> <li>4) Check Comp C injector valve make sure it is not frozen. Look for any damaged or broken parts. Clean and repair as needed. Check the voltage at the valve (or solenoid valve if used). There should be zero volts when the valve is closed. (24 VDC when the valve is energized)</li> <li>5) Check the Comp C injector needle and seat for leaks. Clean and replace parts as needed.</li> <li>6) Check and make sure the Comp C restrictor is in place. The standard restrictor is 0.5 mm. Change to a small restrictor if necessary.</li> <li>7) Check the static mixers for both sets of static mixers. Make sure they are clean. Replace as needed.</li> </ol>
4	Ratio A/C Fault – High Limit	<p>The maximum ratio tolerance for A/C has been reached. (Not enough Comp C)</p> <ol style="list-style-type: none"> <li>1) The Ratio Tolerance setting is wrong.</li> <li>2) Comp C fluid pressure too low.</li> <li>3) The Comp C injector restrictor is partially plugged or damaged.</li> <li>4) The Comp C injector restrictor is too small.</li> <li>5) Min Comp C (injection volume) is set too low.</li> <li>6) The Comp C fluid feed system is blocked or out of material.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the Ratio Tolerance for A/C Max: Make sure it is set according to the ratio. (Usually within 5% ± of the ratio)</li> <li>2) Adjust the Comp C fluid pressure up until the correct ratio is achieved.</li> <li>3) Check the Comp C injector restrictor clean or replace as needed.</li> <li>4) Check the Comp C restrictor size. The standard is 1.0 mm. If viscosity is too high change to a larger restrictor.</li> <li>5) Check Min Comp C setting. Adjust as needed. (Note: The setting should be a multiple of the Comp C Flow meter CC/pulse setting.)</li> <li>6) Check Comp C pressure. Check Comp B feed system for material. Make sure the pump is working and the air pressure is set correctly. Check and make sure all ball valves feeding Comp C are open. Check and clean all filters.</li> </ol>
5	Flow Fault Comp A Side	<p>The air flow switch signal is energized for a predetermine time but the controller is not receiving pulses from the Comp A flow meter.</p>	<ol style="list-style-type: none"> <li>1) Check the air line from the air flow switch to the gun for leaks. Check the gun for air leaks. Repair all leaks.</li> <li>2) With the atomizing air turned off check the input # 7 (gun 1) and #8 (gun2) on the PLC. If either input is enabled then the air flow switch or wiring is defective. Replace or repair as needed.</li> </ol>

	Alarms	Causes	Solutions
		<ol style="list-style-type: none"> <li>1) There is an air leak after the flow switch.</li> <li>2) The flow switch is staying on.</li> <li>3) The painter is triggering the gun with air only for longer than the programmed time.</li> <li>4) The Comp A feed system is blocked or out of material.</li> <li>5) The Comp A flow meter gears are not turning.</li> <li>6) The sensor cable is defective or wired wrong.</li> <li>7) The flow meter sensor is defective.</li> </ol>	<ol style="list-style-type: none"> <li>3) Train the painter not to trigger air only. Adjust the Comp A Circuit Fault setting (located in the Machine Parameter). Note: It is important to keep this setting as low as possible. If this setting is too high the machine will not fault.</li> <li>4) Check Comp A Pressure. Check Comp A feed system for material. Make sure the pump is working and the air pressure is set correctly. Check and make sure all ball valves feeding Comp A are open. Check and clean all filters. Check the air pressure at the gauge on the controller; make sure there is 80 PSI.</li> <li>5) Check flow meter; make sure the gears move freely. Clean and /or replace as needed. Note: Do not over tighten screws when reassembling the flow meter. This could prevent the gears from turning.</li> <li>6) Check the sensor cable. Remove the sensor from the flow meter. Connect the sensor to the cable. Put a piece of metal in front of the sensor while looking at the input # 0 on the PLC. Then remove the piece of metal from the sensor. Repeat the process. The input should go light and then dark. If not repeat the above steps with the sensor from the B Comp flow meter. If the input does not go light and dark, check the wiring. Replace cable as needed.</li> <li>7) Check the sensor. Remove the sensor from the flow meter. Connect the sensor to the cable. Put a piece of metal in front of the sensor while looking at the input # 0 on the PLC. Then remove the piece of metal from the sensor. Repeat the process. The input should go light and then dark. If not replace the sensor.</li> </ol>
6	Flow Fault Comp B Side	<p>The air flow switch signal and the Comp B injector valve are energized for a predetermine time but the controller is not receiving pulses from the Comp B flow meter.</p> <ol style="list-style-type: none"> <li>1) The Comp B feed system is blocked or out of material.</li> <li>2) The Comp B injector is not opening.</li> <li>3) The Comp B injector restrictor is plugged.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check Comp B Pressure. Check Comp B feed system for material. Make sure the pump is working and the air pressure is set correctly. Check and make sure all ball valves feeding Comp B are open. Check and clean all filters. Check the air pressure at the gauge on the controller; make sure there is 80 PSI.</li> <li>2) Check Comp B injector valve make sure it is not frozen with dried catalyst. Clean and repair as needed. Check the voltage at the valve (or solenoid valve if used). There should be 24 VDC when the valve is energized. If no voltage, check the Comp B injector fuse.</li> <li>3) Check B injector restrictor. Clean or replace as needed.</li> </ol>

	Alarms	Causes	Solutions
		<ol style="list-style-type: none"> <li>4) The Comp B flow meter gears are not turning.</li> <li>5) The sensor cable is defective or wired wrong.</li> <li>6) The flow meter sensor is defective.</li> <li>7) The Comp B fluid pressure is equal to or lower then Comp A fluid pressure.</li> </ol>	<ol style="list-style-type: none"> <li>4) Check flow meter; make sure the gears move freely. Clean and /or replace as needed. Note: Do not over tighten screws when reassembling the flow meter. This could prevent the gears from turning.</li> <li>5) Check the sensor cable. Remove the sensor from the flow meter. Connect the sensor to the cable. Put a piece of metal in front of the sensor while looking at the input # 1 on the PLC. Then remove the piece of metal from the sensor. Repeat the process. The input should go light and then dark. If not repeat the above steps with the sensor from the A Comp flow meter. If the input does not go light and dark, check the wiring. Replace cable as needed.</li> <li>6) Check the sensor. Remove the sensor from the flow meter. Connect the sensor to the cable. Put a piece of metal in front of the sensor while looking at the input # 1 on the PLC. Then remove the piece of metal from the sensor. Repeat the process. The input should go light and then dark. If not replace the sensor.</li> <li>7) Check the Comp A and B Fluid pressure. Make sure the Comp B fluid pressure is at least 15% high than Comp A when the injector valve opens.</li> </ol>
7	Flow Fault Comp C Side	<p>The air flow switch signal and the Comp C injector valve are energized for a predetermine time but the controller is not receiving pulses from the Comp C flow meter.</p> <ol style="list-style-type: none"> <li>1) The Comp C feed system is blocked or out of material.</li> <li>2) The Comp C injector is not opening.</li> <li>3) The Comp C injector restrictor is plugged.</li> <li>4) The Comp C flow meter gears are not turning.</li> <li>5) The sensor cable is defective or wired wrong.</li> <li>6) The flow meter sensor is defective.</li> <li>7) The Comp C fluid pressure is equal to or</li> </ol>	<ol style="list-style-type: none"> <li>1) Check Comp C Pressure. Check Comp C feed system for material. Make sure the pump is working and the air pressure is set correctly. Check and make sure all ball valves feeding Comp C are open. Check and clean all filters.</li> <li>2) Check Comp C injector valve make sure it is not frozen with dried catalyst. Clean and repair as needed. Check the voltage at the valve (or solenoid valve if used). There should be 24 VDC when the valve is energized. If no voltage, check the Comp C injector fuse.</li> <li>3) Check C injector restrictor. Clean or replace as needed.</li> <li>4) Check flow meter; make sure the gears move freely. Clean and /or replace as needed. Note: Do not over tighten screws when reassembling the flow meter. This could prevent the gears from turning.</li> <li>5) Check the sensor cable. Remove the sensor from the flow meter. Connect the sensor to the cable. Put a piece of metal in front of the sensor while looking at the input # 2 on the PLC. Then remove the piece of metal from the sensor. Repeat the process. The input should go light and then dark. If</li> </ol>

	Alarms	Causes	Solutions
		<p>lower then Comp A fluid pressure.</p>	<p>not repeat the above steps with the sensor from the A Comp flow meter. If the input does not go light and dark, check the wiring. Replace cable as needed.</p> <p>6) Check the sensor. Remove the sensor from the flow meter. Connect the sensor to the cable. Put a piece of metal in front of the sensor while looking at the input # 2 on the PLC. Then remove the piece of metal from the sensor. Repeat the process. The input should go light and then dark. If not replace the sensor.</p> <p>7) Check the Comp A and C Fluid pressure. Make sure the Comp C fluid pressure is at least 15% high than Comp A when the injector valve opens.</p>
8	Solvent Flow Fault- Comp A	<p>The flush cycle has been enabled for a predetermine time but the controller is not receiving pulses from Comp A flow meter.</p> <ol style="list-style-type: none"> <li>1) The painter did not have enough time to open the gun.</li> <li>2) The flush is selected but the gun is plugged.</li> <li>3) Solvent valve is not opening.</li> <li>4) The Comp A flow meter gears are not turning.</li> <li>5) The solvent fluid pressure is too low.</li> <li>6) The sensor cable is defective or wired wrong.</li> <li>7) The flow meter sensor is defective.</li> </ol>	<ol style="list-style-type: none"> <li>1) Train the painter to trigger the gun fast. Adjust Flow Fault Solvent setting (located in the Machine Parameter) to give the painter time to pull the trigger.</li> <li>2) Check static mixer, outlet fluid hose and gun for blockage. Clean and/or replace as needed.</li> <li>3) Check the air pressure at the gauge on the controller; make sure there is 80 PSI.</li> <li>4) See Flow Fault Comp A side # 5.</li> <li>5) Check solvent Pressure. Check solvent feed system for material. Make sure the pump is working and the air pressure is set correctly. Check and make sure all ball valves feeding solvent are open. Check and clean all filters.</li> <li>6) See Flow Fault Comp A #6</li> <li>7) See Flow Fault Comp A #7</li> </ol>
9	Cycle Stop (Emergency Stop) – Voltage Not On	Yellow button on front of controller is depressed (push in).	Rotate the yellow button to deactivate.
10	Critical Pot life Time Expired	The Critical Pot Life Timer has expired. The controller did not see any/ or enough material flow after the pot life alarm.	The controller stopped production and is in the flush cycle waiting for the gun to be triggered. If the gun is not trigger fast enough the Solvent Flow Fault will appear.
11	Solvent Flow Fault-Comp B	The flush cycle has been enabled and step 1 has been completed. During step 3 the controller is not receiving	<ol style="list-style-type: none"> <li>1) Check air pressure at the gauge on the controller; make sure there is 80 PSI.</li> <li>2) See Flow Fault Comp B Side #4</li> <li>3) See Solvent Flow Fault (Comp A) #5</li> </ol>

	<b>Alarms</b>	<b>Causes</b>	<b>Solutions</b>
		<p>pulses for a predetermined time form the Comp B flow meter.</p> <ol style="list-style-type: none"> <li>1) Solvent Comp B valve is not opening.</li> <li>2) The Comp B flow meter gears are not turning.</li> <li>3) The solvent fluid pressure is too low.</li> <li>4) The sensor cable is defective or wired wrong.</li> <li>5) The flow meter sensor is defective.</li> <li>6) The Comp B solvent feed system is blocked or out of material.</li> <li>7) The Comp B injector is not opening.</li> <li>8) The Comp B injector restrictor is plugged.</li> </ol>	<ol style="list-style-type: none"> <li>4) See Flow Fault Comp B Side #5</li> <li>5) See Flow Fault Comp B Side #6</li> <li>6) Check solvent Pressure. Check solvent feed system for material. Make sure the pump is working and the air pressure is set correctly. Check and make sure all ball valves feeding solvent are open. Check and clean all filters.</li> <li>7) See Flow Fault Comp B Side #2</li> <li>8) See Flow Fault Comp B Side #3</li> </ol>
12	Maximum Flow Rate Exceeded	<p>The controller has exceeded the maximum programmed flow rate. (Usually used with automatic guns)</p> <ol style="list-style-type: none"> <li>1) The fluid hose burst or is leaking.</li> <li>2) The fluid tip is missing from gun or worn out.</li> <li>3) The gun fluid regulator pressure is too high.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the fluid hose for leaks tighten fittings, replace hose as needed.</li> <li>2) Check the fluid tip on the gun. Replace as needed.</li> <li>3) Check the gun fluid regulator. Adjust as needed.</li> </ol>
13	Below Minimum Flow rate	<p>The controller has fallen below the minimum programmed flow rate. (Usually used with automatic guns)</p> <ol style="list-style-type: none"> <li>1) The gun tip is plugged</li> <li>2) The gun fluid regulator is too low.</li> <li>3) The fluid hose is starting to line out with material.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the gun and tip for blockage. Clean and/or place as needed.</li> <li>2) Check the gun fluid regulator. Adjust as needed.</li> <li>3) Check the fluid hose and replace as needed.</li> </ol>
14	CPU Battery Low – Replace Soon	<p>The voltage drops below the accessible level on battery in the CPU.</p>	<p>Replace the battery in the CPU (Allen Bradley PLC).</p>

	Alarms	Causes	Solutions
15	Below Minimum Flow rate – Display Only	This is a display only and will not stop production! The controller has fallen below the minimum programmed flow rate. (Usually used with automatic guns)	See Below Minimum Flow Rate.
16	Above Maximum Flow rate – Display Only	This is a display only and will not stop production! The controller has exceeded the maximum programmed flow rate. (Usually used with automatic guns)	See Maximum Flow Rate Exceeded.
17	Comp B (Catalyst) Injector Leak Detected	<p>The controller is receiving pulses from the Comp B flow meter when the injector valve is closed.</p> <ol style="list-style-type: none"> <li>1) The Comp B injector valve needle and seat are leaking.</li> <li>2) The Comp B injector valve is staying open.</li> <li>3) The # of Pulses to Consider Flow for B is set too low.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the Comp B injector needle and seat for leaks. Clean and replace parts as needed.</li> <li>2) Check Comp B injector valve make sure it is not frozen with dried catalyst. Look for any damaged or broken parts. Clean and repair as needed.</li> <li>3) Check the voltage at the valve (or solenoid valve if used). There should be zero volts when the valve is closed. (24 VDC when the valve is energized)</li> <li>4) Check the setting for # of pulses to Consider Flow for B (Located in the Machine Parameters page 3/3). The minimum setting should be 10. This value may change depending on what flow meter is being used.</li> </ol>
18	Comp C (3K) Injector Leaked Detected	<p>The controller is receiving pulses from the Comp C flow meter when the injector valve is closed.</p> <ol style="list-style-type: none"> <li>1) The Comp C injector valve needle and seat are leaking.</li> <li>2) The Comp C injector valve is staying open.</li> <li>3) The # of Pulses to Consider Flow for C is set too low.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the Comp C injector needle and seat for leaks. Clean and replace parts as needed.</li> <li>2) Check Comp C injector valve make sure it is not frozen. Look for any damaged or broken parts. Clean and repair as needed.</li> <li>3) Check the voltage at the valve (or solenoid valve if used). There should be zero volts when the valve is closed. (24 VDC when the valve is energized)</li> <li>4) Check the setting for # of pulses to Consider Flow for C (Located in the Machine Parameters page 3/3). The minimum setting should be 10. This value may change depending on what flow meter is being used.</li> </ol>

### 11.3 Flow Meter

Symptom	Possible Cause	Solution
Meter indicates lower than actual	Viscosity of fluid is <30cst.	Decrease the K-factor by percent error.
	Excessive pressure differential across meter causing gears to bind.	Reduce flow rate, reduce fluid viscosity.
	Debris in measuring chamber.	Clean meter, change or add filter.
	Upper housing has dimple from over tightening sensor.	Replace upper housing.
Meter indicates higher than actual.	Air in lines.	Add air eliminator.
	Electro-magnetic interference.	Ground flow meter and all electronics.
	Reverse fluid flow.	Add check valve.
Indicator shows flow when there is no flow.	Fluid oscillates.	Check pump, add check valve, increase back pressure.
	Electro-magnetic interference.	Ground flow meter and all electronics. Use shielded cable and relocate away from electrical noise.
No flow Indication.	No fluid flow.	Check pump.
	Debris in measuring chamber or gears.	Clean meter, change or add filter.
	Sensor not installed properly.	Check sensor is installed to hand tight. Review sensor guide.
	Faulty wiring.	Check sensor connection and readout connection.
	Faulty sensor.	Replace sensor.
	Upper housing has dimple from over-tightening sensor.	Replace upper housing.
Erratic system indication.	Ground loop in shielding.	Ground shields one place only. Re-route cables from electrical noise.
	Pulsating fluid flow.	Add pulse dampener.

### 11.4 Software Install

The following procedure will restore the HMI software. Located in **Software > HMI > CMIX\_EXPERT\_HMI\_V7.153\_GP4301T USB INSTALL**, copy all content to the ROOT section of an empty USB drive.

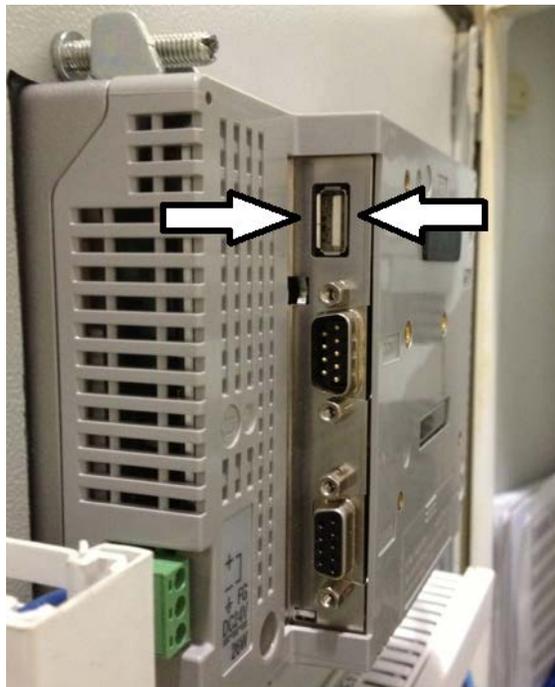
**File Name**

- boot.cfg
- MEM4X0X.CML
- SYSFONTTBL.BIN

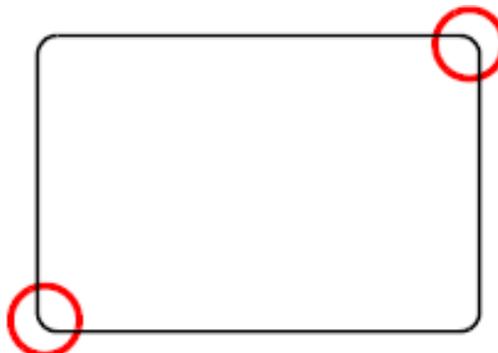
**Folder Name**

- Prj001

1. Power on the Control Panel, open the door to access the USB slot on the back of the HMI unit (pictured below).
  - a. Insert the USB drive.



2. After Inserting the USB drive; go to the HMI screen and **within 0.5 second** of each touch, touch the top-right then the bottom-left corner, or touch the top-left then bottom-right corner.



3. The following screen should appear at the bottom of the monitor.



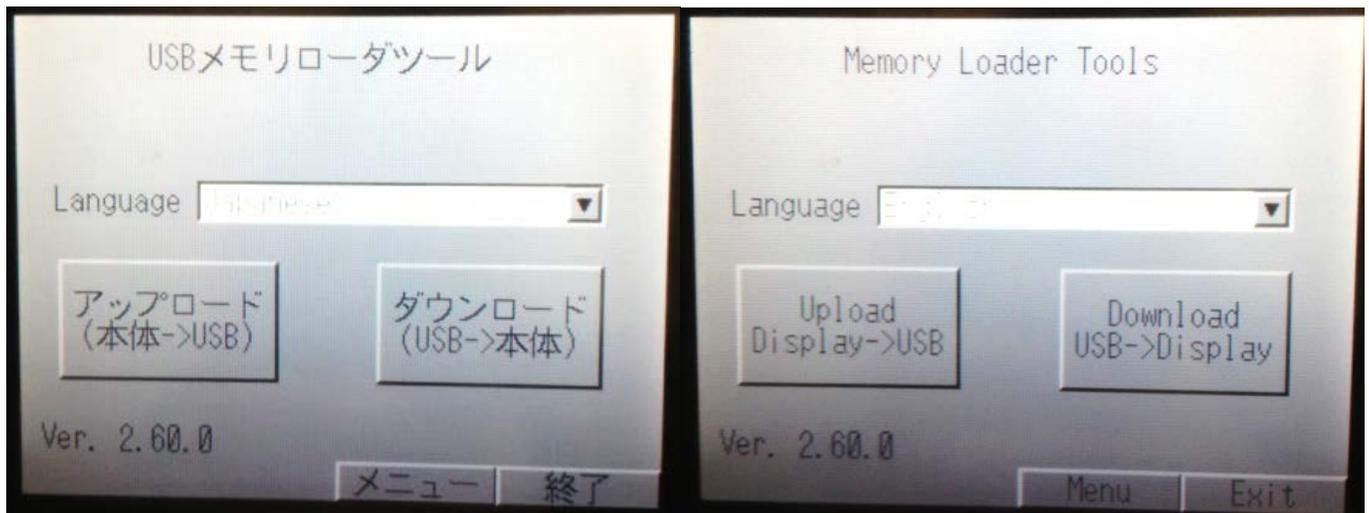
4. Select CF/USB to bring up the following choices.



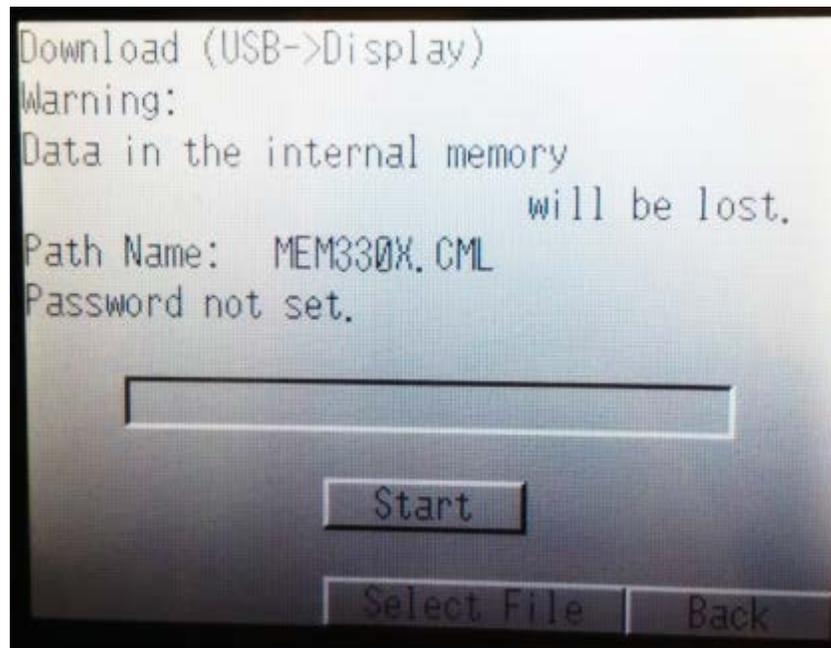
5. Select USB Start.

6. The following screen pops-up in Japanese.

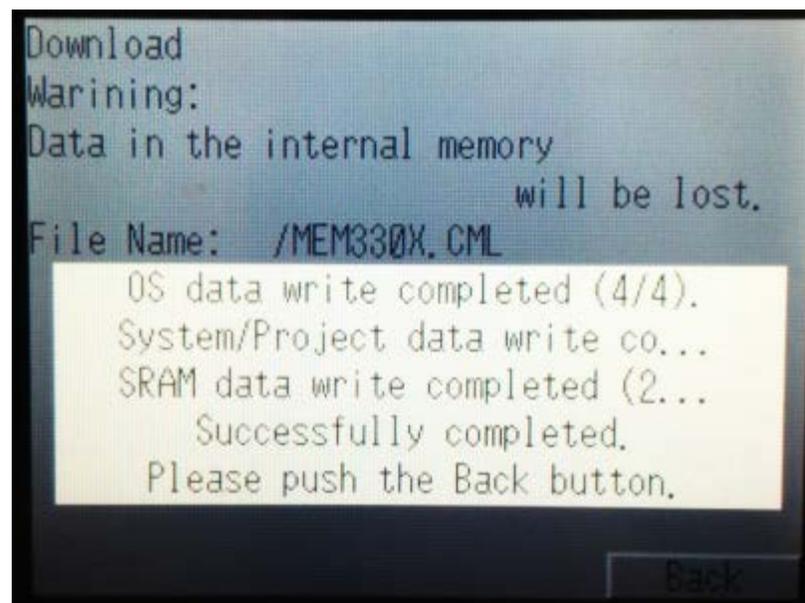
a. Select the drop-down menu and switch it to English.



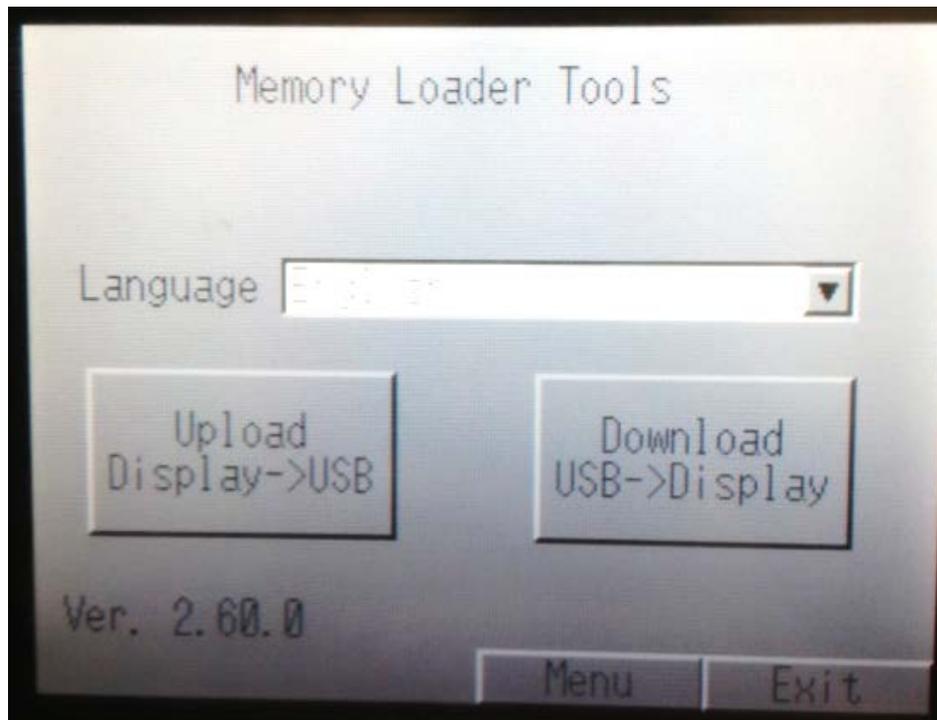
7. Select Download USB ->Display, the following screen will appear.



8. Press start and you will be prompted, "Do you want to download the data?" press YES.
9. The transfer takes about 5 minutes; when completed, the following screen will be displayed.



10. Continue pressing back until you get to the Memory Loader Tools screen.



11. Select Exit and a message will come up asking if you want to restart your system.

12. Select Yes.

The system will restart with your HMI restored. You may now remove your USB stick and close the panel door.

## 11.5 AB PLC Ethernet IP Utilities



**CAUTION:** Uploading the factory default program will reset customer specific site configuration file, known as the “Product Component Configuration”. This configuration file if overwritten will cause the machine not to prime or flush if multiple colors or solvents were setup.

The specific site configuration file is located inside the panel on the inside of the door. This setup table is accessed by the small LCD in the PLC. To recover the correct configuration, navigate to the N:16 Integers file and reenter the codes in the right column of the “Product Configuration File”. Please contact technical services for additional support.

The AB Utilities program allows the end user to archive the PLC programs as an encrypted text file. This program allows the user to return to a certain point in time or recover from a corrupted PLC when the program must be reloaded. The saved file will contain the values in the data tables at the time the program was saved. Uploading a previous version of the program will over write the existing values. End user is responsible for all changes between the current version and the previous version. The encrypted text file will only work with the AB Utilities program.

### 11.5.1 Typical PLCs used in Cyclomix Units

## MICROLOGIX 1400 PLC



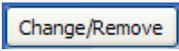
### 11.5.2 Installing the AB Utilities

The program is in the sub-folder labeled “AB PLC Backup Recovery Utility” located in the Software folder.

Select the “setup” file to install. The PC must be connected to the internet because it will download required drivers. The AB Utilities will not work without these drivers installed.

### 11.5.3 Removing the AB Utilities

AB Utilities is removed by using Windows “Add or Remove Programs”.

Select AB Utilities and then select the Change/Remove  command button.

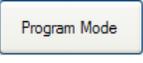
### 11.5.4 Starting the AB Utilities

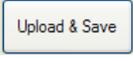
The programming is easily started from the program list provided by Windows under the Start Menu and located in the “SAMES KREMLIN Applications” folder.

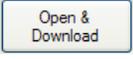
### 11.5.5 Using the AB Utilities

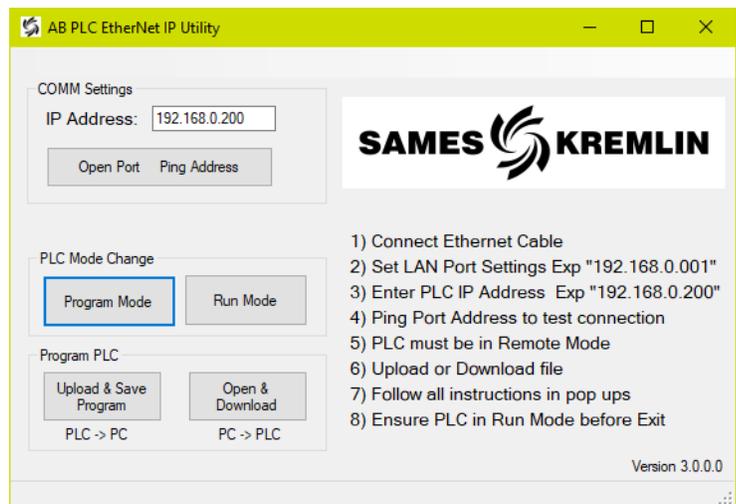
1. Connect your computer’s Ethernet LAN port to an empty port either at the bulkhead or on the Ethernet hub located in the control panel using a standard CAT 5 or CAT 6 cable.
2. Before starting the AB Ethernet communications program set your computer IP address to be a member of the Expert’s Local Area Network, (LAN); 192.168.0.XXX with a Subnet of 255.255.255.0. A typical installation uses IP address of 192.168.0.200 thru 192.168.0.202. Your IP address must be different for any address on the LAN. For help with setting your IP address see section titled “Setting IP Address”.
3. Start the AB Utilities program and the following window will appear. The IP address that appears first will be your computer’s IP address. Change the IP address to 192.168.0.200. This is the standard IP address programmed. Installations with multiple Experts’ on their own LAN will all have different IP addresses. The IP addresses can be obtained by the small LCD screens on the front of the PLCs. For help with obtaining an IP addresses see section titled, “Obtaining IP Address”.

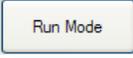
4. Select the “Open Detect & Ping Address”  command button to automatically detect the IP address.
5. At the bottom left hand corner of the pop up window review the message bar for positive indication of the connection to the PLC. If the status bar states, “IP Address 192.168.0.200 Failed”, ensure the cable is connected. Failure to connect on the second try, review the IP address settings and try pinging your own computer’s IP address

6. Select the “Program Mode”  command button to remove the PLC from the “RUN” mode to the “PROGRAM” mode. This will be known by looking the small LED lights on the front of the PLC.

7. It is recommended first to upload the existing program, by selecting the “Upload & Save”  command button. Save the file by giving it a name and select the desired file location.

8. Select the “Open & Download”  command button to load a previously saved file. Use the Browse button to navigate to the file’s location and select the file. Select the windows Open button to proceed.



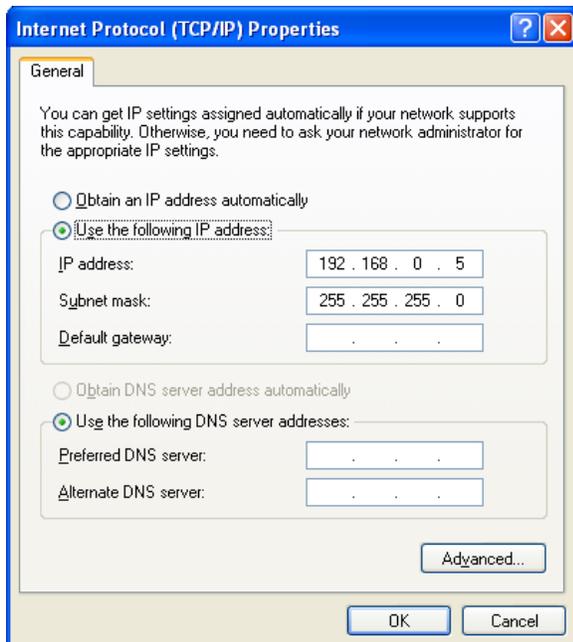
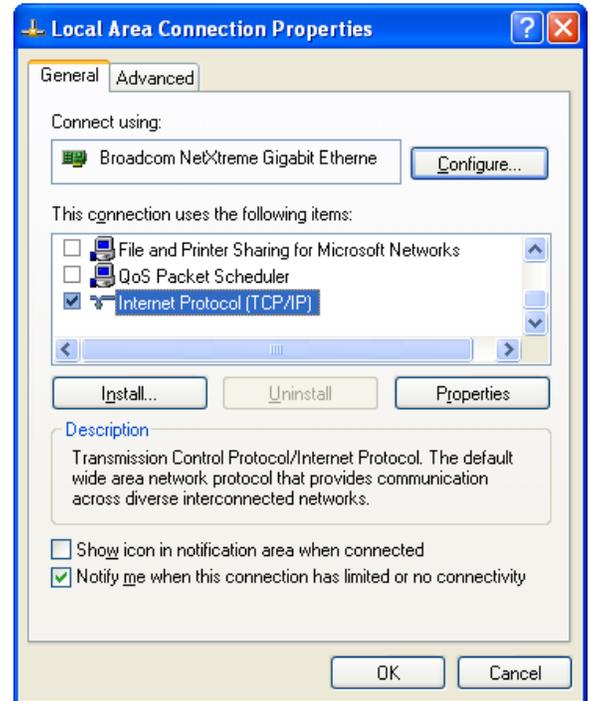
9. Place the PLC back into RUN mode by selecting the “Run Mode”  command button.

## Setting IP Address (Microsoft OS XP)

Set your computers TCP/IP address by changing the LAN connection properties. Navigate to the LAN Properties by follow the list of menus on your PC.

**Start Menu → Connect To → Show All Connections → Local Area Connection**

- a) Select the Internet Protocol (TCP/IP) connection
- b) Then select the Properties command button
- c) Select the “Use the following IP address”
- d) Enter the IP address 192.168.0.105; Note IP addresses must differ in the last three digits.
- e) Enter Subnet Mask; 255.255.255.0
- f) Select OK; twice
- g) Your computer may want to reboot, Allow reboot!

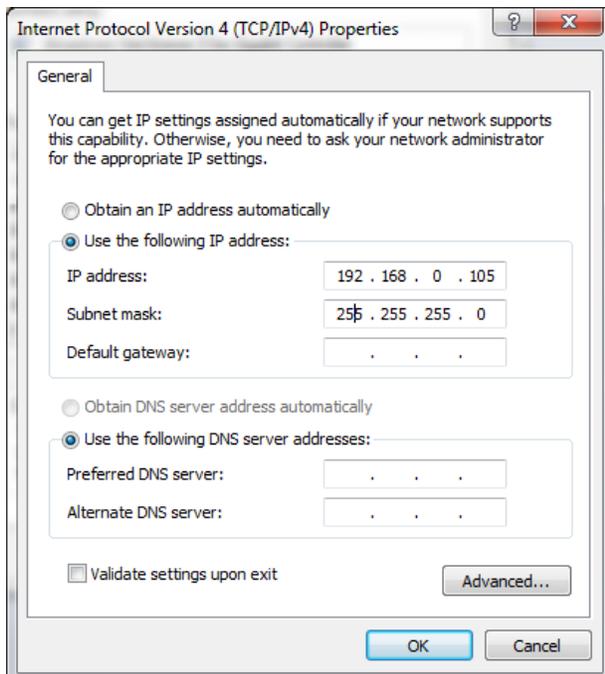
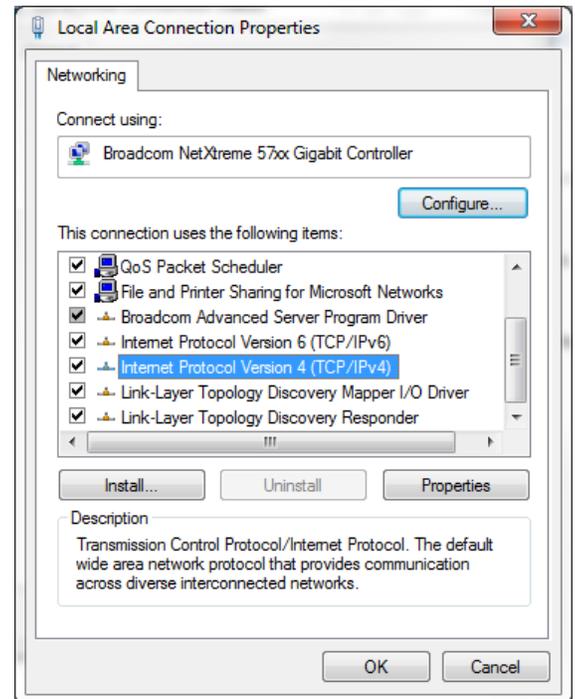


## Setting IP Address (Microsoft OS 7)

Set your computers TCP/IP address by changing the LAN connection properties. Navigate to the LAN Properties by follow the list of menus on your PC.

**Start Menu → Control Panel → Network and Sharing Center → Local Area Connection**

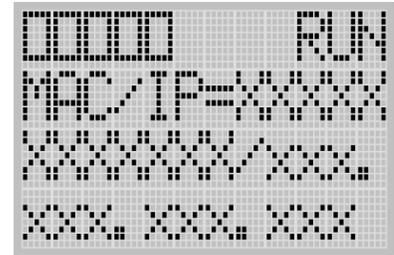
- a) Select the Properties button
- b) Select the Internet Protocol (TCP/IPv4) connection
- c) Then select the Properties command button
- d) Select the “Use the following IP address”
- e) Enter the IP address 192.168.0.105; Note IP addresses must differ in the last three digits.
- f) Enter Subnet Mask; 255.255.255.0
- g) Select OK; twice
- h) Your computer may want to reboot, Allow reboot!



### 11.5.6 Obtaining IP Addresses

#### 1 Cyclomix Expert's Equipped with PLC 1100

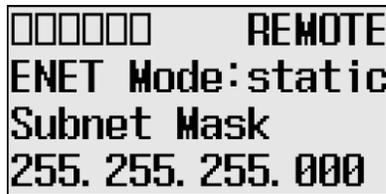
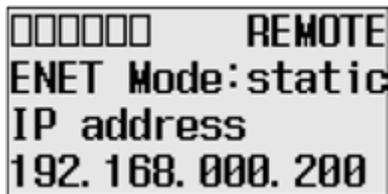
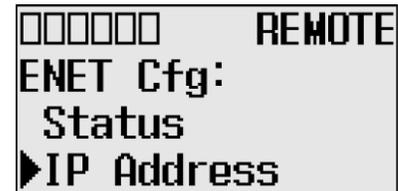
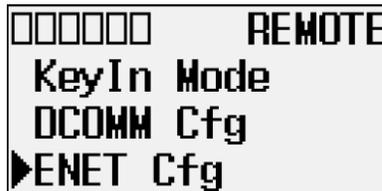
- a. From the small LCD screen located on the PLC; using the navigation buttons move through the following list of menus.



**CAUTION:** Press the exit key several times to return to the top menu. Failure to do so may result in communications problems.

#### 2 Cyclomix Expert's Equipped with PLC 1400

- b. From the small LCD screen located on the PLC; using the navigation buttons move through the following list of menus.



**CAUTION:** Press the exit key several times to return to the top menu. Failure to do so may result in communications problems.

### 11.5.7 Troubleshooting the AB Utilities

Description	Possible Cause	Possible Solution
No Connection to PLC.	Cable Not Connected.	Ensure cable is connected to the PC and the PLC's Channel ZERO.
		Ensure Ethernet cable is connected to the PC and the Hub. Small LEDs next to the port should be ON and flashing.
	Wrong COM Port.	Review Determine COM Port Section for help.
		Try alternate COM Ports.
		Check TCP/IP properties for correct IP address. PC's IP address must be unique.
		Ensure the correct LAN is being used; Try unplugging and reconnecting the Ethernet cable.
	Undetermined COMM problem.	Some programs, such as RS Links, will automatically grab COM1. Close any programs that may be using COM1.
		Resolve conflicts between drivers utilizing windows COM port properties.
		Un-install and re-install KR AB Utilities. PC must be connected to internet for successful installation.
		Ensure the PLC is not on the Ethernet Address screen. Press ESC several times.
	USB to Serial Adaptor being used.	Review Determine COM Port Section for help.
		Resolve conflicts between drivers utilizing windows COM port properties.
		Update or re-install the adaptor and its driver.
		Try alternate USB adaptor and driver.
Connection made but cannot upload or download program.	PLC is in RUN Mode.	Put PLC in PROGRAM Mode.
Machine will not operator after loading program.	PLC is in PROGRAM Mode.	Put PLC in RUN Mode.
	PLC is faulted.	Corrupted download; Try downloading file again.
Corrupted text file; Try downloading a different file.		
Connection made but cannot put PLC in Program Mode or Run Mode.	PLC is in Run Mode.	Put PLC in REMOTE Mode on its LCD screen, under MODE SWITCH.
	PLC is in Program Mode.	Put PLC in REMOTE Mode on its LCD screen under MODE SWITCH.

## 12 Spare Parts

The Mixing Section is configured per order and its build configuration is captured in the model No. field on the legend placard. Before ordering parts ensure correct configuration is being referenced.

Reference your configuration in the part sheets and complete the following table for an individualized spare parts list. Some items will have multiple quantities while other items will be crossed off depending on the configuration. Reference individual part sheets for further break down of assemblies.

Refer to the Part Manual for assemblies and installed components.

**Note:** This table only represents the mix manifold.

Item	Part Number	2K QTY	3K QTY
Flow Meter	055-729-505	2 (-1 for every mass flow)	3 (-1 for every mass flow)
Flow Meter HF	055-729-564	0 (1 IF PH)	0 (2 IF PH)
Flow Meter Mass -04	055-729-104	X	X
Flow Meter, PH	055-729-508	1	1
Check Valve, Fluid	055-729-530	2	3
Check Valve, Air	055-729-914	1	1
Mix Tube	055-729-901	1	2
Mixing Element	055-729-509	4	7
Mixing Element, SS	668-090-212	3	4
Mix Tube, PH	668-000-649	1	X
Mix Tube, PH	62-2082-00	X	2
Injector Valve, <b>(US)</b>	055-729-102	1 (-1 IF PH)	2 (-1 IF PH)
Injector Valve, <b>(ATEX)</b>	055-729-101	1 (-1 IF PH)	2 (-1 IF PH)
Injector Valve, PH <b>(ATEX)</b>	055-729-116	0 (1 IF PH)	0 (1 IF PH)
Sensor, Flow Meter Pick Up <b>(US)</b>	055-660-002	2 (-1 for every mass flow)	3 (-1 for every mass flow)
Sensor, Flow Meter Pick Up <b>(ATEX)</b>	910-060-102	2 (-1 for every mass flow)	3 (-1 for every mass flow)
Valve, Air Mix	155-535-315	1 (0 IF PH)	1 (0 IF PH)
Valve, Air Mix, PH	155-536-200	0 (1 IF PH)	0 (1 IF PH)
Injector, A/B	055-729-906	1 (0 IF PH)	1 (0 IF PH)
Injector, A/B PH	055-729-907	0 (1 IF PH)	0 (1 IF PH)
Injector A/C	055-729-908	0	1
Elbow, Bent Tube	055-729-904	1	2
Elbow, U Shaped Tube	055-729-902	1	2
Valve, RS5 PH	155-636-500	0 (1 IF PH)	0 (1 IF PH)
Valve, RS5 STD	055-528-003	0 (1 IF EXP)	0 (2 IF EXP)
Valve, Solenoid, 3/2	055-729-105	1 (1 IF PH)	1 (1 IF PH)
Valve, Solenoid, EXP, 3/2	055-729-108	0 (1 IF EXP)	0 (2 IF EXP)
Valve, Ball	055-729-528	1	2
Valve, Ball PH	82-2880-00	0 (1 IF PH)	0 (2 IF PH)