

RansFlow

Fluid Metering System



MODEL: A12410-XXXXXXX

IMPORTANT: Before using this equipment, carefully read **SAFETY PRECAUTIONS**, starting on page 1, and all instructions in this manual. Keep this Service Manual for future reference.

NOTES

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Section 1: SAFETY

Before operating, maintaining or servicing any ITW Ransburg electrostatic coating system, read and understand all of the technical and safety literature for your ITW Ransburg products. This manual contains information that is important for you to know and understand.

This information relates to USER SAFETY and PREVENTING EQUIPMENT PROBLEMS. To help you recognize this information, we use the following symbols:



CAUTION - states information that tells how to prevent damage to equipment or how to avoid a situation that might cause minor injury.



WARNING - states information to alert you to a situation that might cause serious injury if instructions are not followed.

While this manual lists standard specifications and service procedures, some minor deviations may be found between the literature and your equipment. Differences in local codes and plant requirements, material delivery requirements, etc., make such variations inevitable. Compare this manual with your system installation drawings and appropriate ITW Ransburg equipment manuals to reconcile such differences.

Careful study and continued use of this manual will provide a better understanding of the equipment and process, resulting in more efficient operation, longer trouble-free service and faster, easier troubleshooting. If you do not have the manuals and safety literature for your Ransburg system, contact your local ITW Ransburg representative or ITW Ransburg.



WARNING

- The user **MUST** read and be familiar with the Safety Section in this manual and the ITW Ransburg safety literature therein identified.
- This manual **MUST** be read and thoroughly understood by **ALL** personnel who operate, clean or maintain this equipment! Special care should be taken to ensure that the WARNINGS and safety requirements for operating and servicing the equipment are followed. The user should be aware of and adhere to **ALL** local building and fire codes and ordinances as well as NFPA 33 SAFETY STANDARD, 2009 EDITION, prior to installing, operating, and/or servicing this equipment.
- The hazards shown on the following pages may occur during normal use of this equipment. Please read the hazard chart beginning on page 6.

AREA	HAZARD	SAFEGUARDS
<p>Spray Area</p> 	<p>Fire Hazard</p> <p>Improper or inadequate operation and maintenance procedures will cause a fire hazard.</p> <p>Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation. Frequent power supply shutdown indicates a problem in the system requiring correction.</p>	<p>Follow These Guidelines</p> <p>Fire extinguishing equipment must be present in the spray area and test periodically.</p> <p>Spray areas must be kept clean to prevent the accumulation of combustible residues.</p> <p>Smoking must never be allowed in the spray area.</p> <p>The high voltage supplied to the atomizer must be turned off prior to cleaning, flushing or maintenance.</p> <p>When using solvents for cleaning:</p> <ul style="list-style-type: none"> • Those used for equipment flushing should have flash points equal to or higher than those of the coating material. • Those used for general cleaning must have flash points above 1000F (37.80C). <p>Spray booth ventilation must be kept at the rates required by NFPA 33, 2009 Edition, OSHA and local codes. Ventilation must be maintained during cleaning operations using flammable or combustible solvents.</p> <p>Electrostatic arcing must be prevented.</p> <p>Non-factory replacement parts or unauthorized equipment modifications may cause fire or injury.</p> <p>If used, a key switch bypass is intended for use only during setup operations. Production should never be done with safety interlocks disabled.</p> <p>Never use equipment for use in waterborne installations to spray solvent based materials.</p>

AREA	HAZARD	SAFEGUARDS
<p>Spray Area</p> 	<p>Explosion</p> <p>Improper or inadequate operation and maintenance procedures may cause an explosion.</p> <p>Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation. Frequent power supply shutdown indicates a problem in the system requiring correction.</p>	<p>Follow These Guidelines</p> <p>Electrostatic arcing MUST be prevented.</p> <p>All electrical equipment must be located outside Class I or II, Division 1 or 2 hazardous areas, in accordance with NFPA 33, 2009 Edition.</p> <p>Test only in areas free of flammable or combustible materials.</p> <p>The current overload sensitivity (if equipped) MUST be set as described in corresponding section of the equipment manual. Protection against inadvertent arcing that is capable of causing fire or explosion is lost if the current overload sensitivity is not properly set. Frequent power shutdown indicates a problem with the system which requires correction.</p> <p>Always turn the control panel off prior to flushing, cleaning, or working on spray system equipment.</p> <p>Ensure that the control panel is interlocked with the ventilation system and conveyor in accordance with NFPA 33, 2009 Edition.</p> <p>Have fire extinguishing equipment readily available and tested periodically.</p>
<p>Spray Area</p> 	<p>Explosion - Incompatible Materials</p> <p>Halogenated hydrocarbon solvents for example: methylene chloride and 1,1,1,-Trichloroethane are not chemically compatible with the aluminum that might be used in many system components. The chemical reaction caused by these solvents reacting with aluminum can become violent and lead to an equipment explosion.</p>	<p>Follow These Guidelines</p> <p>Aluminum is widely used in other spray application equipment - such as material pumps, regulators, triggering valves, etc. Halogenated hydrocarbon solvents must never be used with aluminum equipment during spraying, flushing, or cleaning. Read the label or data sheet for the material you intend to spray. If in doubt as to whether or not a coating or cleaning material is compatible, contact your coating supplier. Any other type of solvent may be used with aluminum equipment.</p>

AREA	HAZARD	SAFEGUARDS
<p>Spray Area / High Voltage Equipment</p> 	<p>Electrical Discharge</p> <p>There is a high voltage device that can induce an electrical charge on ungrounded objects which is capable of igniting coating materials.</p> <p>Inadequate grounding will cause a spark hazard. A spark can ignite many coating materials and cause a fire or explosion.</p>	<p>Follow These Guidelines</p> <p>Parts being sprayed must be supported on conveyors or hangers and be grounded. The resistance between the part and ground must not exceed 1 mega ohm.</p> <p>All electrically conductive objects in the spray area, with the exception of those objects required by the process to be at high voltage, must be grounded.</p> <p>Any person working in the spray area must be grounded.</p> <p>Unless specifically approved for use in hazardous locations, the power supply and other electrical control equipment must NOT be used in Class I, Division 1 or 2 locations.</p>
<p>Electrical Equipment</p> 	<p>Electrical Discharge</p> <p>High voltage equipment is utilized. Arcing in areas of flammable or combustible materials may occur. Personnel are exposed to high voltage during operation and maintenance.</p> <p>Protection against inadvertent arcing that may cause a fire or explosion is lost if safety circuits are disabled during operation.</p> <p>Frequent power supply shutdown indicates a problem in the system which requires correction.</p> <p>An electrical arc can ignite coating materials and cause a fire or explosion.</p>	<p>Follow These Guidelines</p> <p>All electrical equipment must be located outside Class I or II, Division 1 or 2 hazardous areas. Refer to NFPA 33, 2009 Edition.</p> <p>Turn the power supply OFF before working on the equipment.</p> <p>Test only in areas free of flammable or combustible material.</p> <p>Testing may require high voltage to be on, but only as instructed.</p> <p>Production should never be done with the safety circuits disabled.</p> <p>Before turning the high voltage on, make sure no objects are within the sparking distance.</p>

AREA	HAZARD	SAFEGUARDS
<p>Toxic Substances</p> 	<p>Mechanical Hazard</p> <p>Certain material may be harmful if inhaled, or if there is contact with the skin.</p>	<p>Follow These Guidelines</p> <p>Follow the requirements of the Material Safety Data Sheet supplied by the coating manufacturer.</p> <p>Adequate exhaust must be provided to keep the air free of accumulations of toxic materials.</p> <p>Use a mask or respirator whenever there is a chance of inhaling sprayed materials. The mask must be compatible with the material being sprayed and its concentration. Equipment must be as prescribed by an industrial hygienist or safety expert, and be NIOSH approved.</p>
<p>Robot Work Area</p>	<p>Mechanical Hazard</p> <p>Improper use or maintenance can lead to hazardous conditions, particularly from unexpected robot manipulator movement.</p>	<p>Follow These Guidelines</p> <p>Applicator adjustments or maintenance should be done after the robot is taken out of service. Do not adjust or repair the applicator if the robot is operating or standing ready to start.</p> <p>Refer to robot operating instructions for the procedures to take a robot out of service.</p> <p>Follow all OSHA Lockout / Tagout procedures when performing any maintenance.</p>
<p>All Areas</p>	<p>Improper / Inadequate Training</p> <p>Improper operation or maintenance may create a hazard.</p> <p>Personnel must be properly trained in the use of this equipment.</p>	<p>Follow These Guidelines</p> <p>Personnel must be given training in accordance with the requirements of NFPA 33, 2009 Edition.</p> <p>Instructions and safety precautions must understood prior to using this equipment.</p> <p>Comply with appropriate codes governing ventilation, fire protection, operation maintenance, and housekeeping. OSHA references are sections 1910.94 and 1910.107. Also refer to NFPA 33, 2009 Edition and your insurance company requirements.</p>

Section 2: INTRODUCTION

the RansFlow precisely meters and mixes multi-component materials. This electronic metering system provides accuracy and repeatability for consistent finish quality.

The RansFlow System is composed of four basic elements...

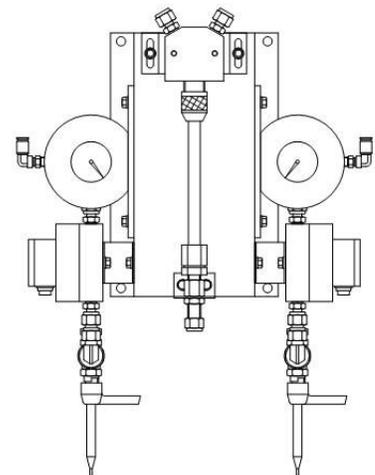
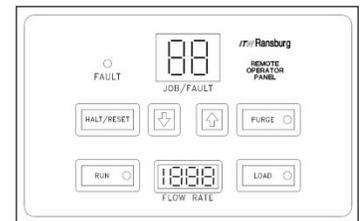
- Main Control Console
- Fluid Panel
- Remote Operator Panel (optional)
- Pneumatic Interface Panel (optional)

The Main Control Console can control up to 3 channels (materials), the fluid panels are available in 1, 2, or 3 channels, and the Remote Pneumatic Interface panels are available in single or 2-channel models.



Main Control Panel

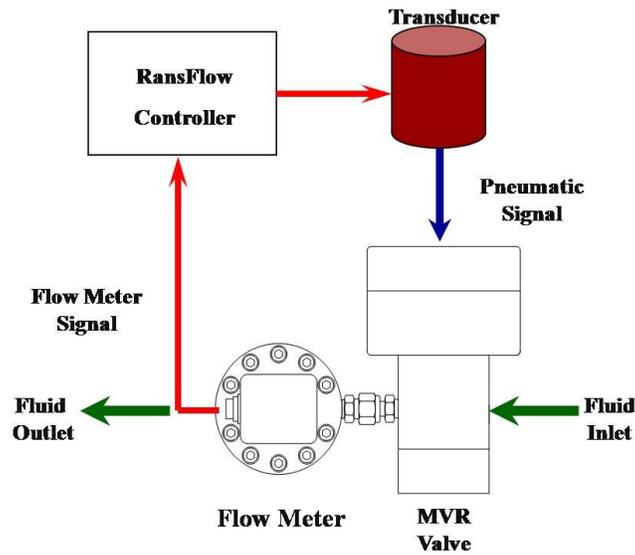
Remote Operator Panel



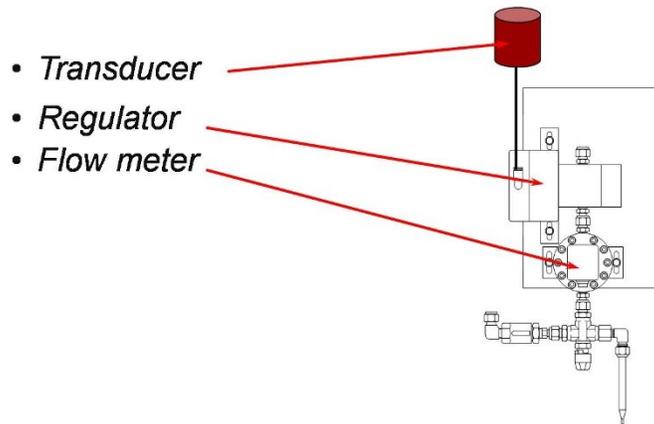
Fluid Panel

The RansFlow is a dynamic fluid metering system using regulators and flow meters to provide true closed-loop flow control.

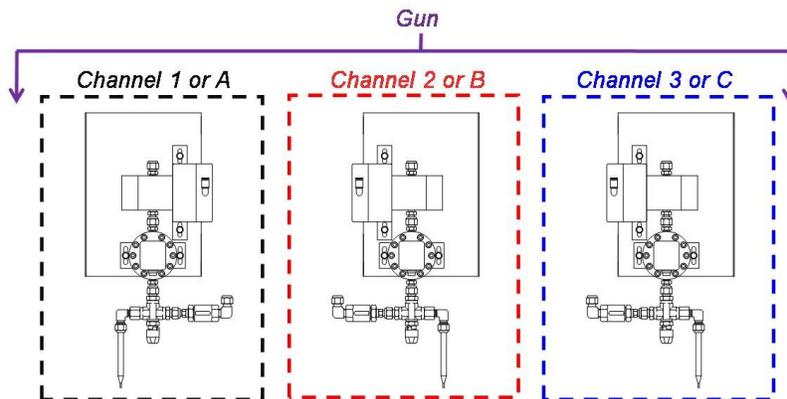
Operation overview:



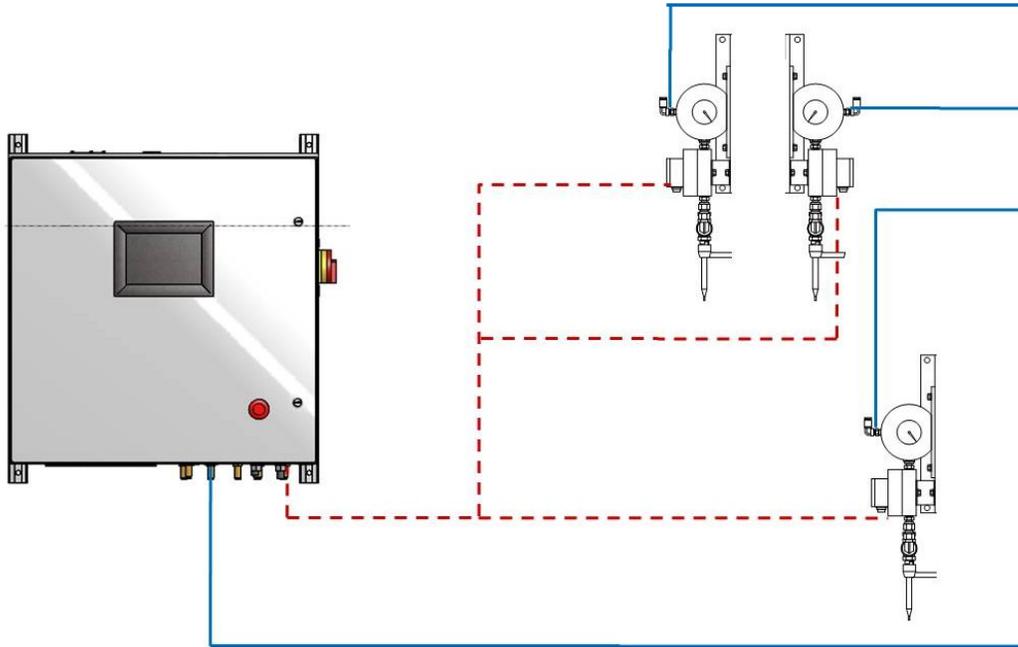
A CHANNEL consists of:



A GUN can consist of 1, 2, or 3 CHANNELS:

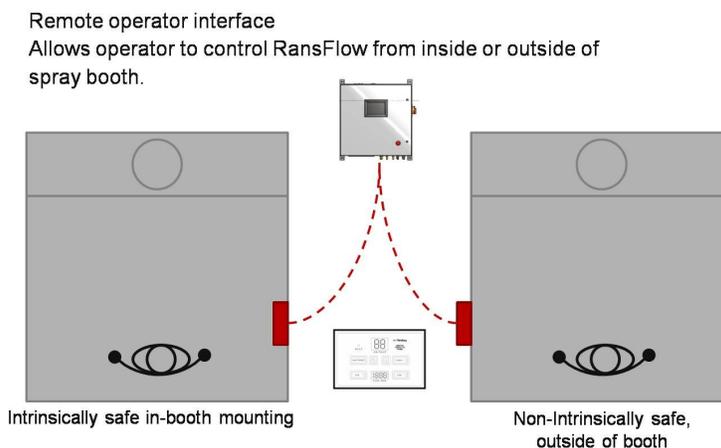


The RansFlow can control up to 3 CHANNELS configured as 1 or 2 GUNS:



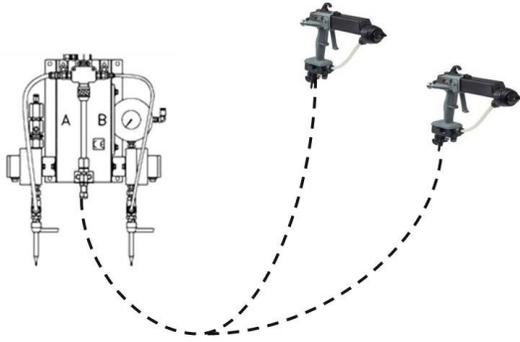
This RansFlow will maintain the fluid delivery and ratio at each individual applicator to a tolerance as close as +/-2%. A flow meter will be located in the fluid stream prior to component mixing upstream from each applicator. This flow meter generates pulses as material flows through it and sends them back to the flow controller. The flow controller converts the pulses to ml/min using a calibration value defined at setup. This actual flow rate will be compared to the operator adjustable set point and ratio. The flow controller will then make an adjustment to the MVR fluid regulators located prior to the applicator. This process of measuring, comparing, and adjusting is repeated 50 times per second maintaining the required flow rate and ratio for each material. After each component leaves the flow meters, they come together in a spiral mix tube assembly prior to delivery to the applicator.

Automatic mode utilizes inputs from a robot controller or PLC to set flow rates and ratios and activate triggers, flushes and fills. Manual mode relies on the operator for the operation of the mixed material. A remote operator panel (depending on the version) is mounted inside or outside the spray booth to allow control of the RansFlow by the manual sprayer and to inform the operator of the RansFlow's operating conditions. This panel allows the operator to flush, fill, run and reset faults to the RansFlow from inside the booth and it also indicates the condition of the unit: Run, Flush, Load, or Fault..

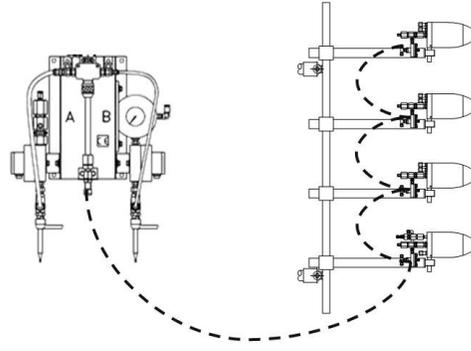


MANUAL MODE examples:

Example A, Manual Guns

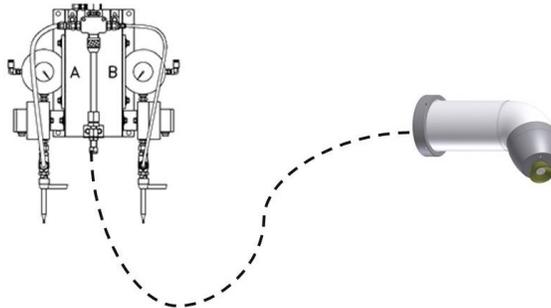


Example B, Reciprocator Bells



In “Manual Mode”, the flow rate of the resin is controlled by the demand of the operator(s) or equipment and the RansFlow supplies the catalyst to maintain the desired ratio set-point.

AUTOMATIC MODE example:



In “Automatic Mode”, a single applicator is supplied and the RansFlow controls the ratio and flow rate to the applicator. The robot can communicate directly with the RansFlow to control the fluid delivery rate with an analog signal.

Main Control Console

The Main Control Console is the heart of the RansFlow System. It houses the following items:

- User-interface computer (incl. LCD display and touchscreen)
 - PC-104 Interface cards (3)
 - Optically isolated interface boards
 - 20 Solenoid valves
 - E to P transducers (1 to 6)
 - DC Power supplies (2)
 - Air Flow Switches (2)
 - Power and I/O terminal strip
-

Main Control Console (continued)

- Pressure Switches (for gun flush box interfacing)
- Optional zener barriers for intrinsically safe flowmeters
- Optional fiberoptic interface modules (for fiberoptic flowmeters)

The user-interface computer is a AMD Geode based P.C. with a non-volatile flash-disk that contains a Windows CE 5.0 operating system and the RansFlow user-interface software. The computer has a USB port for updating its software and for backing up parameter data.

The three PC-104 I/O cards plug onto the back of the user-interface PC and control all I/O functions, including interfacing with external control devices such as remote PLC's.

Ribbon cables connect the PC-104 cards to optically isolated interface boards to prevent harmful voltages, etc. from damaging the user-interface P.C.

There are two DC power supplies housed in the main control console. One is 24 VDC for all discrete I/O signals and for the user-interface P.C. The second supply provides +5 VDC for the optical isolator boards.

On the top of the main control console are three connectors for I/O. One is for a second gun (37-pins), the second (50-pins) for all system I/O, and the third is for the Remote Operator Panel (9-pins).

The E to P pressure transducers convert a 0 to 10 VDC signal from the channel cards to a proportional 0 to 100 psi air signal. This signal is used to pilot the MVR flow control valves.

The Zener barriers make the flowmeter sensors intrinsically safe for use inside the spray area.

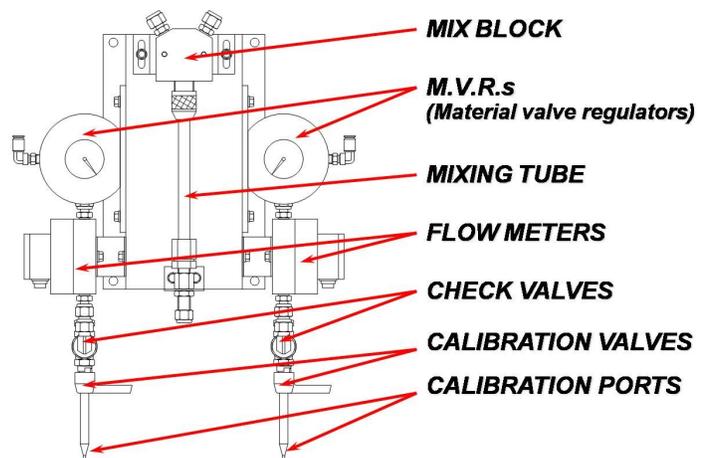
The air flow switches are used to sense when a handgun is triggered (to prevent flow if a master channel flowmeter sticks).

The pressure switches are used to interface to the optional gun flush boxes to prevent flushing and loading of handguns when they are not in the flush box.

Fluid Panel

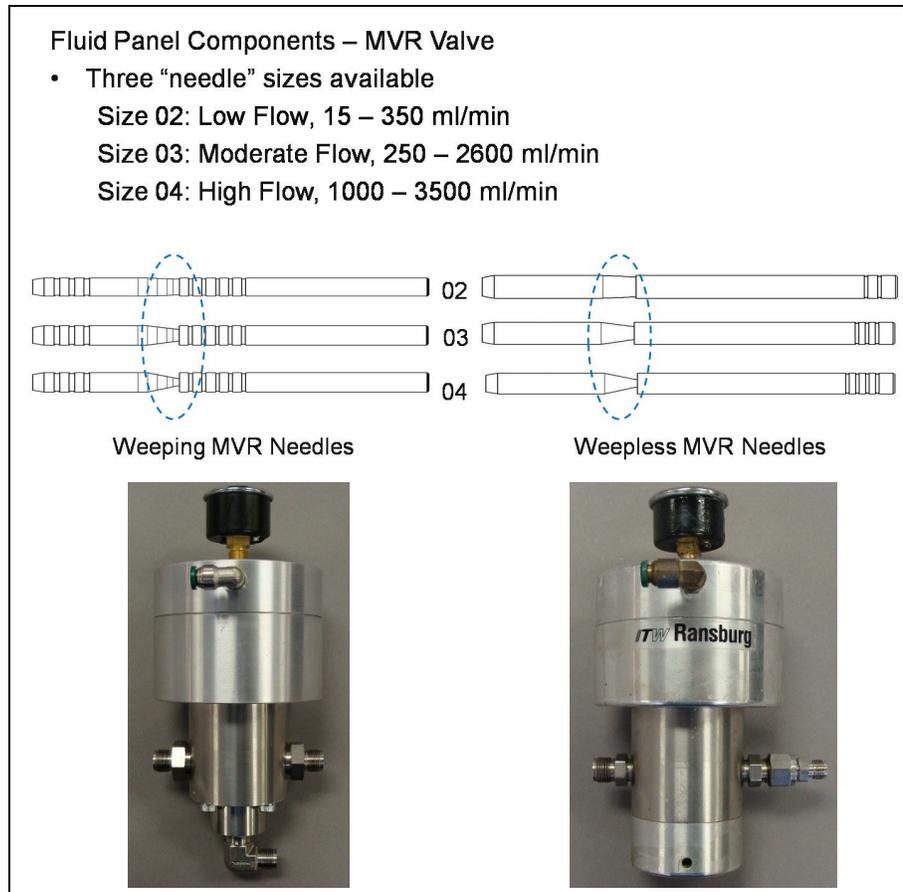
The Fluid Panels contain all of the 'wetted' components for the RansFlow. These include:

- MVR flow control valves
- Flowmeters
- Mixer Block
- Spiral Mix Tube
- Check Valves
- Calibration Valves
- Optional fluid pressure regulators



The flowmeters and MVR valves are available in various sizes for various materials and flow rates. Users should consult our technical support group to determine which are required for their specific application.

The MVR Valves act as both flow control valves and on-off valves depending on the application. With manual mode guns, the master channel MVR opens 100% during operation and the slave channel or channels are controlled to maintain the proper ratio only. With guns configured in automatic mode, all MVR valves act as flow control valves. There are 3 different needle sizes available for the MVR valves (02 for low flow, 03 for medium flow, and 04 for high flow).



The flowmeters act as the feedback mechanism to the software so that it knows what the current flow rate of the material is. The RansFlow is capable of interfacing with any type of flowmeter that is capable of outputting a square wave whose frequency is proportional to the flow rate. It is highly recommended (although not absolutely necessary) that these flowmeters have quadrature outputs so that reverse flow can be detected.

The calibration valves are 3-way ball valves used to direct the flow of material away from the mix block to the calibration tubes. This is used to calibrate the flowmeters.

The check valves prevent backflow of material from one source to another. (Typically, the catalyst is run at a higher pressure than the resin to allow it to ‘inject’ itself into the resin flow stream and can, therefore, back up into the resin supply if an MVR valve is stuck open for any reason.

The Mix-Block is a four-port manifold that brings the fluid from the outlet of the resin MVR together with the outlet of the catalyst MVR. Attached to the top of the Mix-Block is a port for an optional solvent flush valve for quick flushing of only the mixed material from the Mix-Block out to the applicator.

Attached to the outlet of the Mix-Block is the spiral mix tube. This is simply a piece of tubing with a helical-shaped element inside the tube. This element causes the two materials (resin and catalyst) to be ‘folded’ together numerous times as the materials pass through it, thus causing it to mix.

Relevant Information:

The RansFlow control system achieves closed-loop control of its fluids via its configured channels and guns. A channel consists of one MVR valve, one flowmeter, one calibration valve, and one check valve. A gun (in most cases) represents one applicator and may be configured with one channel (for flow control only) or configured with two or three channels (for ratio and flow control).

Each channel operates independently of, and simultaneously with all of the other channels in the system. The controller, therefore, provides accurate and dynamic flow control for all channels regardless of external system variables (ie. fluid inlet pressure, backpressure, material viscosity, flowmeter wear, etc.).

Configurable Operating Parameters:

The design of the RansFlow system allows it to be configured to meet the requirements of the application. The large number of parameters allows the RansFlow to be used in almost any application involving flow and or ratio control of coatings.

System Parameters are parameters that affect the overall system, which includes all channels and guns or the user interface. They include:

- Number of guns
- Channels assigned to each gun
- Function of the alarm horn

Gun Parameters are parameters that affect the gun. These parameters apply to all channels configured to that gun. They include:

- Mode (manual or automatic)
- Which channels open during flush sequences
- Default Job Number
- Flow/Ratio Tolerance
- Tolerance Time
- Tolerance Volume
- Flush Mode
- Trigger-On Delay
- Trigger-Off Delay
- Blow-Off Time
- Mixed Volume
- Flush Box Enable/Disable

The screenshot shows the 'Gun Parameters' interface for Gun 1. It features a grid of input fields and dropdown menus for various parameters. At the top, there are tabs for Gun 1 and Gun 2. The parameters are organized into two columns. The first column includes: CHANNELS (A : B :), MODE (MANUAL), CLEAN CHANNELS (NO : NO), DEFAULT JOB (1), FLOW TOLERANCE (%) (5), TOLERANCE TIME (3), and TOLERANCE VOLUME (150). The second column includes: GUN 1, FLUSH MODE (1), TRIGGER-ON DELAY (ms) (0), TRIGGER-OFF DELAY (ms) (0), BLOW-OFF TIME (sec) (0), POT-LIFE VOLUME (ml) (0), and two radio buttons for Flush Box A and Flush Box B. At the bottom, there is a navigation bar with icons for home, play, and a document.

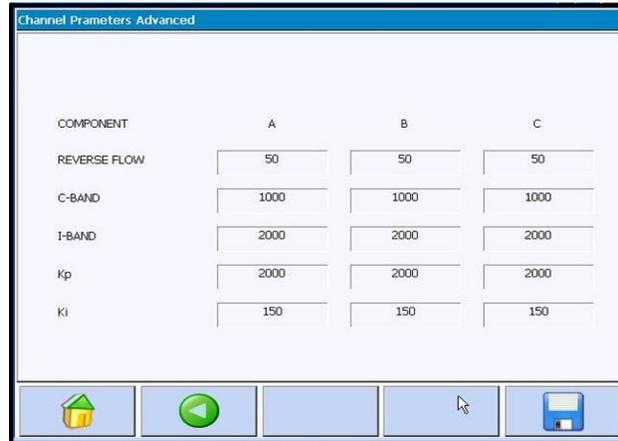
Gun Parameters Screen

Channel Parameters are parameters that affect only that specific channel. For two or three channel guns, there are independent parameters for each of the channels. They include:

- Regulator Type
- MVR High
- MVR Low
- Pulses/Liter (Flowmeter Calibration Value)
- Pressure Regulator Pressure

Advanced Channel Parameters include:

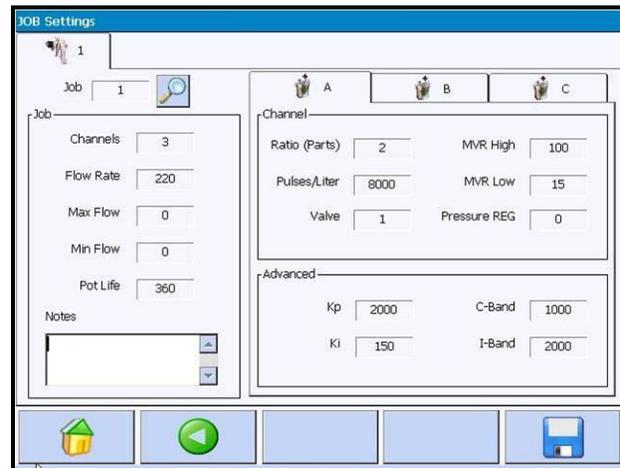
- Reverse Flow Volume
- C-Band
- I-Band
- Kp
- Ki



Advanced Channel Parameters Screen

Job Parameters are parameters that are stored with the specific job number. Typically, a job number is assigned to a specific material. In this way, totalization data and PID parameters relate directly to the material. These parameters include:

- Flow Rate Setpoint
- Maximum Flow (for analog control)
- Minimum Flow (for analog control)
- Pot-Life Time
- Ratio
- Pulses/Liter (flowmeter calibration values)
- Valve (resin and catalyst)
- MVR High
- MVR Low
- Pressure Regulator Setting
- Kp
- Ki
- C-Band
- I-Band
- Text Note(s)



Job Parameters Screen

SPECIFICATIONS - Environmental / Physical

Size:

- Main Control Console: 24" Wide x 24" High x 9" Deep.
- Remote Operator Panel: 9.5" Wide x 6.25" High x 4" Deep.
- Pneumatic Interface Panel (for second gun): 24" Wide x 12" High x 9" Deep.

Operating Temperature:

- 32° F to 130° F inside enclosures
- 100° F maximum ambient outside temperature

Operating Humidity:

- 0% to 95% RH

Air Input:

- **125 psi maximum**

Power Input:

- 120 VAC, 50/60 Hz @ 2.25A or
- 240 VAC, 50/60 Hz @ 1A
(auto selecting)

LCD Display:

- 6.5" Diagonal, Full Color, 640 x 480 pixels (utilizing a touchscreen for data input)

Processor:

- AMD Geode GX533

Flow Capacity:

- 10 ml's/min to 4000 ml's/min per channel (dependant upon material and flowmeter limitations)

Viscosity Range:

- 30 cp to 500 cp

I/O update time (incl. PID loop):

- 20 msec (50 times/sec)

Job Tables:

- 99 Jobs (P-Sets) per gun

FEATURES

Control of up to 3 materials from one 24" W. x 24" H. x 9" D. control console.

Possible gun configurations:

- One 3-component gun
- One 2-component gun and one single component gun
- Two single component guns

Dual channel guns are configurable as manual (ratio control only) or automatic (flow and ratio control) modes.

Configurable operating parameters for all channels and guns. (Up to 99 'Jobs' per Gun can be programmed.)

Full color 6.5" LCD display with touchscreen for setup, operation, and diagnostics.

Pot-life timer monitoring and alarming.

Wide range of ratio and flow capabilities.

Discrete I/O capabilities allow interfacing to any manufacturer's PLC.

USB port allows backup of all operating parameters, retrieval of flow totalization data, and updating of user-interface software (stored on flash drive). USB flash drive size MUST be less than 4GB.

User interface software is Windows CE 5.0 based.

Retrofit option allows current EZ Flow, 2k220, 2k880, and DynaFlow customers upgrade their electronics and use their existing fluid components.

Extremely easy to program color change sequencer for flushing and loading can handle up to 10 colors and 3 different catalysts.

All discrete and analog inputs and outputs can be monitored and forced for diagnostic purposes.

Analog input capability for flow rate setpoints (0-10 VDC).

Convenient test points on I/O boards make it simple to connect data acquisition hardware for process monitoring and fine tuning.

All discrete inputs and outputs optically isolated.

Gun flush box interface I/O option is available.

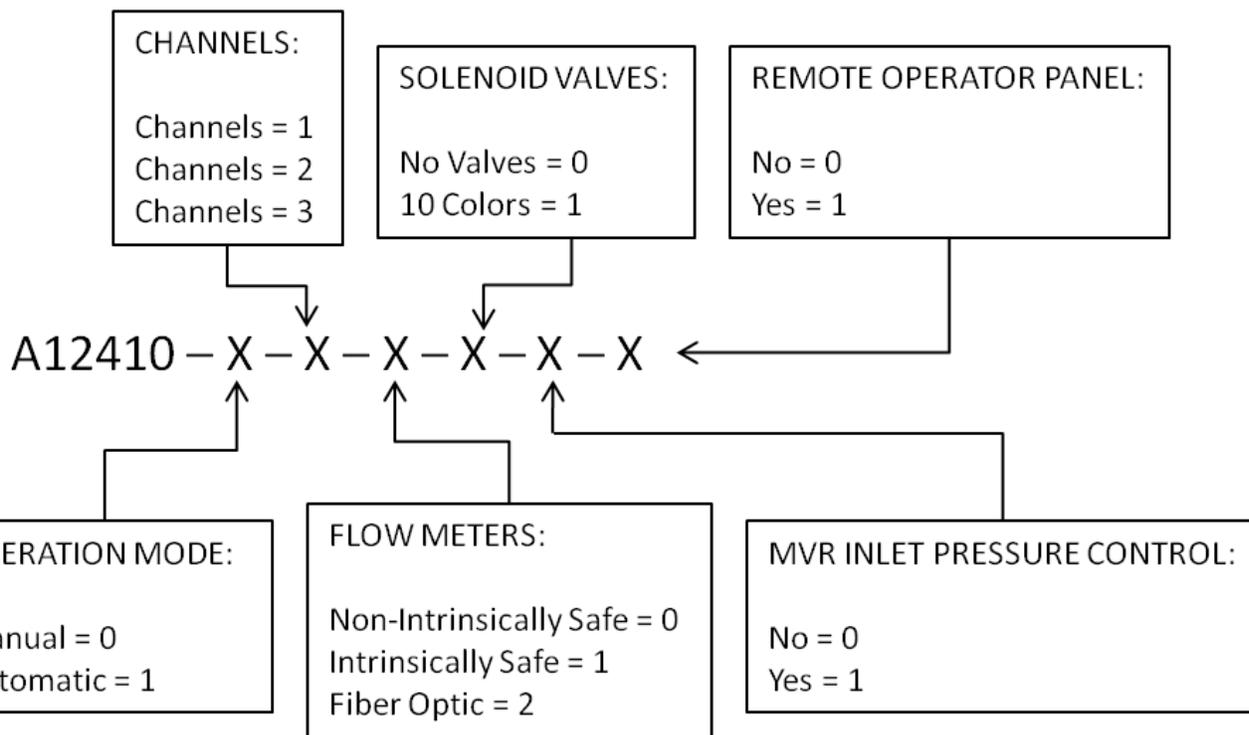
Optional inlet pressure control allows users to program inlet fluid pressure to MVR valves.

Optional Remote Operator Panel uses Hall-Effect switches and a magnet for operation. (This allows the ROP to be mounted outside the booth on a booth window and operated from inside the booth, eliminating overspray contamination.)

All I/O (including PID loop) are updated 50 times/second.

Extremely robust PID loop is factory tuned for nearly all setups.

SELECTION GUIDE



Control Panel Configuration Part Number

Section 3: INSTALLATION

System Guidelines:

Installation Prints:

Drawings and information contained in this section of the manual is applicable to most installations. However in some special cases, ITW Ransburg may supply custom installation drawings for your specific site. It is highly recommended that if your installation differs significantly from the installation drawings supplied by ITW Ransburg, you notify your ITW Ransburg representative to insure that standard installation practices are not violated and to have your prints updated to reflect the installation accurately for future reference. Typical fractional and metric installation prints can be found in the Appendix section of this manual.

Cable Assemblies:

Interconnections between all control panels and the fluid panels are made using manufactured cable assemblies with heavy duty connectors. This simplifies installation and eliminates the possibility of items being wired incorrectly. The one exception to this is the discrete interface I/O wiring. These connections will vary greatly from installation to installation. This can involve well over 50 connections per control console and, therefore, require a cable with the proper 50-pin connector on one end (P/N: A12487-XXX).

Equipment Grounding:

All panels should be grounded in accordance with either the National Electrical Code or local electrical codes (whichever is more stringent). Refer to the electrical installation drawings

provided in this manual to locate the grounding terminal for all control panels. If in doubt, contact your ITW Ransburg representative for clarification.

Equipment Locations:

All of the RansFlow panels must be located outside of the hazardous area. If in doubt, contact your ITW Ransburg representative for clarification.

There are four basic panels used in the RansFlow system:

- Main Control Console
- Fluid Panel
- Remote Operator's Panel (optional)
- Pneumatic Interface Panel (optional)

The Fluid Panel should be placed within 20' of the control console (or Pneumatic Interface Panel in the case of Gun #2) to minimize pneumatic delays between the E to P transducers and the MVR valves.

Fluid Regulators:

It is highly recommended that a pilot operated fluid regulator (similar to the ITW DR-1 regulator) be used on the inlet of all of the MVR valves unless they are supplied from pressure pots.

The RansFlow can (optionally) control the pilot pressure to these fluid regulators. (It is sometimes necessary to use higher pressures for high viscosity materials than lower viscosity materials, etc.) The RansFlow allows the user to program a different pressure for every job and every channel so that the inlet pressure to the MVR valves can be fine-tuned to the specific material and flow rate.

Pneumatic Interface Panel for Gun #2:

If more than one fluid panel is to be controlled from one RansFlow controller, it is necessary to use a second pneumatic interface panel. In this instance, the software will be configured for two guns, Gun #1 and Gun #2 (See gun configuration chart, below.)

Possible Gun Configurations:

One 3-channel gun

- Channels 1, 2, & 3

Two single-channel guns

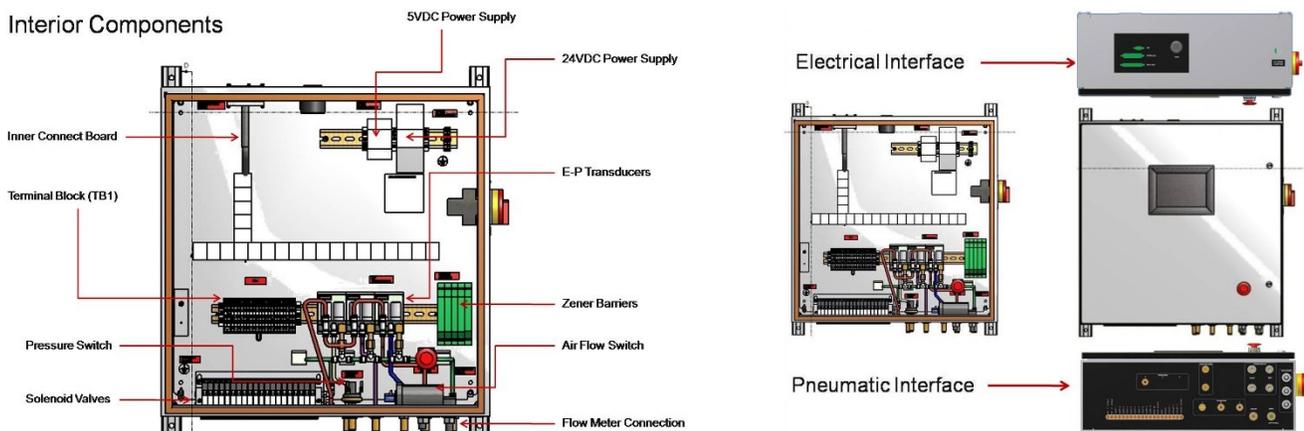
- Gun #1 (Channel 1)
- Gun #2 (Channel 2)

One single-channel gun and one 2-channel gun

- Gun #1 (Channel 1)
- Gun #2 (Channels 2 & 3)

Note: Channel 3 cannot be configured as a master channel!

Control / Interface Panel Overview:



STEP 1 - Main Power to Control Panel Connection



Electrical Connections – Main Power

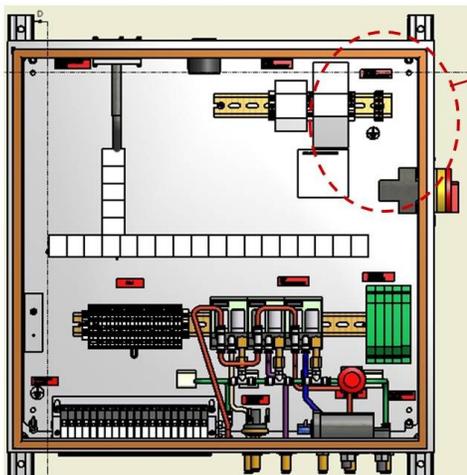
1. AC POWER: Cabinet entrance point for incoming AC power.
2. The RansFlow has an auto-switching AC power input that will accept 120-240 VAC.



Proper OSHA Lockout/Tagout procedures must be performed prior to equipment installation or maintenance.



Electrical connections - Main Power



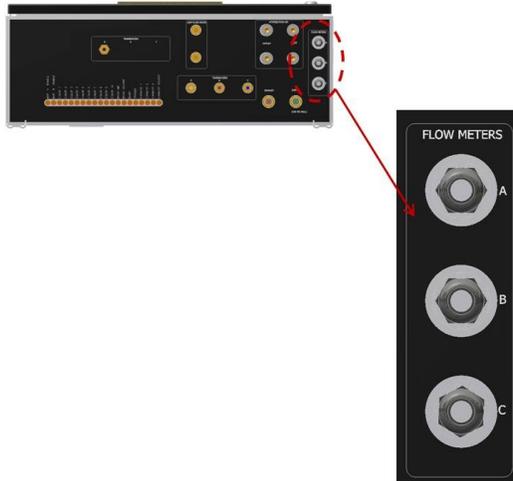
White (neutral)
Black (hot)
Green (ground)

CAUTION:

Wires should be landed on the switch terminal (white & black) and the ground block.



STEP 2 - Flow Meters and I/O Connections



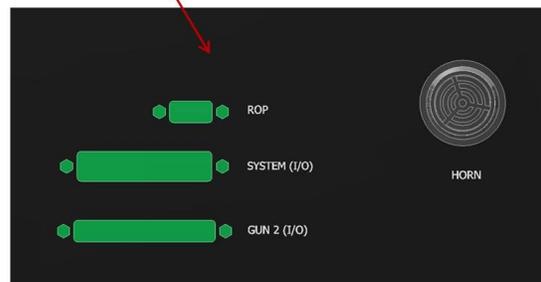
Electrical Connections – Flow Meters

1. FLOW METERS (A B C): Electrical or fiber-optic cable connection point for external flow meters.
2. The RansFlow will support up to 3 flow meters.



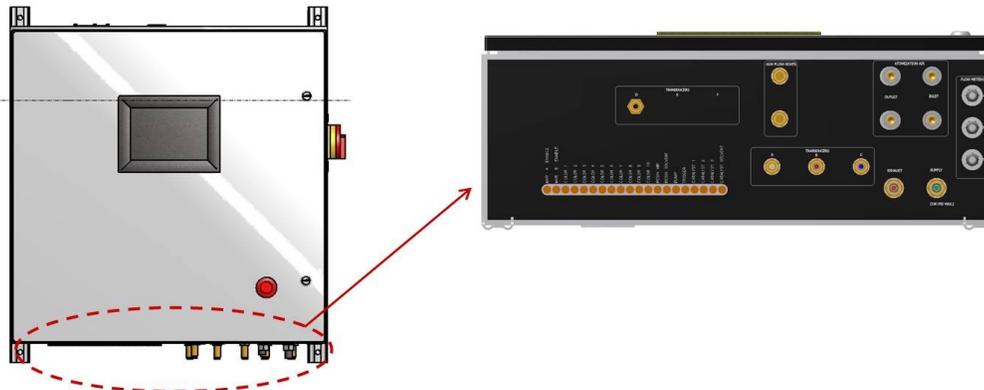
Electrical Connections – I/O

1. ROP: Connection point for the *optional* Remote Operator Panel (ROP) cable.
2. SYSTEM (I/O): I/O cable connection point for external system input and output communication with a PLC or robot (if used).
3. GUN 2 (I/O): I/O connection point to an interface box for an *optional* second gun.

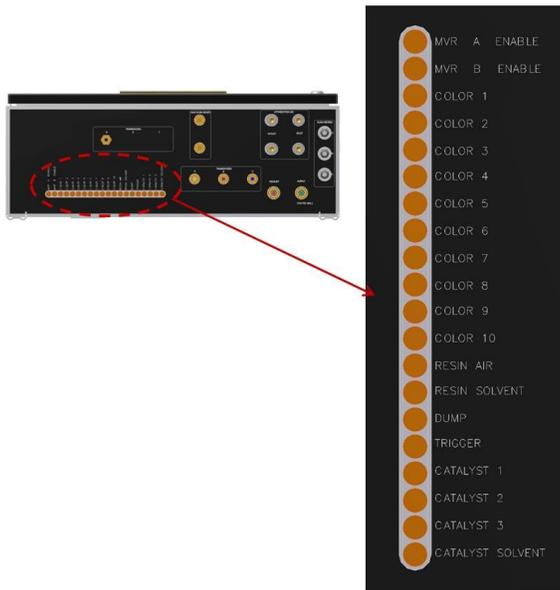


STEP 3 - CCV and Gun Connections

Air Connections – CCV and Gun

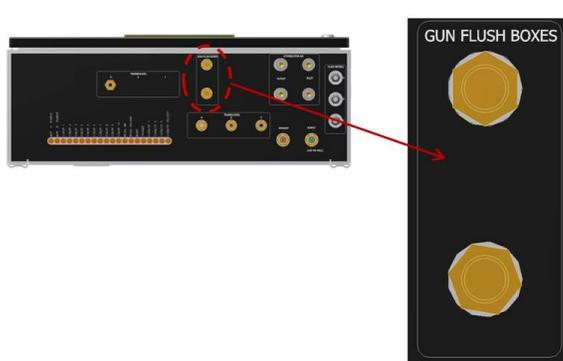


Air Connections – CCV and Gun



1. **MVR (A&B) ENABLE:** Air output that connects to the CCV valve (if equipped) on the fluid inlet of the MVR.
2. **COLOR (1-10):** Air output that connects to the associated color valve on the color stack.
3. **RESIN AIR:** Air output that connects to the resin air valve on the resin color stack.
4. **RESIN SOLVENT:** Air output that connects to the resin solvent valve on the resin color stack.
5. **DUMP:** Air output that connects to the dump signal input on the applicator.
6. **TRIGGER:** Air output that connects to the trigger signal input on the applicator.
7. **CATALYST (1-3):** Air output that connects to the associated catalyst valve on the catalyst valve stack.
8. **CATALYST SOLVENT:** Air output that connects to the solvent valve on the catalyst valve stack.

STEP 4 - Gun Flush Box and Transducer / MVR Connection



Air Connections – Gun Flush Box

1. **GUN FLUSH BOXES:** This is an air input coming from a gun flush box (if used) verifying that the lid has been closed. Will support up to 2 gun flush boxes.

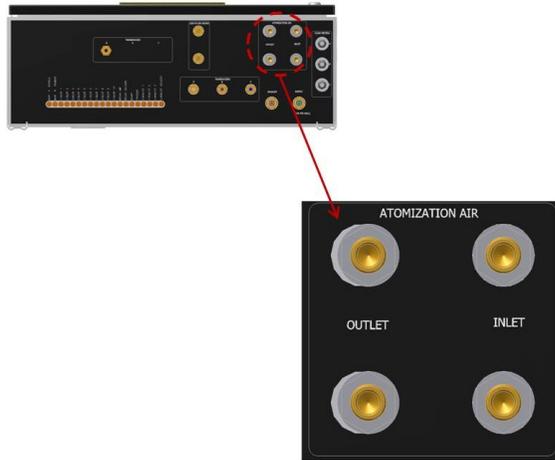


Air Connections – Transducer / MVR

1. **TRANSDUCERS (A B C):** These are air output connections that connect to the associated air pilot input on the designated Material Valve Regulator (MVR).
2. Pilot signal tubing guidelines (shown below)
3. The RansFlow will support up to 3 MVRs.

Tubing Size O.D.	Fluid Regulator Type	Typical Application	MIN LENGTH		MAX LENGTH	
			Feet	Meters	Feet	Meters
1/4"	MVR	Two-component	15	4.6	50	15.3
1/4"	DR1	Single-Component	15	4.6	100	30.5

STEP 5 - Atomization Air and Supply Air Connections



Air Connections – Atomization Air

1. **ATOMIZATION AIR (INLET & OUTLET):** This is an input and output for the gun atomization air. The RansFlow uses this air signal to tell if the gun has been triggered.
2. Connects to an air flow switch inside the RansFlow cabinet.
3. Will support up to 2 guns.

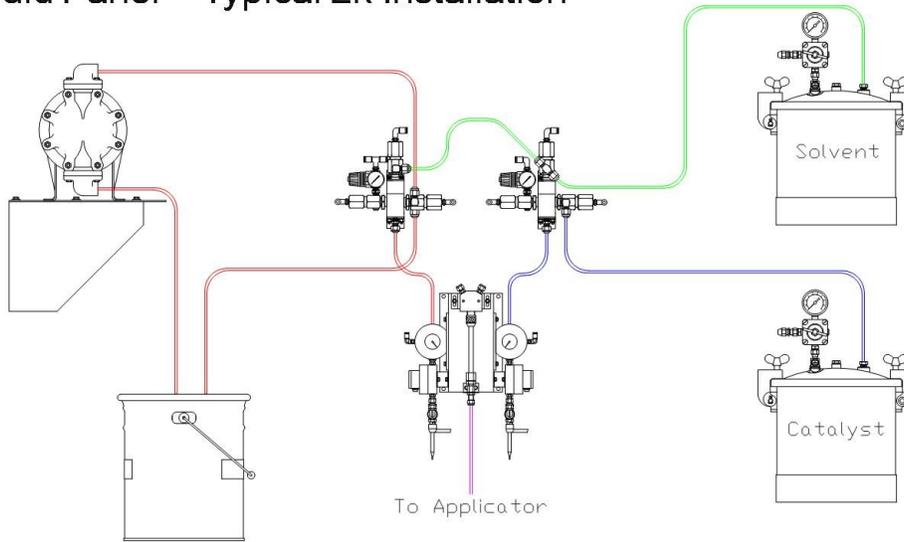


Air Connections – Supply Air

1. **SUPPLY:** Air input for control panel main air supply (100 psi maximum).
2. **EXHAUST:** No connection needed here. This is the exhaust for the transducers inside the RansFlow cabinet. A muffler is NOT recommended as it restricts the exhaust flow and will reduce the response time of the MVR valves.

STEP 6 - Fluid Connections

Fluid Panel – Typical 2k Installation



Can support up to 10 colors

Can support up to 3 catalysts

Discrete (Digital and Analog) GUN Inputs and Outputs

<u>Pin No.</u>	<u>Name</u>	<u>Type</u>	<u>Description</u>
1	Resin Air Solenoid	Output	Intended to drive the CCV air valve on the resin color change valve stack assy. It can be programmed to turn on in steps 1 and/or 3 of the flush sequence and it pulses in step 2.
2	Color #9 Solenoid	Output	Intended to drive the #9 color valve on the CCV stack.
3	Color #7 Solenoid	Output	Intended to drive the #7 color valve on the CCV stack.
4	Color #5 Solenoid	Output	Intended to drive the #5 color valve on the CCV stack.
5	Color #3 Solenoid	Output	Intended to drive the #3 color valve on the CCV stack.
6	Color #1 Solenoid	Output	Intended to drive the #1 color valve on the CCV stack.
7	Ch. B Transducer	Output	A 0-10 VDC output command to drive the E to P transducer which, in turn, drives the MVR flow control valve (Ch. B).
8	Resin Solvent Sol.	Output	Intended to drive the CCV solvent valve on the resin color change valve stack assy. It can be programmed to turn on in steps 1 and/or 3 of the flush sequence and it pulses in step 2.
9	Trigger Solenoid	Output	Intended to be shuttled together with the solenoid valve that triggers the applicator during normal spray sequences. It allows the color change sequencer to trigger the applicator during flush and load sequences. (It is turned on in the 3 rd step of the load sequence and the 4 th step of the load sequence.
10	Catalyst #2 Solenoid	Output	Intended to drive the #2 catalyst valve on the catalyst CCV stack.
11	Ch. C Transducer	Output	A 0-10 VDC output command to drive the E to P transducer which, in turn, drives the MVR flow control valve (Ch. C).
12	Flowmeter C Phase	Input	One of the quadrature feedback signals from the channel C flowmeter.
13	Flowmeter A Phase	Input	One of the quadrature feedback signals from the channel A flowmeter.
14	Flowmeter B Phase	Input	One of the quadrature feedback signals from the channel B flowmeter.
15	Flowmeter B Source	Input	One of the quadrature feedback signals from the channel B flowmeter.
16	Trigger	Input	Connecting this input to +24 VDC starts flow on a gun configured in automatic mode.
17	Ch. C MVR Enable	Output	Intended to drive the enable valve on the inlet of the channel C MVR.
18	Ch. A Transducer	Output	A 0-10 VDC output command to drive the E to P transducer which, in turn, drives the MVR flow control valve (Ch. A).
19	+24 VDC	N/A	
20	Color #10 Solenoid	Output	Intended to drive the #10 color valve on the CCV stack.
21	Color #8 Solenoid	Output	Intended to drive the #8 color valve on the CCV stack.
22	Color #6 Solenoid	Output	Intended to drive the #6 color valve on the CCV stack.
23	Color #4 Solenoid	Output	Intended to drive the #4 color valve on the CCV stack.
24	Color #2 Solenoid	Output	Intended to drive the #2 color valve on the CCV stack.

Pin No.	Name	Type	Description
25	Ch. A MVR Enable	Output	Intended to drive the enable valve on the inlet of the channel A MVR.
26	Dump Solenoid	Output	Intended to drive a dump valve at the applicator. On in steps 1 & 2 of the load sequence and steps 1, 2, & 3 of the flush sequence.
27	Catalyst #1 Solenoid	Output	Intended to drive the #1 catalyst valve on the catalyst CCV stack.
28	Catalyst #3 Solenoid	Output	Intended to drive the #3 catalyst valve on the catalyst CCV stack.
29	Cat. Solvent Solenoid	Output	Intended to drive the CCV solvent valve on the catalyst color change valve stack assy. It can be programmed to turn on in step 2 of the flush sequence.
30	Flowmeter C Source	Input	One of the quadrature feedback signals from the channel C flowmeter.
31	DC Common	N/A	DC Common to all I/O signals and DC power supply voltages.
32	Flowmeter A Source	Input	One of the quadrature feedback signals from the channel A flowmeter.
33	DC Common	N/A	DC Common to all I/O signals and DC power supply voltages.
34	Ch. B MVR Enable	Output	Intended to drive the enable valve on the inlet of the channel B MVR.
35	Flush Box "A" Ready	Input	Signal to be on with gun in flush box and flush box lid closed.
36	Flush Box "B" Ready	Input	Signal to be on with gun in flush box and flush box lid closed.
37	+24 VDC	N/A	

Discrete (Digital and Analog) SYSTEM Inputs and Outputs

<u>Pin No.</u>	<u>Name</u>	<u>In or Out</u>	<u>Type</u>	<u>Description</u>
1	Spare	Output	24 VDC	Not currently implemented in software
2	Mixed Volume Cleared, Gun 2	Output	24 VDC	This output goes on when the mixed volume of material has flowed through the flowmeters during the flush cycle.
3	Pressure Regulator, Channel 3	Output	0-10 VDC	This is an analog output programmed in the job parameters intended to drive an E to P transducer to drive a fluid regulator
4	Pressure Regulator, Channel 2	Output	0-10 VDC	This is an analog output programmed in the job parameters intended to drive an E to P transducer to drive a fluid regulator
5	Actual Flow, Gun 2	Output	0-10 VDC	Analog indication of actual flow rate. If Min. Flow is programmed at 0 ml's/min and Max. Flow is programmed at 1000 ml's/min and 400 ml's/min is flowing, this output will be at 4.00 volts DC.
6	Flow Rate Command, Gun 2	Input	0-10 VDC	For remote analog control of flow rate. If Min. Flow is programmed at 0 ml's/min and Max. Flow is programmed at 1000 ml's/min and 4.00 volts DC is sent to this input, the gun will flow at 400 ml's/min.
7	Job Select Bit 1, Gun 2	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
8	Flush, Gun 2	Input	24 VDC	Connecting this input to +24 VDC initiates the flush sequence
9	Halt/Reset, Gun 2	Input	24 VDC	Connecting this input to +24 VDC (momentarily) resets a faulted gun or halts a gun in run (active) mode.
10	Run, Gun 2	Input	24 VDC	Connecting this input to +24 VDC (momentarily) puts a halted (non-faulted) gun in run (active) mode.
11	Job Strobe, Gun 1	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
12	Job Select Bit 40, Gun 1	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
13	Job Select Bit 10, Gun 1	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
14	Job Select Bit 4, Gun 1	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
15	Job Select Bit 1, Gun 1	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
16	Flush, Gun 1	Input	24 VDC	Connecting this input to +24 VDC initiates the flush sequence
17	+24 VDC	N/A		
18	H.V. Enable, Gun 2	Output	24 VDC	This output goes on once the load sequence is completed and the gun flush box(es) is/are closed.
19	Fault, Gun 2	Output	24 VDC	This output goes on when the gun faults.
20	Job Strobe, Gun 2	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
21	Pressure Regulator, Channel 1	Output	0-10 VDC	This is an analog output programmed in the job parameters intended to drive an E to P transducer to drive a fluid regulator

<u>Pin No.</u>	<u>Name</u>	<u>In or Out</u>	<u>Type</u>	<u>Description</u>
22	Actual Flow, Gun 1	Output	0-10 VDC	Analog indication of actual flow rate. If Min. Flow is programmed at 0 ml's/min and Max. Flow is programmed at 1000 ml's/min and 400 ml's/min is flowing, this output will be at 4.00 volts DC.
23	Flow Rate Command, Gun 1	Input	0-10 VDC	For remote analog control of flow rate. If Min. Flow is programmed at 0 ml's/min and Max. Flow is programmed at 1000 ml's/min and 4.00 volts DC is sent to this input, the gun will flow at 400 ml's/min.
24	Load, Gun 2	Input	24 VDC	Connecting this input to +24 VDC initiates the load sequence
25	Spare	Output	24 VDC	Not currently implemented in software
26	DC Common	N/A		DC Common to all I/O signals and DC power supply voltages.
27	Job Select Bit 80, Gun 1	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
28	Job Select Bit 20, Gun 1	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
29	Job Select Bit 8, Gun 1	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
30	Job Select Bit 2, Gun 1	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
31	Load, Gun 1	Input	24 VDC	Connecting this input to +24 VDC initiates the load sequence
32	Halt/Reset, Gun 1	Input	24 VDC	Connecting this input to +24 VDC (momentarily) resets a faulted gun or halts a gun in run (active) mode.
33	Run, Gun 1	Input	24 VDC	Connecting this input to +24 VDC (momentarily) puts a halted (non-faulted) gun in run (active) mode.
34	Pot Life Expired, Gun 2	Output	24 VDC	This output goes on when the mixed material in the applicator has been mixed for a time greater than the time programmed in the job parameter for pot-life time.
35	Gun Active, Gun 2	Output	24 VDC	This output goes on if the gun is in run mode or if it is loading or flushing.
36	Job Select Bit 80, Gun 2	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
37	Job Select Bit 20, Gun 2	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
38	Job Select Bit 40, Gun 2	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
39	Job Select Bit 8, Gun 2	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
40	Job Select Bit 10, Gun 2	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
41	Job Select Bit 2, Gun 2	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
42	Job Select Bit 4, Gun 2	Input	24 VDC	For remote selection of next job to be loaded. See appendix for recommended job load timing sequence.
43	DC Common	N/A		DC Common to all I/O signals and DC power supply voltages.
44	H.V. Enable, Gun 1	Output	24 VDC	This output goes on once the load sequence is completed and the gun flush box(es) is/are closed.
45	Mixed Volume Cleared, Gun 1	Output	24 VDC	This output goes on when the mixed volume of material has flowed through the flowmeters during the flush cycle.

<u>Pin No.</u>	<u>Name</u>	<u>In or Out</u>	<u>Type</u>	<u>Description</u>
46	Pot Life Expired, Gun 1	Output	24 VDC	This output goes on when the mixed material in the applicator has been mixed for a time greater than the time programmed in the job parameter for pot-life time.
47	Gun Fault, Gun 1	Output	24 VDC	This output goes on when the gun faults.
48	Gun Active, Gun 1	Output	24 VDC	This output goes on if the gun is in run mode or if it is loading or flushing.
49	System Pulse	Output	24 VDC	This output pulses on and off at approximately a 1 Hz rate as long as the RansFlow software is running.
50	+24 VDC	N/A		

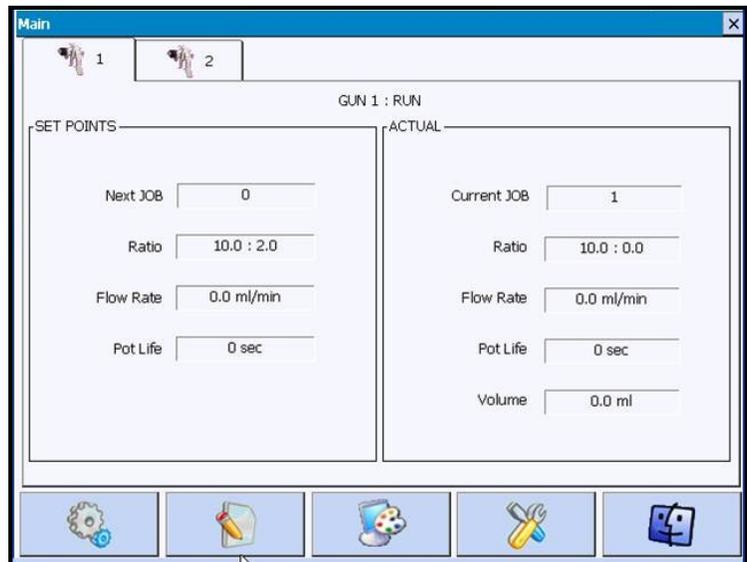
Section 4: PROGRAMMING

Main Screen

This is the screen that appears immediately after powering up the RansFlow controller. All data on this screen upon power up is non-valid random data and should be disregarded until a job is loaded from the Emulator Screen.

The icons across the bottom, starting from the left are:

- Configure
- Reports
- Color Change Sequencer
- Tools
- Emulator (Operator Panel)



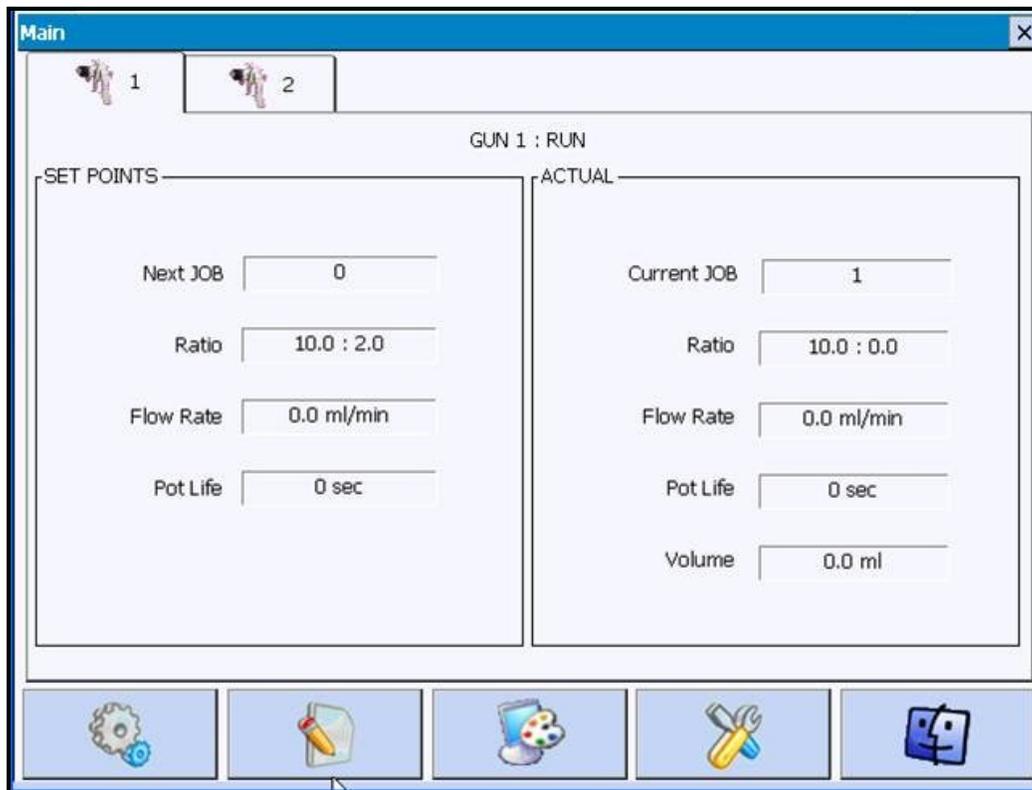
If there is more than one gun configured, there will be two tabs displayed at the top of the screen. Select the gun number you wish to monitor or control.

Note: The RansFlow can control up to three channels of fluid. They can be configured in any of the following ways:

- One, single channel gun.
- Two, single channel guns.
- One single channel gun and one two component (2-channel) gun. (The 2-channel gun MUST be configured to be channels B & C).
- One three component (3-channel) gun.
- One 2-channel gun (can be configured as channels A & B OR B & C if a 3-channel unit was ordered).

Immediately below the gun tab (or tabs) there is a gun status line, indicating the status of that gun (i.e. Run, Idle, Faulted, Loading, Flushing, etc.).

Main Screen (continued)

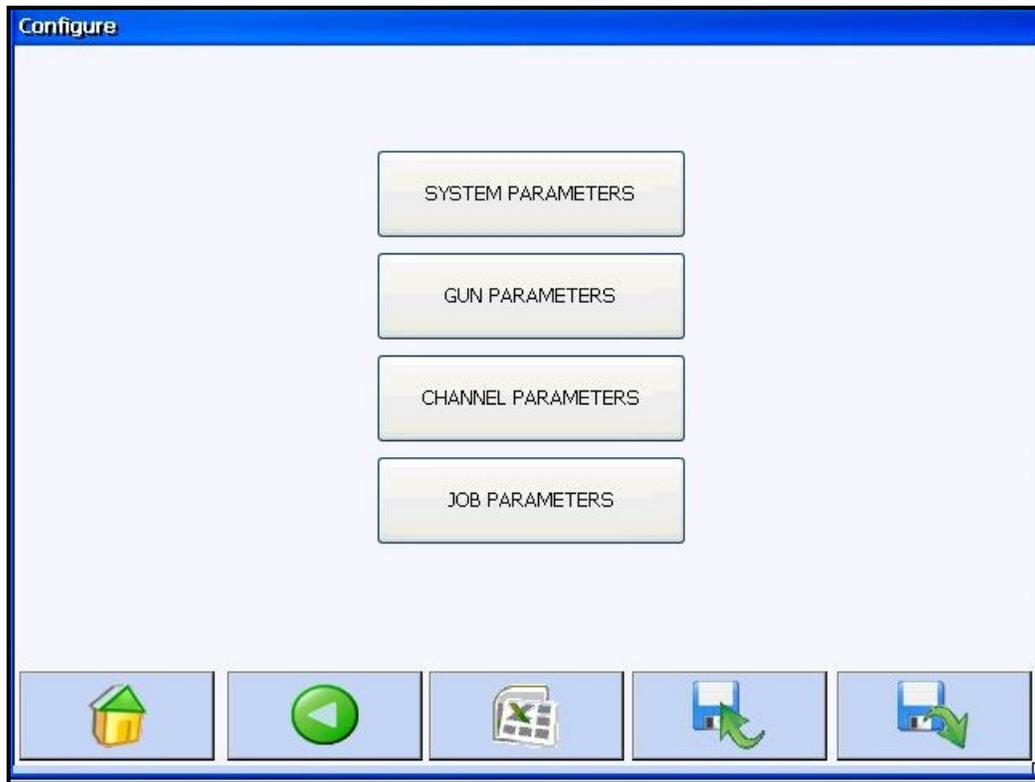


Once a valid job has been loaded, the information in the left column of the Main Screen indicates the targets or setpoints for ratio, flow rate and the pot-life of the material. It also indicates what the next job number to be loaded is (if one was toggled in externally while still running the current job).

Note: The ratio and flow rate setpoint can be changed “on the fly” by touching the ratio or flow rate boxes in the left column. A keypad will popup on the screen, allowing the user to change the target ratio or flow rate. This is a temporary change only and is not saved to the job data. This temporary change will be discarded the instant a new job is loaded (even if it is the same job number that is currently running).

In the right column real-time information is provided to allow the user to monitor the current running job number, the actual ratio, the actual flow rate, and the remaining pot-life of the material currently in the applicator. The ratio being displayed is an average over a period of time. If the user wants to get a more instantaneous idea of the ratio, simply touch the volume box in the right column and a small box will popup asking if you would like to reset the volume. If you answer yes, the volume box at the bottom of the column will be zeroed and the ratio being displayed will be averaged once again from that point forward.

Configure Screen



When you touch the left function button on the main screen, you will be taken to the Configure Selection Screen.

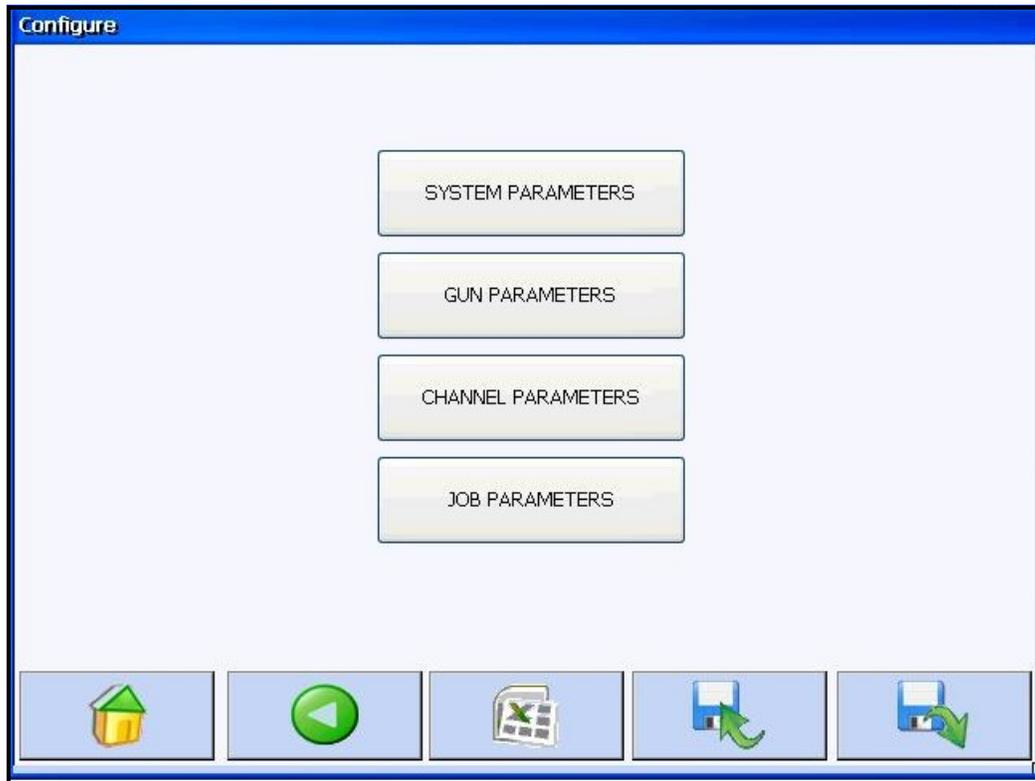
The icons across the bottom of the screen, starting from the left are:

- Return to the Home Screen
- Go back one screen
- Save parameters to Excel file
- Save Configuration and Job Data (to USB Port). USB flash drive size MUST be less than 4GB.
- Read Configuration and Job Data (from USB Port)

Buttons on this screen allow the user to select which parameters they wish to examine or edit.

- System Parameters
- Gun Parameters
- Channel Parameters
- Job Parameters

Configure Screen (continued)

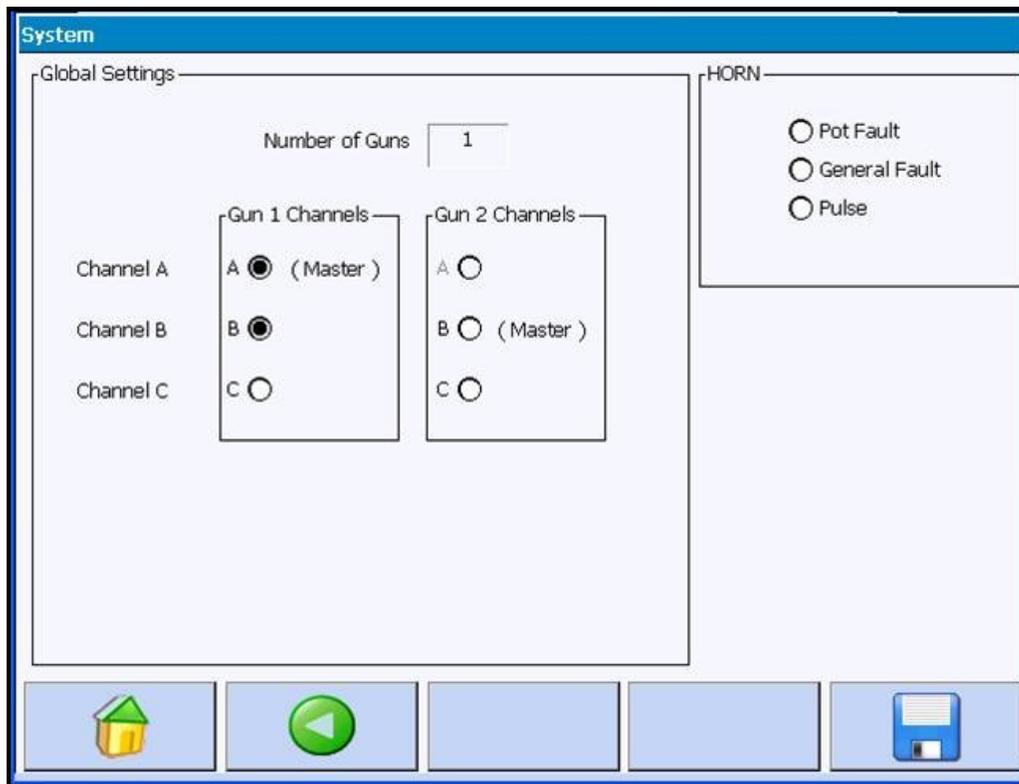


The icon on the middle key:



allows users to save parameters in Excel (comma separated variables, .csv) format to a memory stick and take them to a printer to be printed out. Two files are created, one that has all of the job data and second that has all of the totalization data.

System Parameters Screen



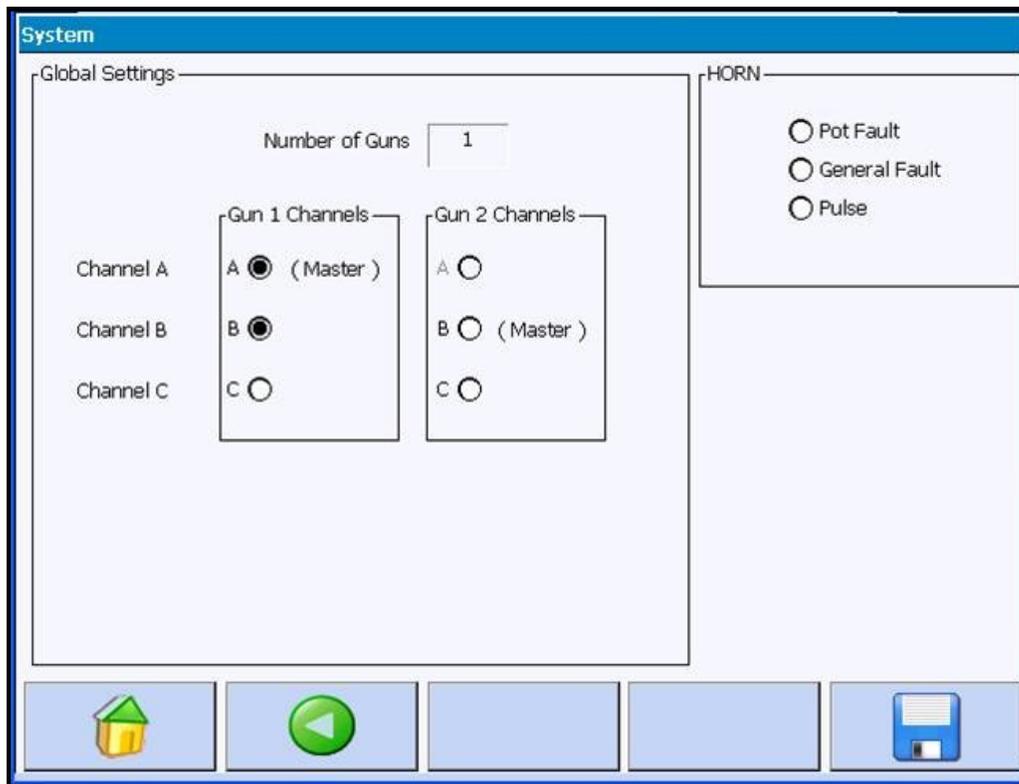
The icons across the bottom of the screen, starting from the left are:

- Return to Home Screen
- Go back one screen
- Not used
- Not used
- Save System Parameters to flash memory

There are only three things that relate to the system that need to be configured:

- The number of guns
- The channels assigned to each gun
- Horn configuration

System Parameters Screen (continued)



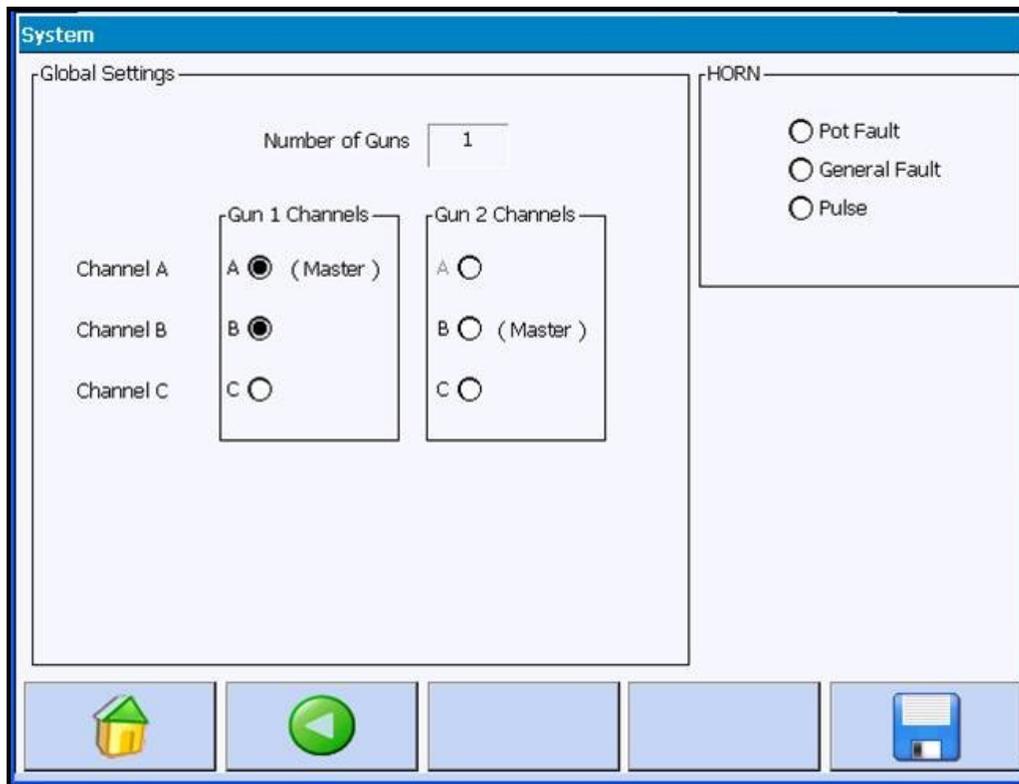
The number of guns can only be 1 or 2. As stated previously, they can be configured one of five different ways:

- One, single channel gun.
- Two, single channel guns.
- One single channel gun and one two component (2-channel) gun. (The 2-channel gun MUST be configured to be channels B & C).
- One three component (3-channel) gun.
- One 2-channel gun (can be configured as channels A & B or B & C if a 3-channel unit was ordered).

The radio buttons inside the Horn box allows the user to set when the horn sounds and if the sound will be one continuous tone or a pulsing tone. Options for when the horn sounds are:

- Never
- If a gun fault occurs
- If a pot-life timer expires
- If either a gun fault or pot life timer expires (both radio buttons selected)

System Parameters Screen (continued)



Note: If a gun fault occurs (whether or not the horn is configured to sound) the controller turns off all flow control valves configured to that gun. If a pot-life time expires, the controller does not turn off the flow control valves. (This is simply a warning to the user that the material in the applicator is approaching the point where it may coagulate.)

Note: If the number of channels configured to a gun changes, it is necessary to reboot the computer (user-interface touch-screen) for change to take effect.

Hitting the back button returns you to the Configure Selection Screen.

Gun Parameters Screen

The screenshot shows the 'Gun Parameters' screen for 'GUN 1'. At the top, there are two tabs labeled '1' and '2'. Below the tabs, the screen is divided into two columns of settings. The left column contains: CHANNELS (A : B :), MODE (MANUAL), CLEAN CHANNELS (NO : NO), DEFAULT JOB (1), FLOW TOLERANCE (%) (5), TOLERANCE TIME (3), and TOLERANCE VOLUME (150). The right column contains: GUN 1, FLUSH MODE (1), TRIGGER-ON DELAY (ms) (0), TRIGGER-OFF DELAY (ms) (0), BLOW-OFF TIME (sec) (0), POT-LIFE VOLUME (ml) (0), and two radio buttons for 'Flush Box A' and 'Flush Box B'. At the bottom, there are five icons: a home icon, a back arrow, two empty boxes, and a save icon (floppy disk).

This screen allows the user to configure parameters specific to the gun.

The icons across the bottom of the screen, starting from the left are:

- Return to Home Screen
- Go back one screen
- Not used
- Not used
- Save Gun Parameters to flash memory

CHANNELS

This box indicates which channels are configured to the gun. If it is necessary to change this setting, it must be done on the Systems Parameters screen.

MODE

When this box is touched, a popup will allow the user to select either **Manual** or **Automatic** mode for the gun.

Gun Parameters Screen (continued)

Gun Parameters			
1		2	
CHANNELS	A : B :	GUN 1	
MODE	MANUAL	FLUSH MODE	1
CLEAN CHANNELS	NO : NO	TRIGGER-ON DELAY (ms)	0
DEFAULT JOB	1	TRIGGER-OFF DELAY (ms)	0
FLOW TOLERANCE (%)	5	BLOW-OFF TIME (sec)	0
TOLERANCE TIME	3	POT-LIFE VOLUME (ml)	0
TOLERANCE VOLUME	150	Flush Box A <input type="radio"/>	Flush Box B <input type="radio"/>

Navigation icons: Home, Play, Stop, Save.

In **manual mode**, there is no flow control on the master channel and the user controls the flow rate either with an external fluid regulator or by adjusting the needle on the applicator. The controller monitors the flow of the master channel and simply controls the ratio of the slave channel or channels based on the programmed ratio. (Note that during the load sequence, if there is a flow control valve on the master channel, the color change sequencer will attempt to control the flow rate of the master channel to prevent flow too high faults as the fluid fills the empty supply lines.)

In **automatic mode**, the controller controls the flow rate and ratio of all channels configured to the gun based on the target flow rate and target ratio.

CLEAN CHANNELS

This allows the user to control which materials are flushed during the color change sequences. If set for No, the color valves and flow control valves will not be opened during the color change sequence. (These channels have to be manually flushed either by pneumatically bypassing the flow control valves/regulators or by forcing the necessary valves/regulators open on the Force I/O Screen.)

DEFAULT JOB

This is the job that is automatically loaded into the gun at power up. (Note that this only loads the gun parameter data and does not automatically initiate a color load sequence.)

Gun Parameters Screen (continued)

The screenshot shows the 'Gun Parameters' screen for 'GUN 1'. At the top, there are two tabs labeled '1' and '2'. Below the tabs, the parameters are arranged in a grid:

CHANNELS	A : B :		GUN 1
MODE	MANUAL	FLUSH MODE	1
CLEAN CHANNELS	NO : NO	TRIGGER-ON DELAY (ms)	0
DEFAULT JOB	1	TRIGGER-OFF DELAY (ms)	0
FLOW TOLERANCE (%)	5	BLOW-OFF TIME (sec)	0
TOLERANCE TIME	3	POT-LIFE VOLUME (ml)	0
TOLERANCE VOLUME	150	Flush Box A <input type="radio"/>	Flush Box B <input type="radio"/>

At the bottom of the screen, there are five buttons: a home icon, a play button, two empty buttons, and a save icon.

FLOW TOLERANCE

This parameter allows the user to specify how far out of tolerance the flow rate and ratio are allowed to vary before the system generates a fault and closes all valves.

For example:

If flow tolerance is set for $\pm 5\%$ on a 2-channel gun, with a target flow rate of 150 cc's/min and a 2:1 target ratio, this indicates that the master channel should be flowing at 100 cc's/min and the slave channel should be flowing at 50 cc's/min. So...

Flow Rate Errors:

- A flow too low on channel A would occur if the flow rate of A falls below 95 cc's/min.
- A flow too high on channel A would occur if the flow rate of A goes above 105 cc's/min.
- A flow too low on channel B would occur if the flow rate of B falls below 47.5 cc's/min.
- A flow too high on channel B would occur if the flow rate of B goes above 52.5 cc's/min.

(Keep in mind that the flow rate has to remain out of tolerance for the duration of the time programmed for tolerance time.)

Gun Parameters Screen (continued)

Gun Parameters			
1		2	
CHANNELS	A : B :	GUN 1	
MODE	MANUAL	FLUSH MODE	1
CLEAN CHANNELS	NO : NO	TRIGGER-ON DELAY (ms)	0
DEFAULT JOB	1	TRIGGER-OFF DELAY (ms)	0
FLOW TOLERANCE (%)	5	BLOW-OFF TIME (sec)	0
TOLERANCE TIME	3	POT-LIFE VOLUME (ml)	0
TOLERANCE VOLUME	150	Flush Box A <input type="radio"/>	Flush Box B <input type="radio"/>

Ratio Errors:

Since a 2:1 ratio results in 66.67% of the channel A material and 33.33% of the channel B material...

- A ratio too high fault will occur if the actual ratio calculated is greater than 71.67% of the mixed material.
- A ratio too low fault will occur if the actual ratio calculated is less than 61.67% of the mixed material.

(Keep in mind this is based on the value programmed in for tolerance volume.)

TOLERANCE TIME

This is the amount of time any error (except ratio) must persist before a fault is generated. It is recommended that this never be programmed less than 3 seconds as numerous nuisance faults will probably occur. (Note: Ratio checks are based on volume, not time. See Tolerance Volume below.)

TOLERANCE VOLUME

This parameter is only used with multiple component guns. Flow rates of all channels are checked 50 times/second (every 20 milliseconds). Ratio, however, is checked based on volume rather than flow rate. Every time this volume of material has exited the applicator, the controller calculates the actual ratio based on how much of that volume flowed through each of the 2 or 3 channels. If the actual ratio (based on the volumes measured) is outside the flow tolerance setting, a ratio fault will occur.

Gun Parameters Screen (continued)

Gun Parameters			
1		2	
CHANNELS	A : B :	GUN 1	
MODE	MANUAL	FLUSH MODE	1
CLEAN CHANNELS	NO : NO	TRIGGER-ON DELAY (ms)	0
DEFAULT JOB	1	TRIGGER-OFF DELAY (ms)	0
FLOW TOLERANCE (%)	5	BLOW-OFF TIME (sec)	0
TOLERANCE TIME	3	POT-LIFE VOLUME (ml)	0
TOLERANCE VOLUME	150	Flush Box A <input type="radio"/>	Flush Box B <input type="radio"/>

Navigation icons: Home, Back, Forward, Stop, Save.

FLUSH MODE

Currently there is only one flush and load sequence saved for all jobs. Therefore, this should always be left at the default value of 1.

TRIGGER-ON DELAY (ms)

This allows the operator to put a short delay between the time that the controller sees a trigger input signal and when it turns on the flow control valves to start flow. This is to prevent flow too low faults if there is a pneumatic delay getting the applicator opened. It is specified in milliseconds. (250 milliseconds = ¼ second)

TRIGGER-OFF DELAY (ms)

This allows the operator to put a short delay between the time that the controller sees the trigger input signal go off and when it closes the flow control valves. This prevents the fluid pressure from dropping off while the applicator is closing.

BLOW-OFF TIME (sec)

This parameter is only functional with manual mode guns. This parameter allows a hand painter to blow off a part prior to beginning the spray operation. Note that the timer accumulates until the controller sees flow through the master channel flow meter.

Gun Parameters Screen (continued)

Gun Parameters			
1		2	
CHANNELS	A : B :	GUN 1	
MODE	MANUAL	FLUSH MODE	1
CLEAN CHANNELS	NO : NO	TRIGGER-ON DELAY (ms)	0
DEFAULT JOB	1	TRIGGER-OFF DELAY (ms)	0
FLOW TOLERANCE (%)	5	BLOW-OFF TIME (sec)	0
TOLERANCE TIME	3	POT-LIFE VOLUME (ml)	0
TOLERANCE VOLUME	150	Flush Box A <input type="radio"/>	Flush Box B <input type="radio"/>

The reason this is important is that there is the possibility that the gears in the master channel flowmeter could become stuck. If this occurs, material can slip by the gears without the gears turning. As a result, there is no signal fed back to the controller and it has no way of knowing that master channel component is flowing. The controller, therefore, does not meter in any of the slave component or components. This results in only a single component material being applied to the parts. If the controller sees a trigger input for a longer time than the blow off time when running the handgun air through the air flow switch, it checks to make sure that the master channel flowmeter is spinning and that it is metering in the proper slave material or materials. If not, the controller generates a no master flow fault and shuts down the gun.

The system can be operated without the trigger signal (the slave channel or channels are controlled based on the flow rate of the master) but this is risky. If more than one applicator is connected to the output of the fluid panel, the trigger signals from all applicators should be paralleled and fed back to the trigger input of the controller. Note that this may require a diode array to prevent feeding back voltage to the triggering devices. If you are unsure how to implement this scheme, contact your ITW Ransburg representative or our technical support group.

NOTE:

It is highly recommended that all handguns have air flow switches attached to the atomization airline feeding the handgun. The signal from that air flow switch should be wired back to the trigger input of the controller (System I/O connector) if the factory installed air flow switch is NOT being used.

Gun Parameters Screen (continued)

The screenshot shows the 'Gun Parameters' screen for Gun 1. At the top, there are two tabs labeled '1' and '2'. Below the tabs, the screen is divided into several sections with input fields and radio buttons. The parameters are as follows:

Parameter	Value
CHANNELS	A : B :
MODE	MANUAL
CLEAN CHANNELS	NO : NO
DEFAULT JOB	1
FLOW TOLERANCE (%)	5
TOLERANCE TIME	3
TOLERANCE VOLUME	150
FLUSH MODE	1
TRIGGER-ON DELAY (ms)	0
TRIGGER-OFF DELAY (ms)	0
BLOW-OFF TIME (sec)	0
POT-LIFE VOLUME (ml)	0
Flush Box A	<input type="radio"/>
Flush Box B	<input type="radio"/>

At the bottom of the screen, there are five icons: a home button (house icon), a play button (green circle with a right-pointing triangle), a blank button, another blank button, and a save button (floppy disk icon).

POT-LIFE VOLUME (ml)

This volume represents the volume of material in the system that has been mixed (a.k.a. mixed volume). It, basically, is all of the material between the top of the spiral mix tube and the applicator or applicators. It is calculated based on the inside diameter of the fluid lines and their lengths. Use the following formula to calculate this value:

$$\text{Volume (ml)} = d^2 \times L \times 12.87$$

Where:

d = the inside diameter of the tubing (in inches)

L = the length of the tubing (in inches)

Also add in the appropriate volumes for the spiral mix tube and the applicator or applicators.

Flush Box A and B Radio Buttons

In the lower right hand corner of the screen are two radio buttons, one labeled Flush Box A and the other Flush Box B. There are two pressure switches in the bottom of the control console that have been provided to interface with gun flush boxes. If these radio buttons are enabled on this screen, the color change sequencer will not be allowed to operate unless a signal is coming into the pressure switch or switches that are enabled on this screen. (Pressure on the switch indicates to the software that the applicator or applicators are in the flush box, that the flush box is closed, and that the high voltage power supply, if used, is disabled.)

Once all of these parameters meet your requirements, make sure you touch the save button in the bottom right hand corner of the screen to save the parameters to the flash disk.

Channel Parameters Screen

COMPONENT	A	B	C
REGULATOR TYPE	MVR	MVR	MVR
MVR HIGH	100	100	91
MVR LOW	15	15	9
PULSES PER LITER	8000	8000	8000
PRESSURE REGULATOR	0	0	0

The bottom navigation bar contains five icons from left to right: a house icon (Home), a left-pointing arrow (Back), an empty box (Not used), a padlock icon (Advanced Channel Parameters), and a diskette icon (Save).

The icons across the bottom of the screen, starting from the left are:

- Return to Home Screen
- Go back one screen
- Not used
- Advanced Channel Parameters
- Write displayed parameters to operating gun (these parameters will not be saved to flash memory!)

Note: All channel parameters displayed on this screen and the advanced channel parameters (accessed by touching the lock symbol) are for temporary changes only (except for the Reverse Flow parameter on the Advanced Screen). When any of these parameters are changed and then saved by touching the diskette symbol, the data is changed for the job currently running ('on the fly') but are not saved to the job. Therefore, when a new job is loaded (even if it is the same job currently running), the data programmed in the job file will over write these temporary parameters.

Since this is the only place to modify the Reverse Flow Parameter, when the save button is pressed, this parameter is saved to flash memory and is permanent for all jobs until, once again, changed on this screen. **Any other changes that are intended to be permanent must be made on the Edit Job Data Screen.**

Note: When making changes to the parameters on this screen, they have to be saved with the button in the lower right corner of the screen (the disk icon) before they temporarily take effect. They do not take effect when the enter key is pressed on the keypad!

Channel Parameters Screen (continued)

Channel Parameters	A	B	C
COMPONENT			
REGULATOR TYPE	MVR	MVR	MVR
MVR HIGH	100	100	91
MVR LOW	15	15	9
PULSES PER LITER	8000	8000	8000
PRESSURE REGULATOR	0	0	0

Navigation icons: Home, Play, Lock, Save

REGULATOR TYPE

This parameter allows the user to specify what type of flow control device is being used on that specific channel. This is a label ONLY and has NO EFFECT on the operation of the system.

MVR HIGH

This parameter allows the user to control the maximum pressure that is sent to the flow control device from the E (voltage) to P (pressure) transducer. This pressure is used for flush sequences and for opening the master channel on a gun configured for manual operation.

MVR LOW

This parameter allows the user to program the cracking pressure of the flow control valve. This parameter should be programmed just below the cracking pressure to prevent leakage of material past the flow control valve when the gun is triggered off. This will result in the fastest possible response in the flow control loop when switching from a no-flow state to a flow-state. A value of 20 psi is recommended for weep-style MVR valves and 10 psi is recommended for the weepless-style MVR valves.

Channel Parameters Screen (continued)

Channel Parameters	A	B	C
COMPONENT			
REGULATOR TYPE	MVR	MVR	MVR
MVR HIGH	100	100	91
MVR LOW	15	15	9
PULSES PER LITER	8000	8000	8000
PRESSURE REGULATOR	0	0	0

Navigation icons: Home, Play, Lock, Save

PULSES PER LITER

This parameter allows the operator to change the calibration values for the flowmeters. This is normally done through the calibration routine.

PRESSURE REGULATOR

This allows the operator to program a fixed pressure to be delivered to a pilot operated fluid regulator on the inlet of the flow control valve for each channel. (Typically, thicker materials require a higher inlet pressure to the flow control valve.) Note that this is an optional feature.

Advanced Channel Parameters Screen

The screenshot shows a software interface titled "Channel Parameters Advanced". It features a table with three columns labeled A, B, and C, and six rows of parameters. Each parameter has a corresponding input field with a numerical value. At the bottom of the screen, there are five icons: a house (Home), a green play button (Back), a blue square (Unused), a mouse cursor (Unused), and a floppy disk (Save).

COMPONENT	A	B	C
REVERSE FLOW	50	50	50
C-BAND	1000	1000	1000
I-BAND	2000	2000	2000
Kp	2000	2000	2000
Ki	150	150	150

(Note that this screen is accessed by touching the lock symbol on the Channel Parameters Screen.)

The icons across the bottom of the screen, starting from the left are:

- Return to Home Screen
- Go back one screen
- Not used
- Not used
- Write displayed parameters to operating gun (these parameters will not be saved to flash memory!)

REVERSE FLOW

This parameter allows the user to control how much flow in the reverse direction is allowed before a fault is generated and the system is shut down. Note that programming a value of zero (0) here is not recommended because there is some unavoidable reverse flow that occurs because of hydrostatic kickback when some applicators turn their trigger valves off. The default value of 50 cc's works well in most cases. Note: This is the only parameter on this screen that is saved to flash memory and used on all future loaded jobs. All other parameters when changed on this screen are temporary only and will revert back to the values stored with the job when the next job is loaded.)

Advanced Channel Parameters Screen (continued)

COMPONENT	A	B	C
REVERSE FLOW	50	50	50
C-BAND	1000	1000	1000
I-BAND	2000	2000	2000
Kp	2000	2000	2000
Ki	150	150	150

C-BAND

This is the control band for the PID control loop. In general, this setting should never need to be changed unless the flow meter has been changed to a flow meter with a significantly different calibration value. This parameter keeps the system steady while maintaining a constant flow rate. Too large a value can keep the system from getting to the target flow rate while too small a value may cause the flow rate to oscillate.

I-BAND

This is the integrator band for the PID control loop. In general, this setting should never need to be changed unless the flowmeter has been changed to a flowmeter with a significantly different calibration value. This parameter controls how responsive the system is when the desired flow rate changes. Too large a value will cause the system to overshoot the target flow while too small a value may prevent the system from reaching the target flow rate or possibly even cause the flow rate to oscillate.

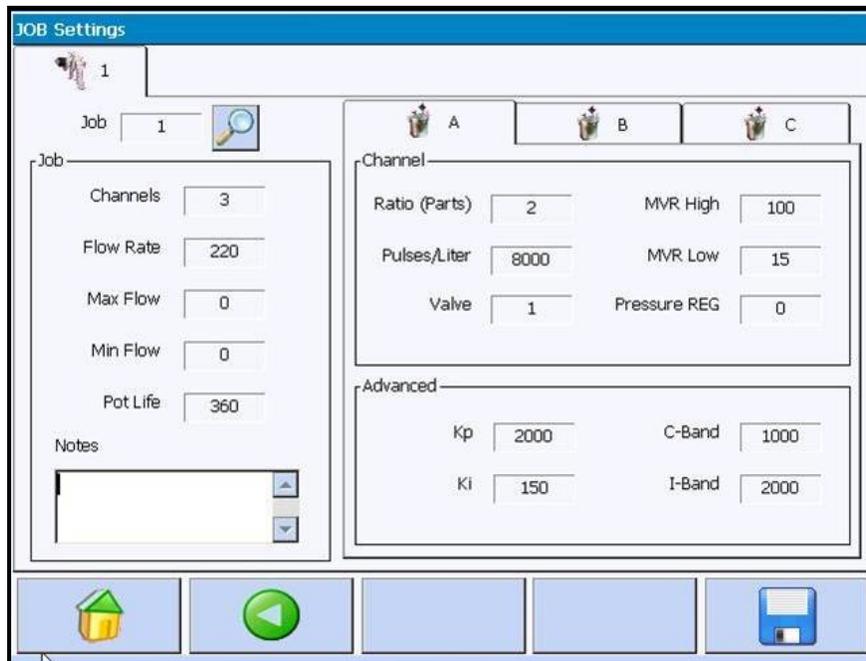
Kp

This is the Proportional Gain parameter for the PID loop. It controls how fast the PID loop opens the flow control valve when flow is initially requested. A value too small here will cause an unnecessary delay in flow on the initial trigger on of the applicator or a slow ramp up of flow. Too large of a value here will cause the flow to oscillate. The default value of 2000 works well in most cases.

Ki

This is the Integral Gain parameter for the PID loop. It controls how fast the PID loop pulls the actual flow back to the target flow after the proportional portion of the PID loop has the actual flow approaching the target.

Job Parameters Screen



Note: If you change any of the parameters on this screen for the job number that is currently running, they will not change the parameters currently running. To actually change parameters that are currently running, the job must be reloaded from the Emulator Screen after the changes to the Job Parameters Screen have been saved.

This is the screen where all of the parameters stored with the “Job” are examined, modified, and saved.

The icons across the bottom of the screen, starting from the left are:

- Return to Home Screen
- Go back one screen
- Not used
- Not used
- Save Job Parameters to flash memory

If two guns are configured, there will be two gun tabs at the top of the screen. Select the gun number that you wish to examine or edit.

Notice the small magnifying glass immediately to the right of the Job number box. This button allows you to “Examine” parameters for any job and edit them, if necessary. For example, if you wanted to examine and edit parameters for job number 22, touch the small box immediately to the right of the word Job. A keypad will popup and allow you to enter a job number. (For the RansFlow, valid job numbers range from 1 to 99.) Enter the job number 22 (or whatever job you wish to examine/edit) and touch the enter (ENT) key and then touch the magnifying glass to retrieve the values. If a valid job #22 was previously stored, its parameters will be displayed. If that job number is not in memory, the job number will change to 0, indicating that this job number is not in memory.

Job Parameters Screen (continued)

The screenshot shows the 'JOB Settings' interface. At the top left, there is a 'Job' field with the value '1' and a magnifying glass icon. Below this, a 'Job' section contains several input fields: 'Channels' (3), 'Flow Rate' (220), 'Max Flow' (0), 'Min Flow' (0), and 'Pot Life' (360). A 'Notes' field is located below these. To the right, there are three channel tabs labeled 'A', 'B', and 'C'. The 'Channel' section for channel A includes: 'Ratio (Parts)' (2), 'MVR High' (100), 'Pulses/Liter' (8000), 'MVR Low' (15), and 'Valve' (1). The 'Pressure REG' field is set to 0. Below the channel settings is an 'Advanced' section with 'Kp' (2000), 'C-Band' (1000), 'Ki' (150), and 'I-Band' (2000). At the bottom of the screen, there are five buttons: a home button (house icon), a play button (green circle with right arrow), two empty buttons, and a save button (floppy disk icon).

Modify the parameters as necessary. (Don't forget to modify all channels with the channel tabs on the right section of the screen.) If you want to save the parameters to the job number currently being displayed in the job number box, simply touch the save button. (The save button is in the lower right corner and has a diskette icon in it.) If you wish to save the displayed parameters to a different job number (or if the job number displayed is 0), change the number in the job number box to the desired value and then touch the save button.

Channels

This value is not adjustable on this screen, it appears for informational purposes only. Channels and guns are configured on the System Parameters screen. This box simply indicates how many channels are configured to the gun. The number of channel tabs on the right side of the screen will match this number. Make sure all parameters for all channels are programmed.

Flow Rate

This is the target flow rate for the gun. If the gun is configured as a manual mode gun, this parameter is ignored. If analog flow control is to be used, this value should be 0. (That is, this value overrides the Min Flow and Max Flow settings.) It is expressed in ml's/min (cc's/min).

Max Flow

This parameter is the target flow rate desired from the applicator when a 10 VDC signal is received at the analog flow rate input. It is expressed in ml's/min (cc's/min).

Job Parameters Screen (continued)

The screenshot shows the 'JOB Settings' interface. At the top, 'Job 1' is selected. Below this, there are several input fields: 'Channels' (3), 'Flow Rate' (220), 'Max Flow' (0), 'Min Flow' (0), and 'Pot Life' (360). A 'Notes' field is also present. To the right, there are three tabs labeled 'A', 'B', and 'C'. Under 'Channel A', the parameters are: 'Ratio (Parts)' (2), 'Pulses/Liter' (8000), 'Valve' (1), 'MVR High' (100), 'MVR Low' (15), and 'Pressure REG' (0). Under 'Advanced', the parameters are: 'Kp' (2000), 'Ki' (150), 'C-Band' (1000), and 'I-Band' (2000). At the bottom, there are five buttons: a home icon, a play button, two empty buttons, and a save icon.

Min Flow

This is the target flow rate desired from the applicator when a 0 VDC signal is received at the analog flow rate input. It is expressed in ml's/min (cc's/min).

Pot Life

This is the amount of time it takes for the plural component material to "setup". The system keeps track of the oldest material in the fluid line (which basically is the material in the applicator) and sounds an alarm when the mixed material in the applicator has been mixed for this amount of time. It is expressed in seconds.

Notes

This box allows the user to enter some simple text notes that they would like displayed with the job data. (Possibly, descriptions of the material or parts that should be used with these job parameters, etc.) Editing of this text requires connection of a keyboard inside the controller. Contact your ITW Ransburg Representative for more information on adding this text.

Ratio (Parts)

This parameter controls the mix ratio of the material for plural component materials. It must be specified in parts and on all channels configured to the gun. For example, if it was desired that the mixed ratio of material was to be 50% resin (channel A), 30% catalyst (channel B), and 20% solvent (channel C), the ratio for channel A should be programmed at 5, the ratio for channel B should be programmed at 3, and the ratio for channel C should be programmed at 2. Alternately they could also be programmed at 2.50:1.50:1.00 and achieve the same ratio. Note that the last parameter does not need to be 1.

Job Parameters Screen (continued)

The screenshot shows the 'JOB Settings' interface. At the top, there's a 'Job' dropdown set to '1'. Below it, a 'Job' section contains input fields for 'Channels' (3), 'Flow Rate' (220), 'Max Flow' (0), 'Min Flow' (0), and 'Pot Life' (360). A 'Notes' text area is below these. To the right, there are three tabs labeled 'A', 'B', and 'C'. Under 'Channel', there are fields for 'Ratio (Parts)' (2), 'MVR High' (100), 'Pulses/Liter' (8000), 'MVR Low' (15), and 'Valve' (1). Below that, an 'Advanced' section has fields for 'Kp' (2000), 'C-Band' (1000), 'Ki' (150), and 'I-Band' (2000). At the bottom, there are five buttons: a home icon, a play icon, two empty buttons, and a save icon.

Pulses/Liter

Although this value can be programmed on this screen, it is recommended that it be setup from the calibration routine. It is the number of pulses per liter that the flow meter sends out for the material being flowed. This may vary significantly from material to material based on viscosity, shear, flow rate, etc.

Valve

This allows the user to program the color valve that will be opened when this job number is loaded. The master channel can control up to 10 color valves and the slave channel can control up to 3 color valves. *NOTE: When running in 1k mode, ensure that NO slave channel valve is programmed to be opened.*

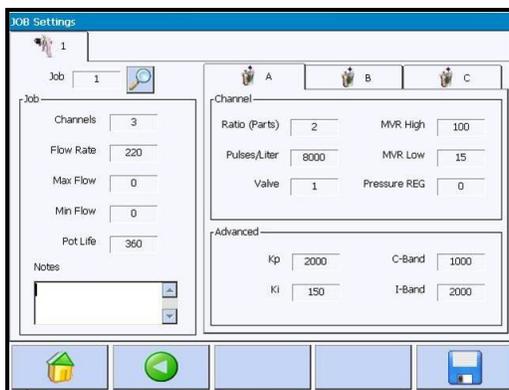
MVR High

This is the maximum pressure that is allowed by the software to be sent to the flow control valve (which in most cases will be an MVR valve). This value is used during flushing, loading, and for the master channel of a manually configured gun. This also limits the maximum pressure that is allowed to be sent to the flow control device while running (PID control) so users are warned that specifying too low of a value here can limit the maximum possible flow rate and possibly response time of the PID control loop. It is expressed in psi. (This parameter can also be temporarily changed on the Channel Parameter Screen.)

MVR Low

This is the pressure (in psi) sent to the flow control valve when the gun is in run mode but the applicator is not triggered. It acts as an 'offset' to hold the flow control valve just below the cracking pressure of the valve so that when the applicator is triggered, a minimal amount of time is lost opening the valve for flow. If this parameter is programmed too high (above the cracking pressure of the valve), undesirable pressures will develop between the flow control valve and the applicator during trigger off times, causing a 'blooming effect' when the applicator triggers, until the higher pressure bleeds off. (This parameter can also be temporarily changed on the Channel Parameter Screen.)

Job Parameters Screen (continued)



Pressure REG

This is a simple analog output that can (optionally) be used to control a pilot operated fluid regulator on the inlet of the flow control valves. Additional E to P transducers will be required to convert this 0 to 10 VDC signal to a 0 to 100 psi signal to control these fluid regulators. (Thicker materials or higher flow rates often require a higher inlet pressure to the flow control valves.) (This parameter can also be temporarily changed on the Channel Parameter Screen.)

Kp

This is the Proportional Gain parameter for the PID loop. It controls how fast the PID loop opens the flow control valve when flow is initially requested. A value too small here will cause an unnecessary delay in flow on the initial trigger on of the applicator or a slow ramp up of flow. Too large of a value here will cause the flow to oscillate. The default value of 2000 works well in most cases.

Ki

This is the Integral Gain parameter for the PID loop. It controls how fast the PID loop pulls the actual flow back to the target flow after the proportional portion of the PID loop has the actual flow approaching the target. (This parameter can also be temporarily changed on the Channel Parameter Screen.)

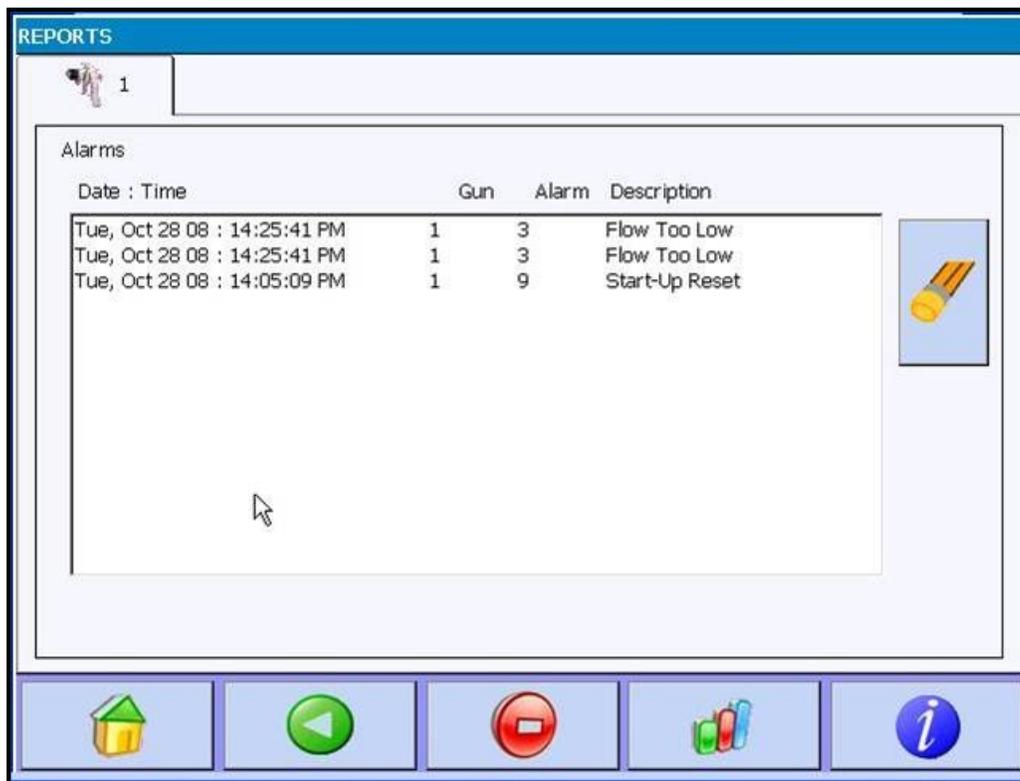
C-Band

This is the control band for the PID control loop. In general, this setting should never need to be changed unless the flowmeter has been changed to a flowmeter with a significantly different calibration value. This parameter keeps the system steady while maintaining a constant flow rate. Too large a value can keep the system from getting to the target flow rate while too small a value may cause the flow rate to oscillate. (This parameter can also be temporarily changed on the Channel Parameter Screen.)

I-Band

This is the integrator band for the PID control loop. In general, this setting should never need to be changed unless the flow meter has been changed to a flow meter with a significantly different calibration value. This parameter controls how responsive the system is when the desired flow rate changes. Too large a value will cause the system to overshoot the target flow while too small a value may prevent the system from reaching the target flow rate or possibly even cause the flow rate to oscillate. (This parameter can also be temporarily changed on the Channel Parameter Screen.)

Alarms Screen



The second button on the main screen takes you to the reports page. The first screen you enter is the Alarms page.

The icons across the bottom of the screen, starting from the left are:

- Return to Home Screen
- Go back one screen
- Return to Alarms Screen (used if you are on the Totals or Information Screens)
- Flow Totals
- Information Screen (Software versions, etc.)

The last 100 alarms are listed with the latest one always appearing at the top of the screen. (Older alarms automatically scroll off of the bottom of the screen. Simply touch the scroll bar on the right side of the screen to scroll down.) To clear the screen, simply touch the eraser icon in the upper right corner of the screen. Note: Faults must be cleared on the Emulator Screen.

Reports Screen

The screenshot shows a 'REPORTS' screen with two tabs labeled '1' and '2'. Below the tabs, there is a 'Totals' section with a 'Job' dropdown set to '1' and a magnifying glass icon. The main data is presented in two tables: 'Job Totals' and 'Clean Totals'. Each table has columns for 'Channel', 'Daily Total', and 'YTD Total'. The 'Job Totals' table shows values for channels A, B, and C, and a total of 39.875. The 'Clean Totals' table shows zero values for all channels and a total of 0.000. To the right of each table are buttons for 'Clear Job Daily', 'Clear Job YTD', and 'Clear ALL Daily Totals'. At the bottom of the screen are five navigation buttons: a home icon, a play button, a stop button, a bar chart icon, and an information icon.

Job Totals		
Channel	Daily Total	YTD Total
A	28.750	28.750
B	11.125	11.125
C	0.000	0.000
Total	39.875	39.875

Clean Totals		
Channel	Daily Total	YTD Total
A	0.000	0.000
B	0.000	0.000
C	0.000	0.000
Total	0.000	0.000

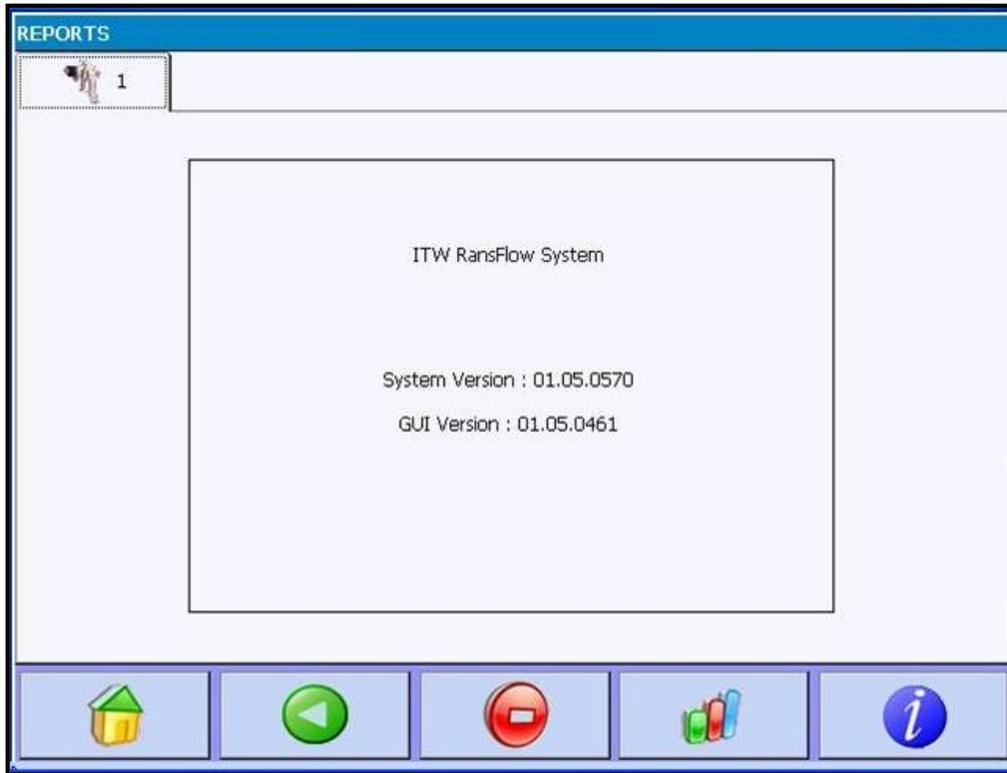
The fourth button on the Reports Screen is for examining and resetting flow totalization data.

Select the job you are interested in retrieving data for and touch the examine button (magnifying glass).

Information is stored separately for all three channels. There are two independent values stored for each channel, Daily and Year to Date (YTD). These values are not tied to the clock in any way, they are simply two values that both increment when material is flowing but can be reset independently. They can be used as shift totals, totals for production runs of one single part, daily totals, weekly, monthly, etc. These six values are stored independently for all 99 jobs.

The clean totals (displayed in the bottom half of the screen) are the totals that are incremented whenever the channel is flushing. These are grand totals for all jobs; they are not stored independently for each job number.

Information Screen



This screen indicates the current version of software installed on the unit. The top number indicates the control software version and the bottom number indicates the version of the user-interface software. These two numbers should be recorded and provided to ITW Ransburg personnel when requesting technical support.

Color Change Sequencer Screen

The screenshot displays the 'Color Change Sequence' interface. At the top, there are two tabs labeled '1' and '2'. Below the tabs, the 'Flush Sequence Time' is set to 15.00 sec and the 'Load Sequence Time' is 8.00 sec. The 'FLUSH SEQUENCE' section contains four steps:

Step	Description	Solvent	Air	Time (sec)
1	Resin Push	<input checked="" type="radio"/>	<input type="radio"/>	5.000
2	Catalyst	(Solvent Only)		2.000
3	Resin Chop	0.250	0.250	5.000
4	Resin Push	<input checked="" type="radio"/>	<input type="radio"/>	3.000

The 'LOAD SEQUENCE' section contains three steps:

Step	Description	Flow Rate (ml/min)	Use Analog	Time (sec)
1	Load to Flowmeter		(A) Resin <input checked="" type="radio"/> (B) Catalyst <input checked="" type="radio"/> (C) Channel <input type="radio"/>	3.000
2	High Flow	375		3.000
3	Low Flow	200	<input checked="" type="radio"/>	2.000

At the bottom of the screen, there are five buttons: a home icon, a green play button, two empty buttons, and a save icon.

The middle button on the bottom of the Main Screen opens the Color Change Sequencer Screen.

The icons across the bottom of the screen, starting from the left are:

- Return to Home Screen
- Go back one screen
- Not used
- Not used
- Save Flush and Load Parameters to flash memory

The top half of this screen allows the user to program the *Flush Sequence*. There are four possible steps in the flush sequence. If the time is programmed to be zero (0) for any step, that step is skipped.

Color Change Sequencer Screen (continued)

Color Change Sequence

 1

 2

Flush Sequence Time: 15.00 sec Load Sequence Time: 8.00 sec

FLUSH SEQUENCE

1 : Resin Push Solvent <input checked="" type="radio"/> Air <input type="radio"/> Time <input type="text" value="5.000"/> sec	2 : Catalyst (Solvent Only) Time <input type="text" value="2.000"/> sec	3 : Resin Chop Solvent <input type="text" value="0.250"/> sec Air <input type="text" value="0.250"/> sec Time <input type="text" value="5.000"/> sec	4 : Resin Push Solvent <input checked="" type="radio"/> Air <input type="radio"/> Time <input type="text" value="3.000"/> sec
---	--	--	---

LOAD SEQUENCE

1 : Load to Flowmeter (A) Resin <input checked="" type="radio"/> (B) Catalyst <input checked="" type="radio"/> (C) Channel <input type="radio"/> Time <input type="text" value="3.000"/> sec	2 : High Flow Flow Rate <input type="text" value="375"/> ml/min Time <input type="text" value="3.000"/> sec	3 : Low Flow Flow Rate <input type="text" value="200"/> ml/min Use Analog <input checked="" type="radio"/> Time <input type="text" value="2.000"/> sec
---	--	--











Step 1: Allows the user to push the material currently in the fluid line with either solvent or air for a specified time period. One or the other (solvent or air) must be selected. If solvent is selected, the following valves are opened:

- Resin MVR Valve
- Resin MVR Enable Valve
- Resin Solvent Valve
- Dump Valve

If air is selected to be used to push the paint in the initial step, the following valves are opened:

- Resin MVR Valve
- Resin MVR Enable Valve
- Resin Air Valve
- Dump Valve

Color Change Sequencer Screen (continued)

Color Change Sequence

 1

 2

Flush Sequence Time: 15.00 sec Load Sequence Time: 8.00 sec

FLUSH SEQUENCE

1 : Resin Push Solvent <input checked="" type="radio"/> Air <input type="radio"/> Time <input type="text" value="5.000"/> sec	2 : Catalyst (Solvent Only) Time <input type="text" value="2.000"/> sec	3 : Resin Chop Solvent <input type="text" value="0.250"/> sec Air <input type="text" value="0.250"/> sec Time <input type="text" value="5.000"/> sec	4 : Resin Push Solvent <input checked="" type="radio"/> Air <input type="radio"/> Time <input type="text" value="3.000"/> sec
--	---	---	--

LOAD SEQUENCE

1 : Load to Flowmeter (A) Resin <input checked="" type="radio"/> (B) Catalyst <input checked="" type="radio"/> (C) Channel <input type="radio"/> Time <input type="text" value="3.000"/> sec	2 : High Flow Flow Rate <input type="text" value="375"/> ml/min Time <input type="text" value="3.000"/> sec	3 : Low Flow Flow Rate <input type="text" value="200"/> ml/min Use Analog <input checked="" type="radio"/> Time <input type="text" value="2.000"/> sec
--	---	---











Step 2: Allows the user to push out the catalyst line with solvent, if necessary. If this step is set for 0 seconds, it is skipped. If this step is used, the following valves are opened:

- Catalyst MVR Valve
- Catalyst MVR Enable Valve
- Catalyst Solvent Valve
- Dump Valve

Step 3: The resin solvent and resin air valves are cycled to cause a scrubbing action inside of the fluid line. The user can specify how long each of the two valves is open in each cycle as well as how long they continue the cycling process for. During this step, the following valves are opened:

- Resin MVR Valve
- Resin MVR Enable Valve
- Resin Solvent Valve (pulsing)
- Resin Air Valve (pulsing)
- Dump Valve

Color Change Sequencer Screen (continued)

Color Change Sequence

1 2

Flush Sequence Time: 15.00 sec Load Sequence Time: 8.00 sec

FLUSH SEQUENCE

1 : Resin Push 2 : Catalyst 3 : Resin Chop 4 : Resin Push

Solvent Air (Solvent Only) Solvent 0.250 sec Air 0.250 sec Solvent Air

Time 5.000 sec Time 2.000 sec Time 5.000 sec Time 3.000 sec

LOAD SEQUENCE

1 : Load to Flowmeter 2 : High Flow 3 : Low Flow

(A) Resin (B) Catalyst (C) Channel Flow Rate 375 ml/min Flow Rate 200 ml/min Use Analog

Time 3.000 sec Time 3.000 sec Time 2.000 sec

Step 4: Allows the user to push out the flushing materials left in the fluid lines with either air or solvent. (For plural component materials, it is often recommended to leave unpressurized solvent in the lines when the system is not in use to soften any material that may have “skinned” the inside of the fluid lines. That material should be flushed out at the start of the next paint cycle.) The valves that are opened during this step are:

- Resin MVR Valve
- MVR Enable Valve
- Resin Solvent (or Resin Air) Valve
- Trigger Valve

Note: This final step flushes the applicator itself as the dump valve is closed and the trigger valve is opened.

Color Change Sequencer Screen (continued)

The screenshot displays the 'Color Change Sequence' control interface. At the top, there are two valve icons labeled '1' and '2'. Below them, the 'Flush Sequence' is defined with a total time of 15.00 sec and a 'Load Sequence Time' of 8.00 sec. The flush sequence consists of four steps:

Step	Description	Solvent	Air	Time (sec)
1	Resin Push	<input checked="" type="radio"/>	<input type="radio"/>	5.000
2	Catalyst (Solvent Only)	<input type="radio"/>	<input type="radio"/>	2.000
3	Resin Chop	0.250	0.250	5.000
4	Resin Push	<input checked="" type="radio"/>	<input type="radio"/>	3.000

The 'Load Sequence' follows, with a total time of 8.00 sec. It consists of three steps:

Step	Description	Flow Rate (ml/min)	Time (sec)
1	Load to Flowmeter	-	3.000
2	High Flow	375	3.000
3	Low Flow	200	2.000

At the bottom of the screen, there are five icons: a house (Home), a play button (Run), a stop button, a refresh button, and a floppy disk (Save).

The bottom half of the Color Change Sequencer Screen allows the user to control the **Load Sequence**. Once again, if any of the times are set to zero, the step is skipped.

In the first step, the user can specify which valve or valves should be opened to allow material to flow from the color valve stack to the flow meter and for how long. The valves that are opened during this step are:

- Resin MVR and/or Catalyst MVR and/or Component C MVR Valves
- Resin CCV and/or Catalyst CCV Valve (note that which of the resin and catalyst CCV valves opened is based on information provided on the Configure Job Screen)
- Resin and Catalyst MVR Enable Valves
- Dump Valve

In the second step, the controller switches to run mode and starts controlling the flow of the material or materials. This should be done at a fairly high flow rate since the dump valve is still opened. Material should be run in this step until mixed material is approaching the dump valve and then this step should end. (It is not advisable to send mixed material through the dump valve as the next spray cycle may exceed the pot-life time of the material and the material could set up in the dump valve.) The valves that are on during this step are:

- All MVR Valves are PIDding
- Resin and Catalyst MVR Enable Valves
- Resin and Catalyst CCV Valves
- Dump Valve

Color Change Sequencer Screen (continued)

Color Change Sequence

 1

 2

Flush Sequence Time: 15.00 sec Load Sequence Time: 8.00 sec

FLUSH SEQUENCE

1 : Resin Push Solvent <input checked="" type="radio"/> Air <input type="radio"/> Time <input type="text" value="5.000"/> sec	2 : Catalyst (Solvent Only) Time <input type="text" value="2.000"/> sec	3 : Resin Chop Solvent <input type="text" value="0.250"/> sec Air <input type="text" value="0.250"/> sec Time <input type="text" value="5.000"/> sec	4 : Resin Push Solvent <input checked="" type="radio"/> Air <input type="radio"/> Time <input type="text" value="3.000"/> sec
--	---	---	--

LOAD SEQUENCE

1 : Load to Flowmeter (A) Resin <input checked="" type="radio"/> (B) Catalyst <input checked="" type="radio"/> (C) Channel <input type="radio"/> Time <input type="text" value="3.000"/> sec	2 : High Flow Flow Rate <input type="text" value="375"/> ml/min Time <input type="text" value="3.000"/> sec	3 : Low Flow Flow Rate <input type="text" value="200"/> ml/min Use Analog <input checked="" type="radio"/> Time <input type="text" value="2.000"/> sec
--	---	---





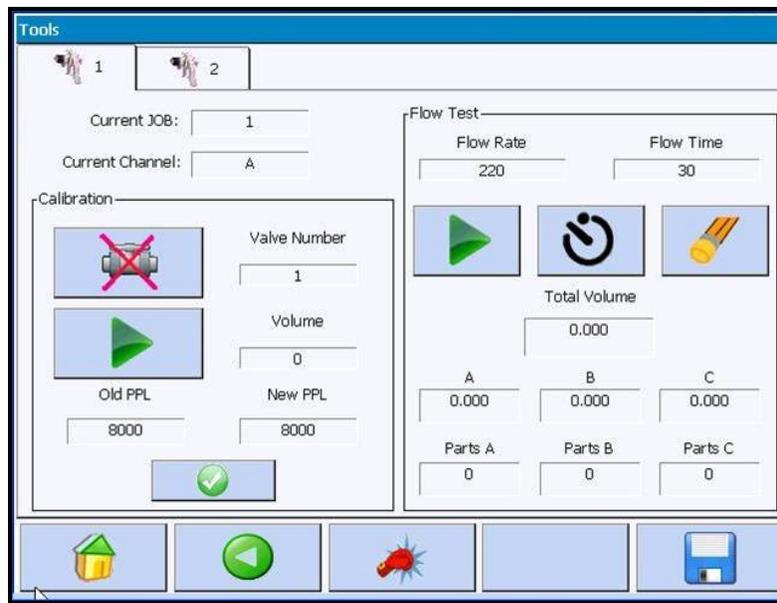






The third and final step closes the dump valve and opens the trigger valve. Flow rate is normally reduced in this step since the applicator typically cannot handle as high a flow as the dump valve. This step is intended to prepare the applicator for the first trigger on a part. This flow rate can be programmed or if the Use Analog radio button is selected, the unit will use the signal from the analog input to determine the target flow rate required in this step. (Refer to the section explaining the Job Parameters to program the Min Flow and Max Flow parameters for this analog feature to work.)

Tools Screen



The fourth button from the left on the Main Screen selects the Tools Screen. From here, users can perform functions such as calibrate the flow meters, do flow tests, and test all digital and analog inputs and outputs.

The icons across the bottom of the screen, starting from the left are:

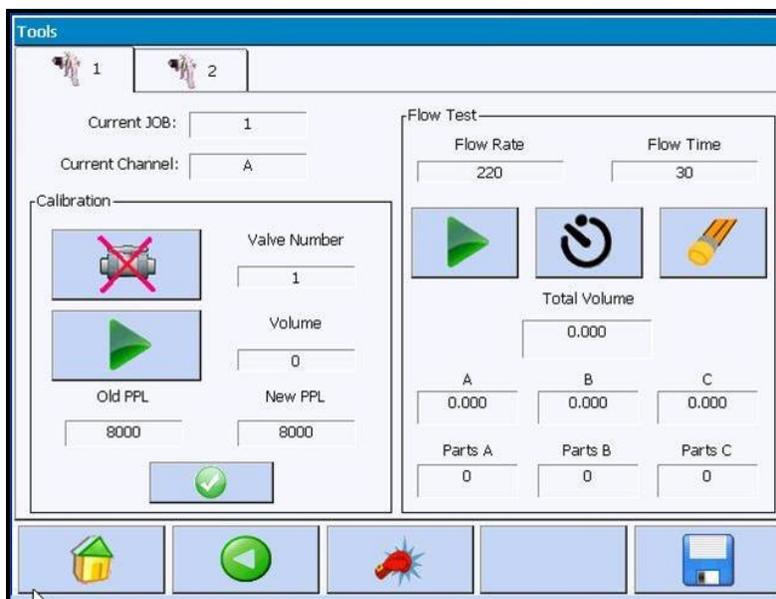
- Return to Home Screen
- Go back one screen
- Force I/O Screens
- Not used
- Save Calibration Parameters to flash memory

Calibration

Four items must be selected prior to calibrating: The Gun Number (tab at the top of the screen), the Job Number (Current JOB) that you want the new calibration values saved to, the channel (Current Channel) which can be A, B, or C, and the Valve Number (this is which color valve) that should be opened during the calibration process. To change the values of Job, Channel, and Valve, simply touch the white box where the value appears that you wish to change and a keypad will popup, allowing you to change its value.

Note: There are three buttons inside the calibration section of the tools screen. The top button has the image of a valve with a red cross through it. This indicates that presently the valves are closed. When you touch this button, three things will happen: The color valve that you selected will open, the MVR enable signal (solenoid valve) for the channel you selected will open, and the MVR valve will go to its MVR High pressure. This allows you to flow material from the color valve down through the MVR valve, flow meter, calibration valve, etc. and get any air out of the fluid lines prior to calibrating. This button can remain on during the entire calibration process if you have a downstream valve to control the flow of material during calibration (such as a calibration ball valve or trigger valve at the applicator, etc.)

Tools Screen (continued)

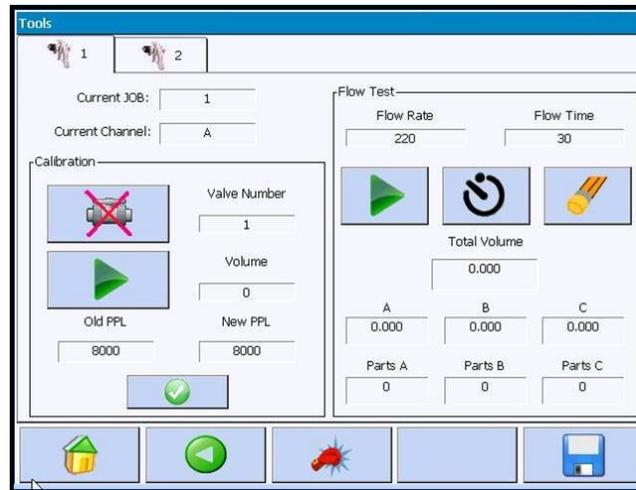


The second button inside of the calibration section of the screen is a large green arrow. When this button is pushed, the software will begin counting pulses from the flow meter. (This button changes to a red stop sign when pushed.) To calibrate, simply push this green arrow button and then open your calibration valve (or trigger valve) and flow an adequate amount of material into a graduated cylinder. Close the calibration valve (or trigger valve) and push the red stop sign button. Next, touch the white box under the text Volume and a keypad will popup. Enter the volume (in milliliters) that was collected in the graduated cylinder and hit enter (ENT). The software will automatically calculate a new calibration value for the flow meter (in pulses per liter) and display it in the lower right box under New PPL. If this value seems reasonable, touch the small box at the bottom of the screen with the check mark in it. This will copy the most recently calculated value over to the box at the left labeled OLD PPL. (This is the value that the software uses to calculate the volume of material as it is counting pulses.)

You should repeat the calibration process until you get at least three consecutive values that are within 5% of each other. Touch the top (open valve) button to close all valves on the channel and color you are calibrating once you are satisfied with the calibration value. Once this has been done, touch the Save to flash memory button in the lower right hand corner of the screen to save the new PPL value to the selected Job. Note that leaving this screen without performing this save function will lose the calibration data you just determined.

This calibration process must be completed for all channels configured to the gun. Also note that these calibration values must be determined for all materials that are to be used. It is recommended that one job number be used for each material as different materials affect the flow meters in different ways and will result in different calibration values. Make sure to save values to flash memory after each calibration process has been completed.

Tools Screen (continued)



Flow Test

Once calibration has been completed, it is a good idea to do some flow tests to insure that the system is flowing at the proper flow rates and giving the proper ratios. The Flow Test screen can be used to easily accomplish this.

Prior to doing a flow test, go back to the emulator screen and perform a load sequence for the material (Job) that you wish to perform the flow test on. Take the gun out of run mode by touching the red stop sign button prior to leaving the emulator screen.

Return to the Tools screen and, once again, begin by selecting the tab for the gun you wish to perform the flow test on at the top of the screen. Next, touch the white box below the Flow Rate text and enter the target flow rate that you wish to come out of the applicator (total of all channels) during the flow test. Next, program how long (in seconds) you wish the flow test to run for under Flow Time. If there are values displayed under Total Volume or the A, B, or C channels, they can be reset to zero by touching the eraser button on the right side of the screen.

At this point, the gun can be placed in "Run Mode" by touching the green arrow button on the left side of the Flow Test screen. To start the flow test, simply touch the middle "Timer Start" button. Flow will start immediately and a signal will be sent from the trigger solenoid valve. Make sure to open the applicator if it is not being controlled by the RansFlow's trigger valve or a flow too low fault will occur. The unit will continue to flow for the amount of time programmed, at which point the trigger valve will be closed and flow will be stopped. During the flow process, the Total Volume and the volumes under channels A, B, and C, (or whatever channels are configured to the gun) will be incremented based on pulses received from the appropriate flow meters. If the materials are collected independently of each other from the calibration ports, those values can be compared to the volumes that the software calculated as having been dispensed. If any of the volumes are outside of acceptable limits, the flow meter for that channel should be recalibrated.

An additional feature of this screen allows you to have the software calculate the actual ratio of the material(s) that were dispensed. Simply touch the white box below the heading Parts A and enter what the target ratio for the master channel was. The software will then automatically calculate the other component or other components ratios for easy comparison to the target. Once again, if any of the component's ratios are outside of acceptable limits, recalibration of the flow meter or flow meters is recommended.

Tools Screen (continued)

Tools

1 2

Current JOB: 1

Current Channel: A

Calibration

Valve Number: 1

Volume: 0

Old PPL: 8000

New PPL: 8000

Flow Test

Flow Rate: 220

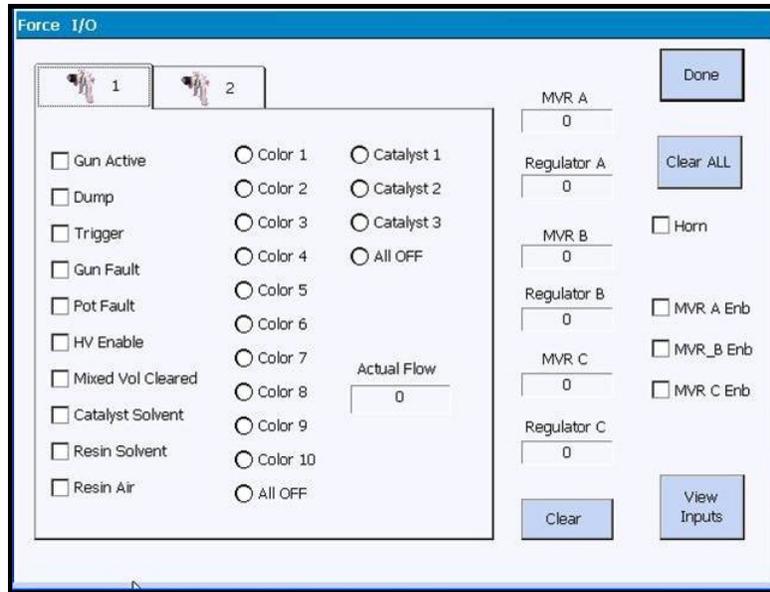
Flow Time: 30

Total Volume: 0.000

A	B	C
0.000	0.000	0.000
Parts A	Parts B	Parts C
0	0	0

An additional feature of this screen allows you to have the software calculate the actual ratio of the material(s) that were dispensed. Simply touch the white box below the heading Parts A and enter what the target ratio for the master channel was. The software will then automatically calculate the other component or other components ratios for easy comparison to the target. Once again, if any of the component's ratios are outside of acceptable limits, recalibration of the flow meter or flow meters is recommended.

Force I/O Screen



This screen allows the user to force any of the digital (discrete) or analog outputs of the RansFlow System. Also from this screen, the user can select the View Inputs Screen.

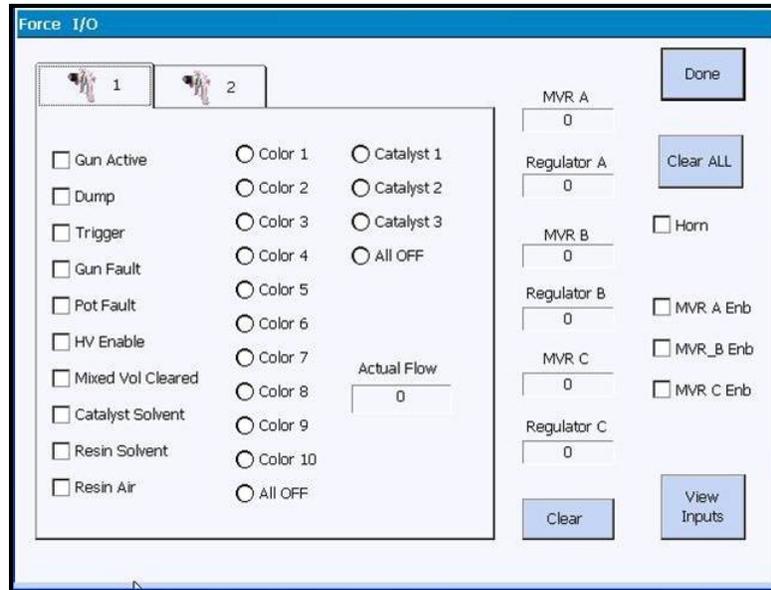
The first column allows you to force the digital status outputs. Simply touch the square next to the signal you wish to force on and a checkmark will appear in the box indicating that the signal is forced on. To remove the force simply touch the box a second time or touch the Clear ALL button in the top right of the screen.

The second column allows you to force any of the color valve solenoids on. Only one can be forced on at a time (to prevent materials backing up from one supply line to another if they don't have matching pressures). Simply touch the radio button next to the color valve you wish to turn on. To turn it off, touch the All OFF radio button at the bottom of the second column or the Clear ALL button.

The third column allows you to force any of the catalyst valve solenoids on. Only one can be forced at a time (to prevent materials backing up from one supply line to another if they don't have matching pressures). Simply touch the radio button next to the catalyst valve you wish to turn on. To turn it off, select another valve to turn on or touch the All OFF radio button in the third column or the Clear ALL button.

Also in the third column is a box marked Actual Flow. This drives an analog output that is proportional to the flow rate passing through the applicator. If you touch the box below the Actual Flow text, a keypad will appear allowing you to key in a voltage to send to this analog output. Key in the value 0 to reset.

Force I/O Screen (continued)

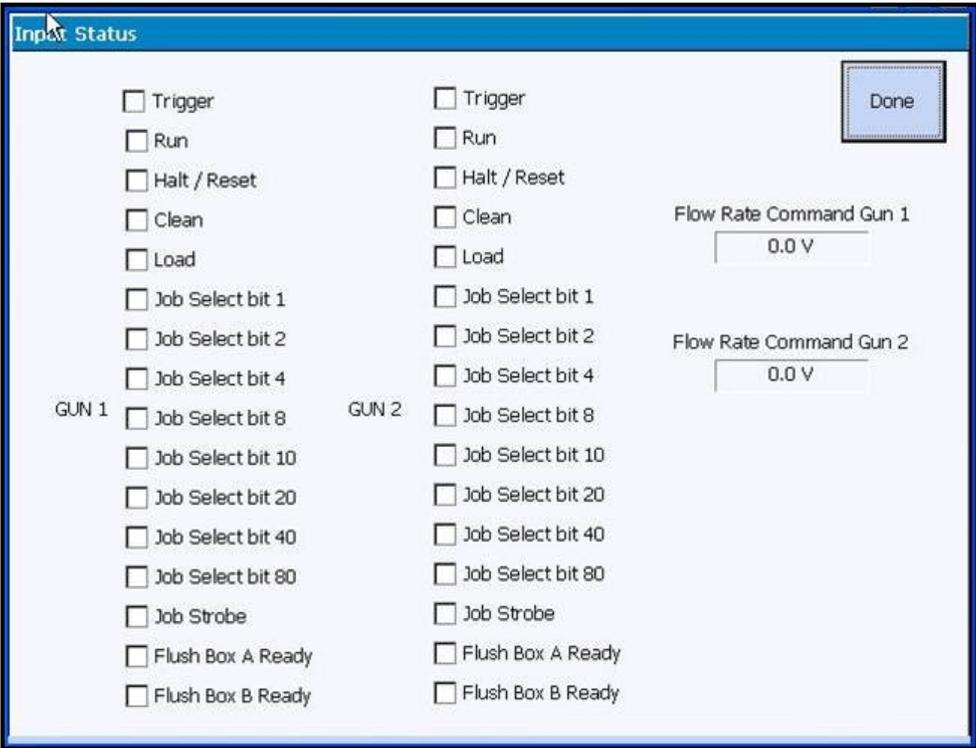


The fourth column allows you to force the analog outputs that drive the transducers that in turn drive the MVR valves (MVR A, MVR B, MVR C). There are three additional analog outputs (Regulator A, Regulator B, and Regulator C) that can be forced. (These outputs allow the user to optionally connect a pilot operated fluid regulator to the input of the MVR valve and specify different inlet pressures for different materials.) Simply touch the box below the output to be forced and key in the voltage desired out of the analog output. Key in a value of 0 to reset the output.

The fifth column allows the user to force the horn on and the MVR Enable signals (solenoids). Simply touch the box next to the text that you wish to force and check mark will appear when the output is turned on. Touch the box a second time to turn the output off or touch the Clear ALL button.

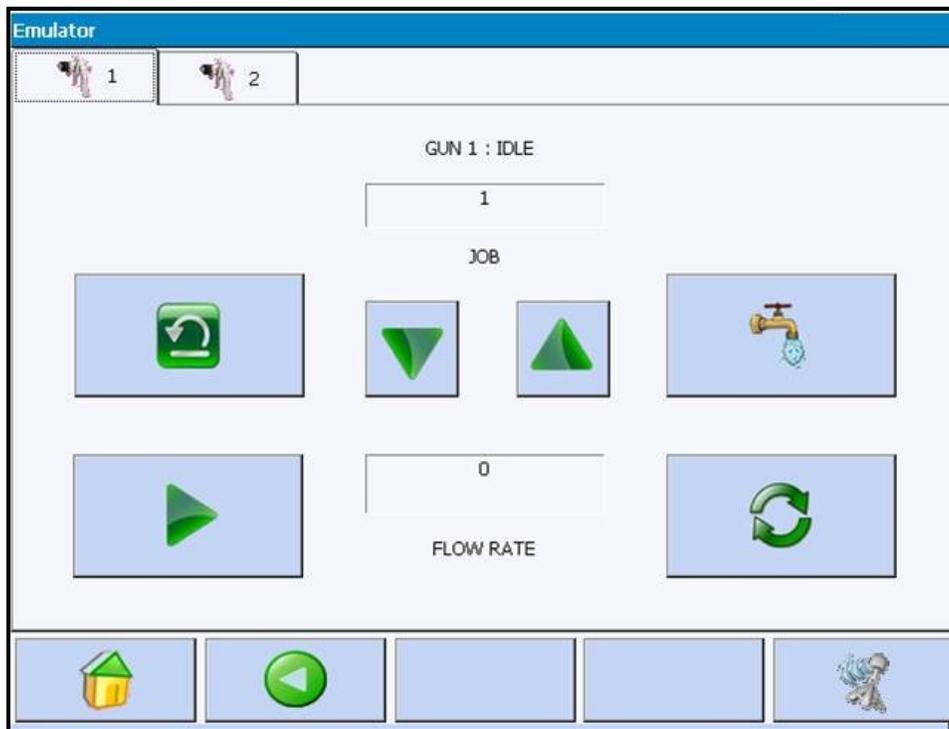
In the bottom right corner of this screen is a button labeled View Inputs. Select this option if you wish to monitor the status of any of the digital or analog inputs.

View Inputs Screen



This screen displays the status of all input signals. A checkmark beside any label indicates a signal is present at that input. The two **Flow Rate Command** boxes indicate the input voltage on that input.

Emulator Screen

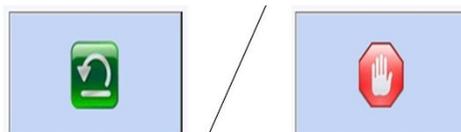


The fifth button from the left on the Main Screen selects the Emulator Screen. From here, users can perform functions such as select the job number to load, load material to the applicator, flush the applicator, put the gun in run mode, halt the gun, reset faults, and view the status of the gun, the currently running job number and the current flow rate.

The icons across the bottom of the screen, starting from the left are:

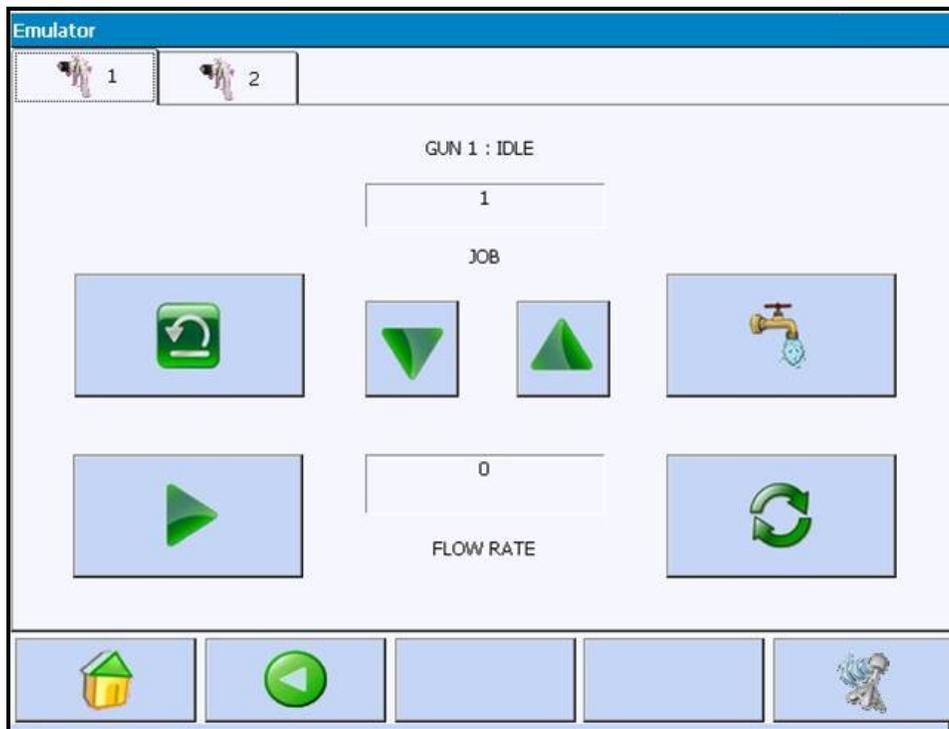
- Return to Home Screen
- Go back one screen
- Not used
- Not used
- Enable the Remote Operator Panel

The icons in the upper area of the screen are described below:



The upper left button is the Reset/Halt button. It changes its appearance depending upon the mode the gun is in. If the gun is faulted, this button resets the fault. If the gun is running, it halts it. The gun must be in run mode to flow material.

Emulator Screen (continued)



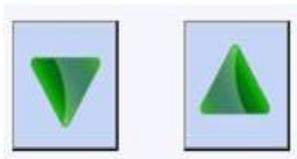
Run – this button puts a halted gun in run mode (which enables it to flow).



Flush – this button performs a flush of the applicator(s).



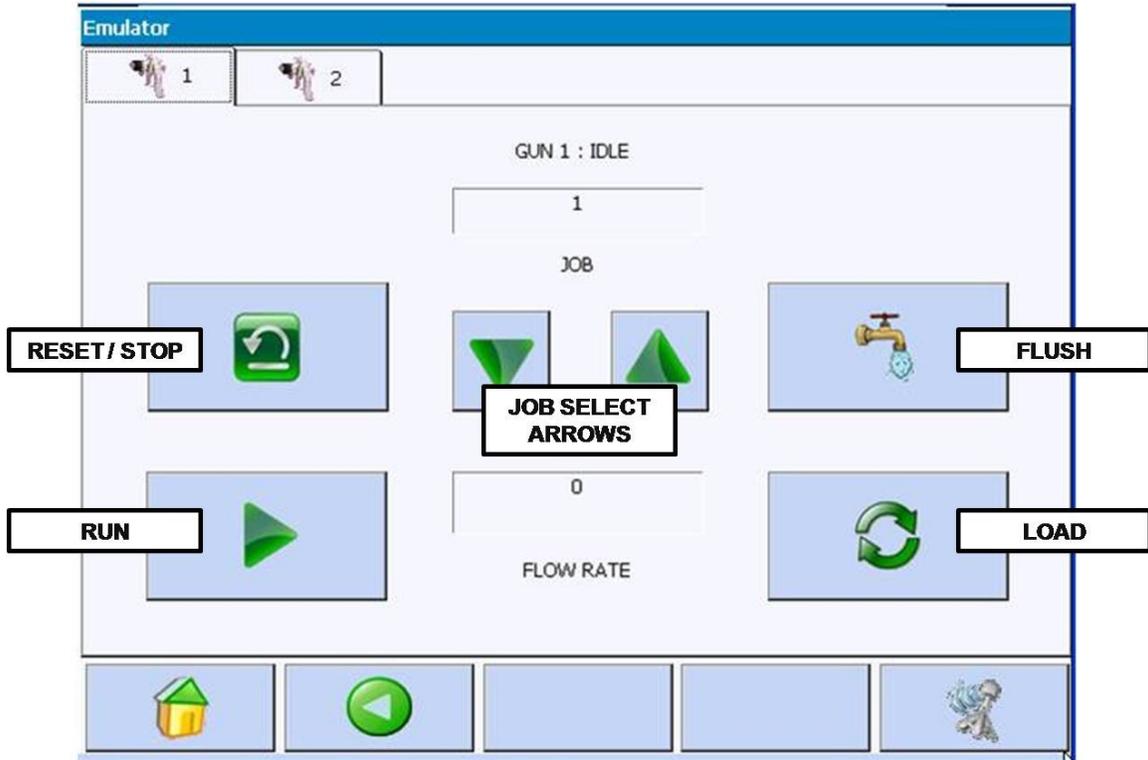
Load – this button performs a load sequence on the applicator. (Which in turn loads the job number specified on this screen.)



Previous/Next Job Number – these two buttons allow the user to select the next job number to load.

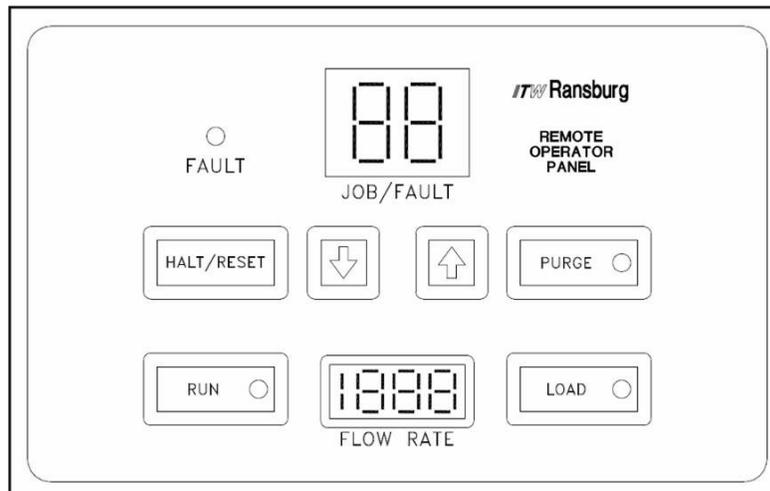
Section 5: OPERATION

Emulator / Remote Operator Panel Screen



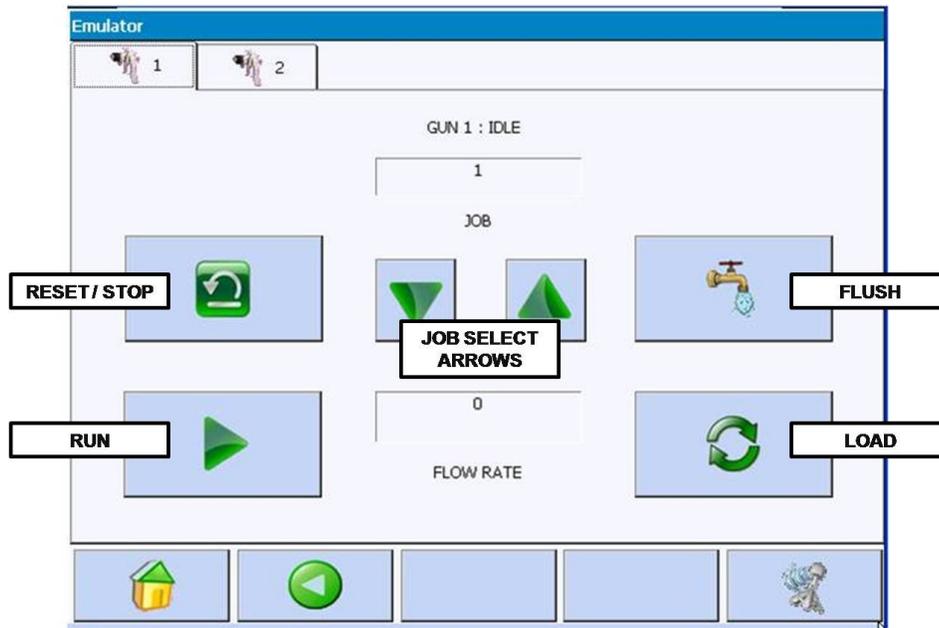
Emulator Screen on RansFlow Main Control Panel

All gun/applicator operation can be done from the Emulator screen or from the optional Remote Operator Panel.



Optional RansFlow *Remote Operator Panel*

Start Spraying



Two steps to start spraying:

1. Start-up

- Turn ON AC power and let the software startup.

2. Loading a Job

- Go to the EMULATOR screen:



- Press the RESET / STOP button to clear any initial faults:



- Press the UP/DOWN arrows to select the job you want to use:



- RansFlow must be in the idle/halt state. Press HALT:



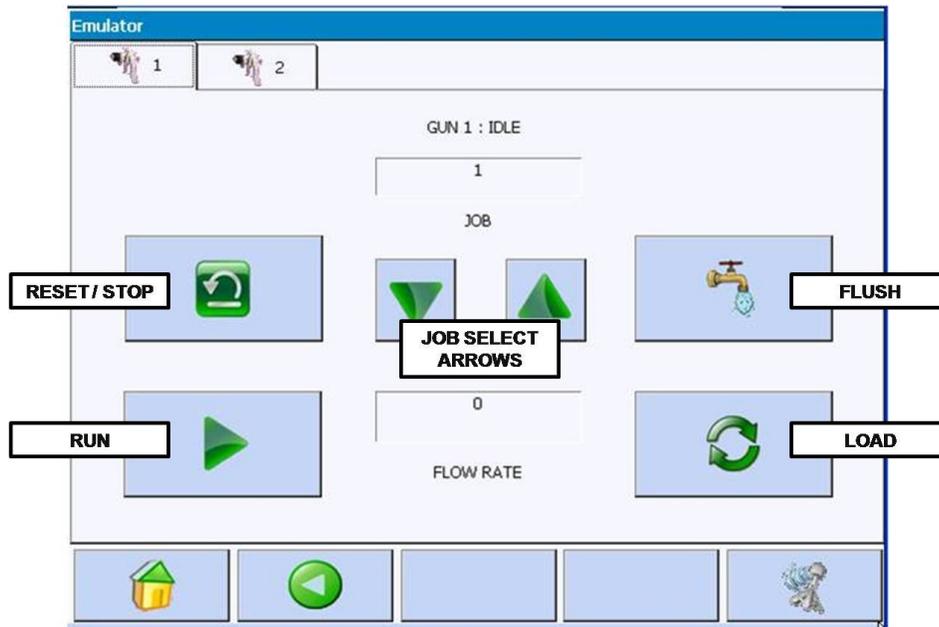
**If unit is already in idle/halt state, this button will not be visible.

- Press LOAD:



- On the first load after power up, or if a job with a new color is selected the RansFlow will do a flush before it loads.
- When the load sequence is complete the RansFlow will be placed in RUN mode and the gun/ applicator will be ready to spray.

Finished Spraying



Two steps when finished spraying:

1. Flushing

- RansFlow must be in the idle/halt state. Press HALT:



**If unit is already in idle/halt state, this button will not be visible.

- Press FLUSH:



- The RansFlow will step through the flush sequence leaving the gun clean and idle.

2. Recovering from a Fault

- If a fault occurs, first the unit must be RESET:



- The unit must be placed back into RUN mode:



- The fault that occurred may be viewed on the **Reports Screen**.

Section 6: TROUBLESHOOTING

POWER SUPPLY ISSUES

There are two DC power supplies in the main control console, one at 5 VDC and a 24 VDC, both capable of 5 amps, maximum. Neither power supply is fused. If a short in the electrical system does occur (greater than 5 amps is sensed), the power supply will shut down its output until that short is removed. It may be necessary to cycle the AC power feeding the power supplies to permit them to reset properly. The photograph below shows the terminals on the power supplies that can be used to verify output voltages with a voltmeter.



The AC power is fed into the bottom of the supplies (L=Hot and N=Neutral). The DC power exits the top of the supplies with the positive terminals marked with a plus (+) sign and the ground terminals with a negative (-) sign. Note that both power supplies have voltage adjustment screws on them that are factory preset but can be readjusted, if necessary. If the 5 volt supply is not within 10% of 5.00 volts (4.95 to 5.05), it should be adjusted. If the 24 volt supply is not within 10% of 24 volts (21.6 to 26.4), it should also be adjusted. The larger 24 VDC power supply also has a Single/Parallel switch that should be set on the Single position.

If no voltage is detected on the output of either supply, and cycling the AC power does not restore the output, try removing the wires on the output of the supply (with the AC power off) and then power up the unit. If there is still no voltage, replace the power supply. If the voltage recovers, place an ammeter in circuit and check to see if you have exceeded the 5 amp limit of the supply. If current draw is less than 5 amps, replace the power supply. If the current draw is greater than 5 amps, look for excessive current draw in the system.



Proper OSHA Lockout/Tagout procedures must be followed prior to performing any equipment maintenance or repair.

FLOW TOO LOW OR FLOW TOO HIGH FAULTS

These types of faults can be caused by numerous problems. We will attempt to describe most of the more common causes below. Keep in mind that, as the name implies, the controller thinks that either too little or too much material is getting to the applicator. This troubleshooting manual assumes that the system was running at one time and something has gone wrong. It is not meant as a manual for setting up a new system, however, many of the troubleshooting procedures described can be used in either case.

1. **Has your material supply pressure changed?** What was the material supply pressure when the system was running properly? Is it the same now? Do you really trust the pressure gauge you have been using for the past several years? The controller can compensate for small changes in pressure (typically 10 psi) but changes greater than this or large pressure surges (as is seen with piston pumps without surge chambers) are a definite problem.
2. **Has the viscosity of the material changed?** A significant change in viscosity alters the way in which it passes through the fluid metering equipment (MVR valve, flow meter, check valves, Y-block, spiral mix tube, etc.). Typically, an increased viscosity will require more pressure to get to the same flow rate. However, in some cases (as with thixotropic materials), the viscosity will actually change as the pressure varies or as the material passes through the MVR valve and the flow meter. Note that there is a large pressure drop across the MVR and flow meters. Additionally, the material 'chopped' into small chunks as it passes through the flow meter, and this can cause some materials to change their properties as they flow.
3. **Has a restriction formed somewhere in the fluid line?** This could be a kinked tube, contamination in the MVR or flow meter, spiral mix tube blockage, or sticky check valve, "Y" block blockage, to name but a few. An easy way to verify that the system is capable of flowing at the flow rate required is to flush the applicator. Watch the flow rate during the flush sequence. If the system cannot get to the required flow rate in flush mode, the system will not be able to get there in run mode since MVR valves are wide open in flush mode. This tests all fluid lines from the material supply to the applicator. Try running the unit from the calibration ports on the fluid panel. Place containers under them, open the calibration ports, and put the unit in run mode. (If the unit is being operated in automatic mode, the trigger will have to be forced on.) If the unit operated correctly that way, the problem is further downstream.
4. **Are you seeing any flow at all?** If it is obvious that material is flowing out of the gun (or from the calibration port) but the display shows no flow at all then this indicates that the controller is not seeing any pulses coming from the flow meter. This could be caused by the gears in the flow meter being stuck, a bad sensor on the flow meter, a disconnected or damaged flow meter cable, a bad zener barrier, or a bad counter card. Disassemble the affected flow meter and inspect it for stuck gears. If it is obvious they are not stuck, place the shafts and gears in the top half of the flow meter and, with the sensor on the flow meter and cable connected, turn the gears. Watch the flow volume value on the main screen of the controller. The volume should increment with fluid flow. If it does not, than one of the problems mentioned above has occurred. Next, connect the flow meter to a cable of another channel that is functional and monitor that channel for flow. If flow is not indicated, you may have a bad flow meter sensor. It is also possible that a fuse in the zener barrier has failed. (Note, zener barriers are optional and only used on intrinsically safe units.) Find the zener barrier that is connected to the channel you are having a problem with. (Refer to electrical diagrams in this manual.) On the side of the zener barriers there are schematics of the internal circuitry. Fuse integrity can be verified quite easily with an ohmmeter. The flow meter cable itself can also be tested with an ohmmeter.

If none of these are the problem, there are only three other possible problems. The first is the high speed counter card mounted on the back side of the touch screen computer. (It is the top card on the stack of 3 cards.) The second option would be the ribbon cables (or their connectors) that run from the interconnect board on the inside-top of the control console or the ribbon cables that run from the high speed counter card to the optical isolator board. The only other possible problem would be the optical isolator board itself. The optical isolator board has some signal conditioning circuitry (optical isolators) on it that reduce the 24 volt flow meter pulses to 5 volt pulses (used by the counter card).

5. **Another possible cause of these type of faults would be if the transducer that controls the MVR valve would fail.** Verification that the transducer for the affected channel is functioning properly is as follows... If there is not already one there, place a pressure gauge in the pilot line between the transducer and the MVR valve. Go to the Force I/O screen on the touch-screen of the controller. Set MVR pressure for the channel you are troubleshooting at various pressures between 0 psi and 100 psi (we suggest every 5 to 10 psi to verify linearity of the transducer). Monitor the actual pressure with the gauge, again insuring only a 10% variance. If the transducer does not perform as described, replace it. NOTE: Make sure there is not a leak in the tubing leading to the MVR valve or in the MVR valve itself! The transducers are very low volume devices and are designed to only feed dead-headed devices.
6. **If you notice in test #5, that the transducer is not responding as expected, it may be the signal coming from the analog output board in the controller is at fault.** First, make sure you have 24 volts ($\pm 10\%$) feeding the transducers (refer to electrical diagrams in this manual and the picture below). There are 3 wires connected to the terminal block in the upper left of the transducer. The far left terminal is the ground terminal (wire #2101), the terminal second from left is the +24 VDC terminal (wire #2011), and the third from left terminal is the command input. The wire numbers for the command signals vary from channel to channel.



7. **Follow the procedure above (in test #5) to send various voltages to the transducer from the analog output card.** There is a 1:10 ratio between the voltage sent to the transducer and the pressure the transducer should produce. That is, if MVR output is set to 1.0 volt, a 1 volt signal should be output by the analog output board to the transducer and the transducer should respond with 10 psi on its pneumatic output. Likewise, 2 volts = 20 psi, 3 volts = 30 psi, etc. If you suspect a faulty analog output card it should be replaced.

OUT OF TOLERANCE FAULTS

Out of tolerance faults are generated in the following way... Every time a certain volume of resin passes through the resin flowmeter (specified by the Tolerance Volume Parameter), the controller determines the amount of catalyst that flowed during that same time interval. The software then calculates the actual ratio that flowed during that interval and checks to see if the ratio itself is within the Flow Tolerance specification on the Gun Parameters Screen.

The reason this fault is generated even though there were no flow too high or flow too low faults is probably best explained with an example: Take for instance, we have a 2k material that is supposed to be mixed at a 3:1 ratio and spray out of the applicator at 400 cc's/min. We have the Flow Tolerance set to 10% and the Tolerance Volume set to 200 cc's. The software sees this to mean it should flow 300 cc's/min of resin and at the same time 100 cc's/min of catalyst, and that is what it attempts to do. As long as the resin flow rate remains between 270 cc's/min and 330 cc's/min ($\pm 10\%$), and the catalyst flow rate stays between 90 cc's/min and 110 cc's/min ($\pm 10\%$), you will not receive a flow too low or flow too high fault. If, however, the resin is flowing at 280 cc's/min and the catalyst is flowing at 107 cc's/min (both within the 10% flow tolerance), you will get an out of tolerance fault. The reason for this is the way the 2k software generates out of tolerance faults. As was mentioned earlier, after each volume of resin specified by Tolerance Volume passes through the resin flowmeter, the 2k software looks to see how much catalyst flowed during that same time period. The software then determines the ratio (based on volume rather than flow rate). If that ratio is above or below the preset ratio by more than the Flow Tolerance specified in the parameters, it generates an out of tolerance fault. In our example above, the volume of resin would, of course, be 200 cc's and, since it was running low, it would have taken 42.857 seconds. In that same 42.857 seconds, the catalyst was flowing 7% high or at 107 cc's/min. This would result in a volume of catalyst of 76.43 cc's in that same time. The ratio of 200 cc's to 76.43 cc's is 72.35:27.65, which is, on the catalyst side more than 10% high. The unit will, therefore fault with an out of tolerance fault on the catalyst channel ($25\% + 2.5\% = 27.5\%$). Keep in mind that ratio is calculated based on total volume, therefore the catalyst ratio above is calculated by:

$$\frac{76.43}{200 + 76.43} \times 100 = 27.65\%$$

Most of the time when this fault is seen, the cause is the material supply pressures. Obviously, if you are not getting flow too low or flow too high faults, the flow rates are getting within the tolerance band of the target. Over an extended period of time, however, the volumes used are not within that same tolerance band. Observe the actual ratio on the main screen of the controller. (Note that the ratio displayed is an average over a period of time. In order to get instantaneous ratio information, touch the Volume box in the lower right of the main screen and reset its value.) If the actual ratio of the catalyst is below target, adjust the supply pressure to the catalyst MVR valve up 5 psi or so, or adjust the resin supply pressure down by 5 psi or so and try to run again. Keep adjusting these pressures until the actual ratio locks in on the target. Keep in mind that higher is not always better. Often times it works better to lower the pressure of the opposite channel, rather than raise a channel that is running low in ratio.

REVERSE FLOW LIMITS

As the name indicates, the software believes that material has backed up through one of the flow meters. This can be caused by any one of the following conditions:

1. **If any of the check valves on the fluid panel has failed in the open condition and the opposite fluid is at a higher pressure, fluid can actually back up into another line.** If this occurs, the system must be flushed immediately and the faulty check valve replaced.
2. **This is sometimes seen after a gun has been flushed and left unused for a period of time, such as at the end of the day or end of the shift.** This may be the result of pressure trapped in the line between the MVR valve and the applicator. This pressure eventually will back up through the flow meter and out the weep port on the MVR valve. To prevent this, make sure the applicator stays triggered for a few seconds after the controller is taken out of clean mode to relieve this pressure.
3. **When electrostatic sprayguns are used, it is not uncommon to see a very large value (in 100,000 of ml's range) displayed for reverse flow.** This is caused when electrostatic 'noise' is generated at the flow meter. That is, if the flow meter is not properly grounded and high voltage feeds back through the paint line from the applicator, noise is generated in the flow meter cable. This noise is read by the software controller as reverse flow. Make sure the flow meter is adequately grounded. This must be the same ground that is used in the controller.

NO MASTER FLOW

This fault will only occur on guns configured as 'manual' (also known as demand mode). On guns configured in manual mode, as soon as the gun is put in run mode, the master channel MVR valve opens to the MVR high setpoint (which is usually 100 psi). This is, typically, wide open. In this way, the operators can demand as much fluid as they wish and all the controller does is insure proper ratio by adjusting the MVR on the catalyst side, based on the flow rate of the resin. It is possible, however, for the master channel flow meter gears to get stuck and still allow material to pass through the flow meter. When this happens, the applicator continues to get resin but the controller is not aware material is flowing as the flow meter is not sending any pulses back to the controller. Therefore, it does not open the catalyst MVR and ratio in any catalyst. You, therefore, get uncatalyzed parts. To prevent this from happening, air flow switches are supplied that should be tubed in the atomization air line of the applicators. When the handgun or handguns are triggered they send a signal into the controller indicating that the handgun is in the triggered state. When the controller gets a trigger signal from the gun, it immediately looks to see if the resin flow meter is turning. If it is not, it issues a NO MASTER FLOW fault.

In many cases, however, operators use their handguns to blow dust and water off of their parts before spraying. They do this by pulling the trigger on the gun back just far enough to get atomization air but no paint. When this happens, the controller gets a trigger signal and no paint flow, which will cause it to fault. To allow for this 'blow off', a parameter called BLOW OFF TIME has been added to the software (found on the Gun Parameters screen). As soon as the 2k sees flow on the resin flow meter, this timer is reset, and it will start counting again, the next time it sees a trigger without flow.

If you receive this fault, it indicates that the gun has been triggered for a period of time specified by the BLOW OFF TIME parameter, but did not see any resin flow during that time.

In most cases, the cause of this is that the gears in the master channel flow meter have stopped (or become stuck). Try flushing the system and watch the flow rate or flow volume on the main screen of the controller during the flush to see if there is flow. If there still is no flow, disassemble and clean the flow meter. If this still does not correct the problem, see the section in this manual on FLOW TOO LOW FAULTS. If this fault occurs while the operator was not even trying to spray, then the air flow switch may be defective. This can be verified by looking at Force I/O screen (for inputs) A check mark will show up next to the Trigger input when the controller receives a trigger signal from the air flow switch. Verify that the signal turns ON and OFF as the applicator is triggered ON and OFF.

Section 7: APPENDIX

Icon Definitions



CONFIGURE



REPORTS



COLOR CHANGE SEQUENCER



TOOLS



EMULATOR



RETURN TO HOME SCREEN



GO BACK ONE SCREEN



BACKUP PARAMETERS TO USB PORT



RESTORE PARAMETERS FROM USB PORT

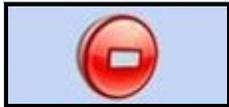
Icon Definitions (continued)



WRITE DISPLAYED PARAMETERS TO OPERATING GUN



ADVANCED PARAMETERS



RETURN TO ALARMS SCREEN



FLOW TOTALS



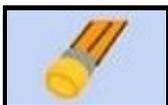
INFORMATION SCREEN



TIMER START



VALVE SELECT (OPEN OR CLOSED)



CLEAR VALUES (SET TO ZERO)



FORCE I/O SCREEN

Icon Definitions (continued)



RUN



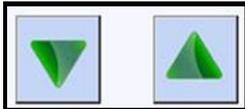
HALT



LOAD



RESET



JOB SELECT



FLUSH



REMOTE OPERATOR PANEL (ENABLE / TURN ON)

Remote Operator Panel (ROP) Error Codes

<u>ERROR CODE</u>	<u>DESCRIPTION</u>
1	Ratio Out of Tolerance
2	Reverse Flow Limit
3	Flow Too Low
4	Flow Too High
5	Integrator Too Low (PID loop Ki value set too low)
6	No Job Loaded
7	Potlife Expired
8	Bad Job Format
9	Startup Reset
10	No Master Flow
11	Not in Flush Box A
12	Not in Flush Box B

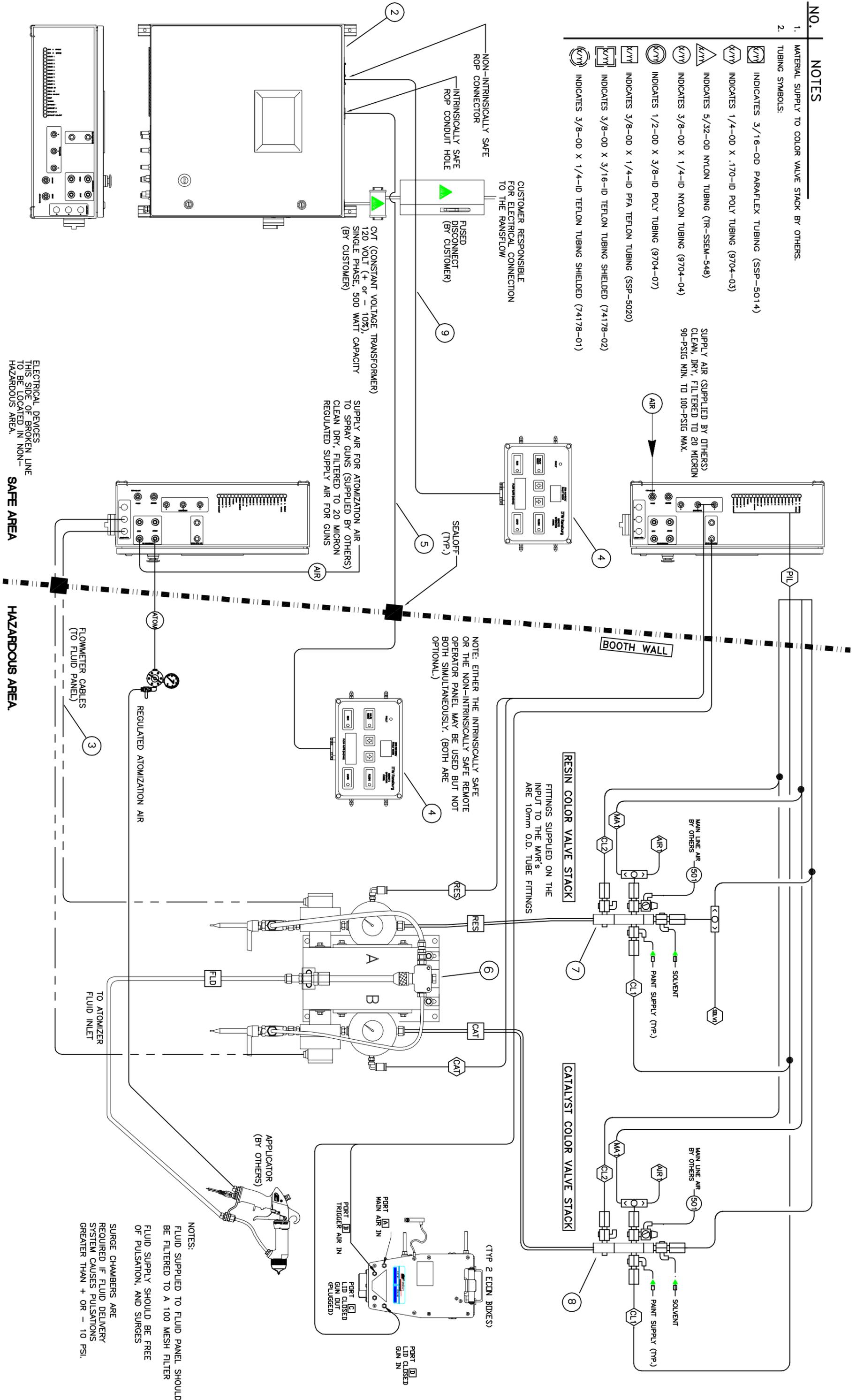
Typical Installation Prints (fractional & metric)

NO. NOTES

1. MATERIAL SUPPLY TO COLOR VALVE STACK BY OTHERS.
2. TUBING SYMBOLS:

- INDICATES 3/16-OD PARAFLEX TUBING (SSP-5014)
- INDICATES 1/4-OD X .170-ID POLY TUBING (9704-03)
- INDICATES 5/32-OD NYLON TUBING (TR-SSEM-548)
- INDICATES 3/8-OD X 1/4-ID NYLON TUBING (9704-04)
- INDICATES 1/2-OD X 3/8-ID POLY TUBING (9704-07)
- INDICATES 3/8-OD X 1/4-ID PFA TEFLON TUBING (SSP-5020)
- INDICATES 3/8-OD X 3/16-ID TEFLON TUBING SHIELDED (74178-02)
- INDICATES 3/8-OD X 1/4-ID TEFLON TUBING SHIELDED (74178-01)

SUPPLY AIR (SUPPLIED BY OTHERS)
CLEAN, DRY, FILTERED TO 20 MICRON
90-PSIG MIN. TO 100-PSIG MAX.



NOTE: EITHER THE INTRINSICALLY SAFE OR THE NON-INTRINSICALLY SAFE REMOTE OPERATOR PANEL MAY BE USED BUT NOT BOTH SIMULTANEOUSLY. (BOTH ARE OPTIONAL.)

NOTES:
FLUID SUPPLIED TO FLUID PANEL SHOULD BE FILTERED TO A 100 MESH FILTER
FLUID SUPPLY SHOULD BE FREE OF PULSATION, AND SURGES
SURGE CHAMBERS ARE REQUIRED IF FLUID DELIVERY SYSTEM CAUSES PULSATIONS GREATER THAN + OR - 10 PSI.

ELECTRICAL DEVICES THIS SIDE OF BROKEN LINE TO BE LOCATED IN NON-HAZARDOUS AREA.

SAFE AREA

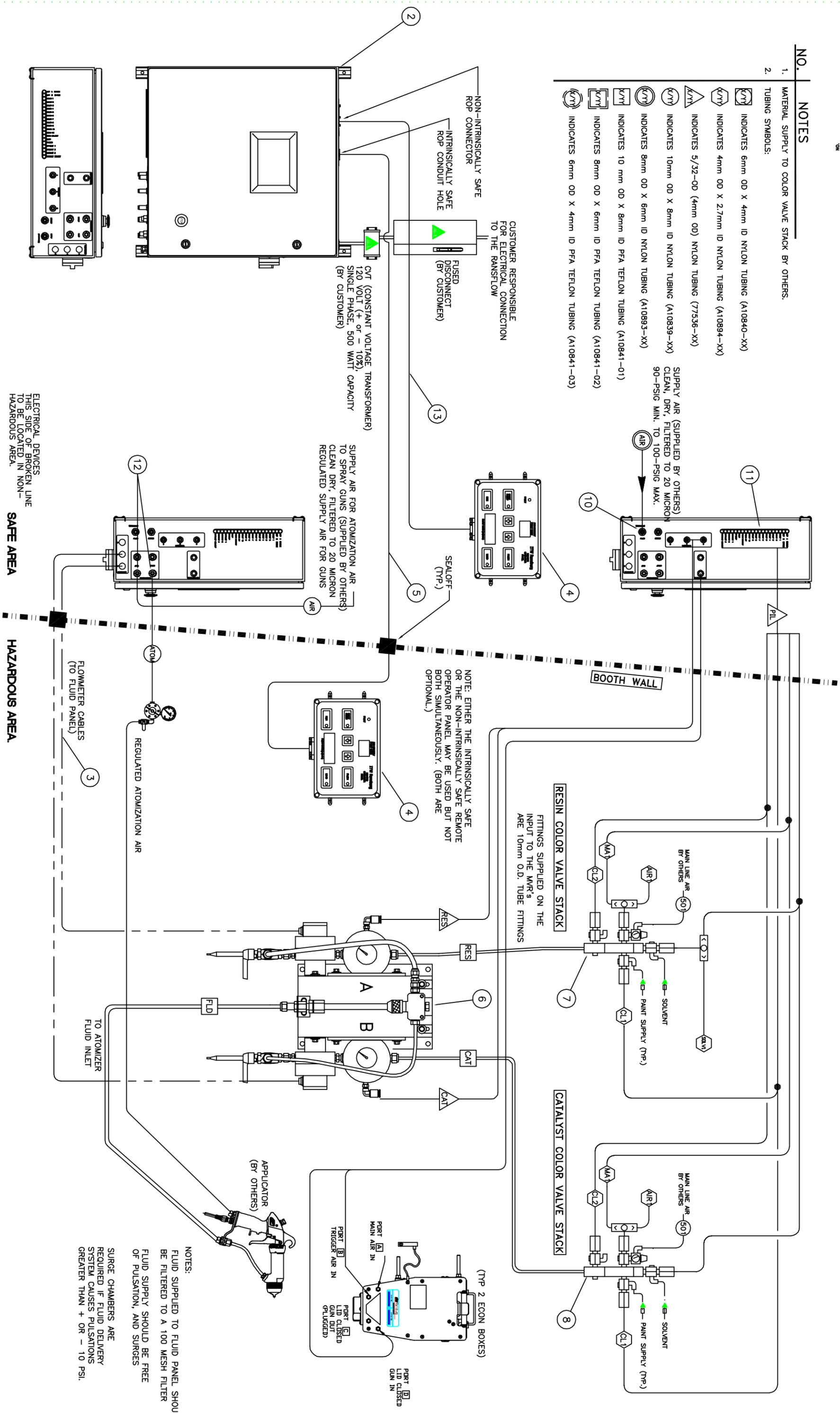
HAZARDOUS AREA

NO. NOTES

1. MATERIAL SUPPLY TO COLOR VALVE STACK BY OTHERS.
2. TUBING SYMBOLS:

- INDICATES 6mm OD X 4mm ID NYLON TUBING (A10840-XX)
- INDICATES 4mm OD X 2.7mm ID NYLON TUBING (A10894-XX)
- INDICATES 5/32-OD (4mm OD) NYLON TUBING (77536-XX)
- INDICATES 10mm OD X 8mm ID NYLON TUBING (A10839-XX)
- INDICATES 8mm OD X 6mm ID NYLON TUBING (A10893-XX)
- INDICATES 10 mm OD X 8mm ID PFA TEFLON TUBING (A10841-01)
- INDICATES 8mm OD X 6mm ID PFA TEFLON TUBING (A10841-02)
- INDICATES 6mm OD X 4mm ID PFA TEFLON TUBING (A10841-03)

SUPPLY AIR (SUPPLIED BY OTHERS)
CLEAN, DRY, FILTERED TO 20 MICRON
90-PSIG MIN. TO 100-PSIG MAX.

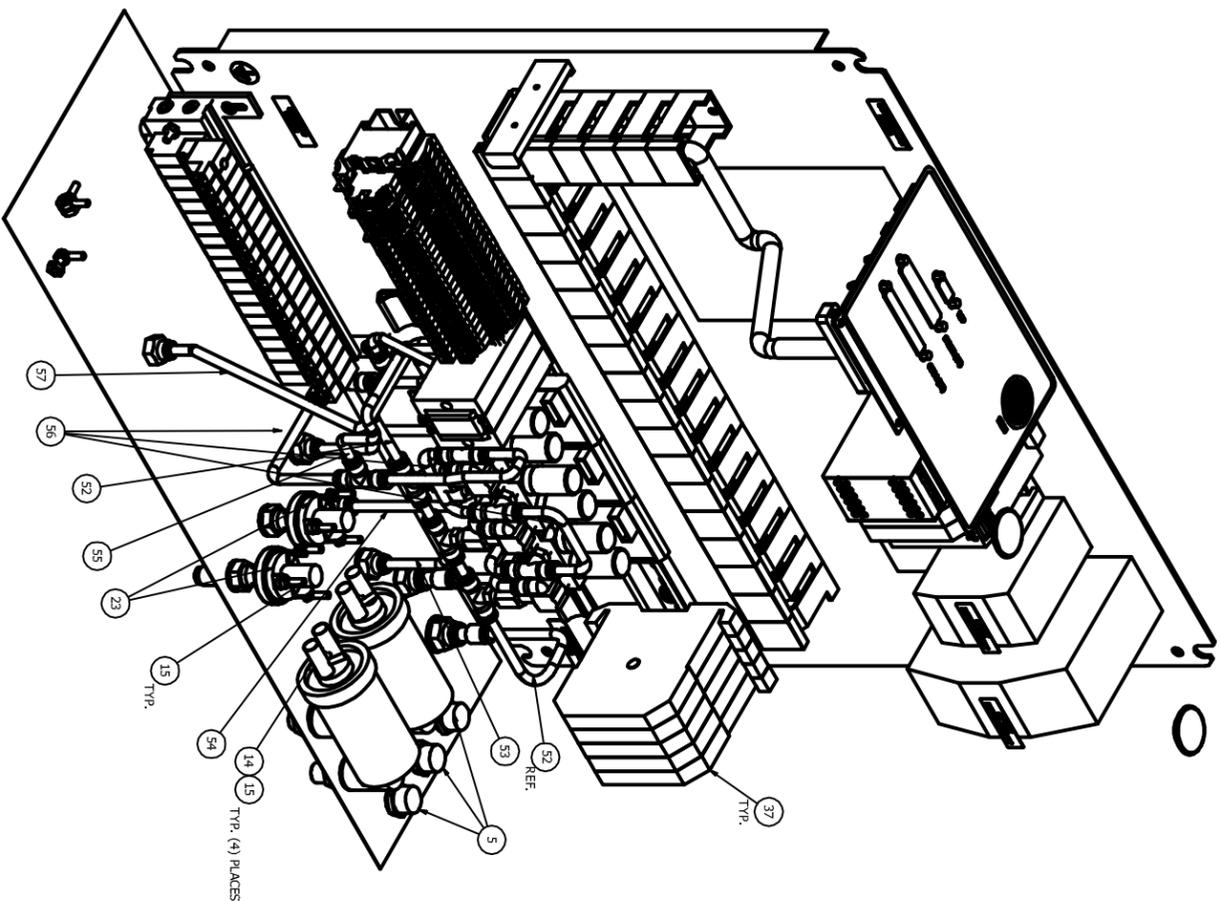


NOTES:
FLUID SUPPLIED TO FLUID PANEL SHOULD BE FILTERED TO A 100 MESH FILTER
FLUID SUPPLY SHOULD BE FREE OF PULSATION, AND SURGES
SURGE CHAMBERS ARE REQUIRED IF FLUID DELIVERY SYSTEM CAUSES PULSATIONS GREATER THAN + OR - 10 PSI.

BILL OF MATERIALS

ITEM	QTY	PART NUMBER	PART DESCRIPTION
1	1	AUT-61598	RANSFLOW 2K SYSTEM
2	2	A12410-021102	RANSFLOW CONTROL UNIT, INTRINSICALLY SAFE
3	4	77220-00	FLOWMETER CABLES, RF-1
4	2	A12559-00	REMOTE OPERATOR PANEL
5	2	A12605-50	REMOTE OPERATOR PANEL CABLE 50 FT.
6	2	78787-40840621M	FLUID PANEL, METRIC
A	2	76251-00	RF-1 FLOW METER
B	1	CCV-403-SS	CCV VALVE, ON INLET OF RESIN
C	1	78137-03	WEEPING MVR #3, ON CATALYST
D	1	78014-02	MIX BLOCK ASSEMBLY, NON FLUSHABLE
7	2	CCV-7102-111	CCV COLOR VALVE ASSEMBLY, 2 COLORS, SOLVENT, AIR, METRIC
8	2	CCV-7102-011	CCV COLOR VALVE ASSEMBLY, 2 COLORS, SOLVENT, METRIC
9	1	iMAQ56-8MX4	CONVERSION UNION 8mm ODT X 1/4 ODT
10	2	MAQ82-P-8	BULKHEAD UNION, 8mm BRASS
11	25	41-FTP-1015	STEM REDUCER 1/4 OD STEM X 5/32 ODT
12	4	8X10-14-SS	FITTING 1/4 NPS(F) X 10mm X 8mm TUBE
13	1	A12606-XXX	REMOTE OPERATOR PANEL CABLE, NON-INTRINSICALLY SAFE

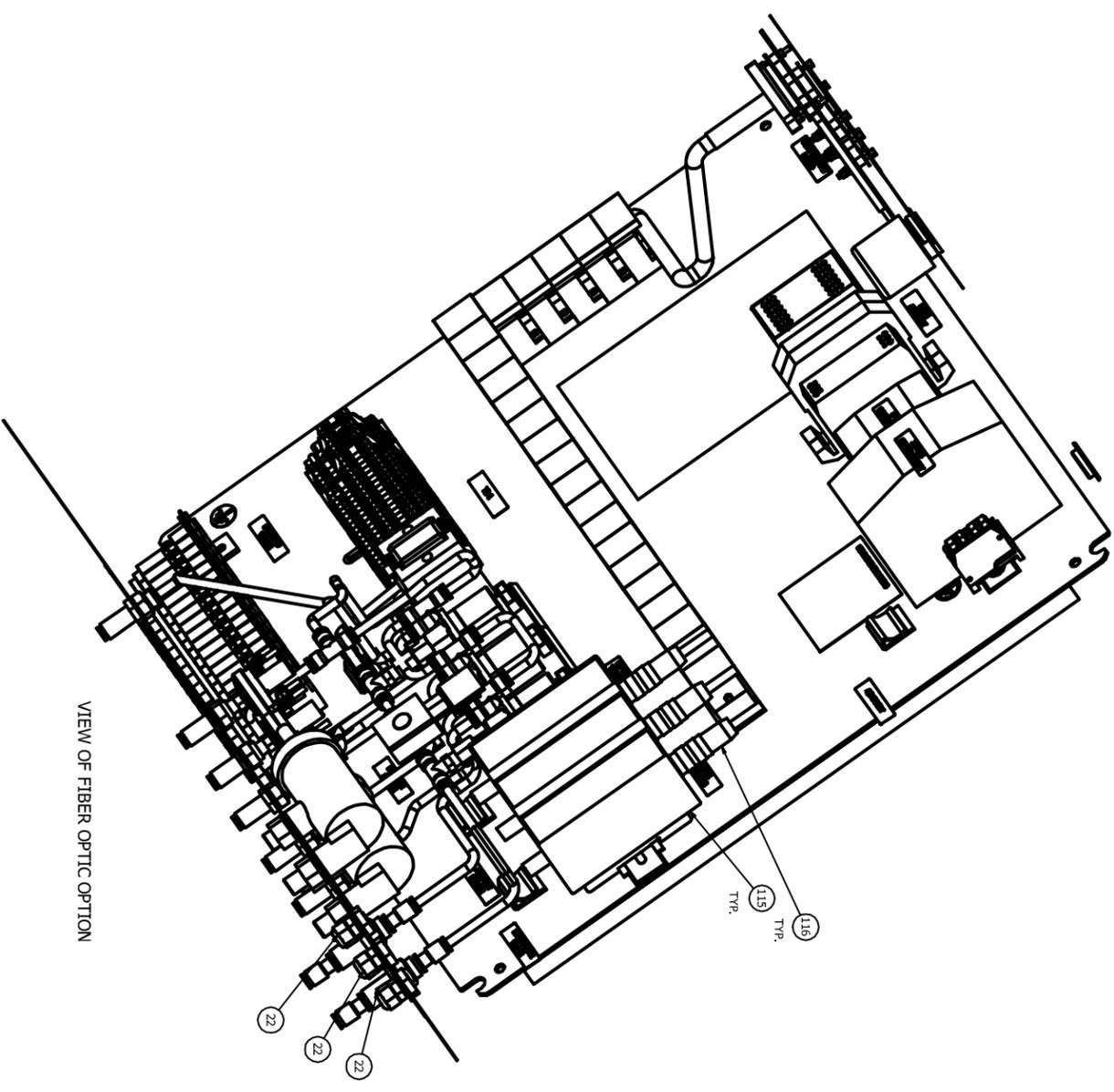
Control Panel Parts List



VIEW OF ZENER BARRIER OPTION

PNEUMATIC TUBING CONNECTION CHART

PANEL BULKHEADS	MVR TRANSDUCCERS	DR1 TRANSDUCCERS	SOLENOID VALVE MANIFOLD
SUPPLY	1	3	1P
EXHAUST	E	1	3R
TRANSDUCCER A	0		
TRANSDUCCER B	0		
TRANSDUCCER C	0		
TRANSDUCCER D	2		
TRANSDUCCER E	2		
TRANSDUCCER F	2		



VIEW OF FIBER OPTIC OPTION

ENCLOSURE ASSEMBLY

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	A12412-00	RANSFLOW WALL MOUNT ENCLOSURE
2	1	41-FRH-1000	BULKHEAD UNION, 1/4" ODT
3	2	41-FRT-1022	REDUCER, 3/8 ODT TO 1/4 ODT
4	1	TABLE A-J	FLOW METER ASSEMBLY
5	1	A11004-00	FLOW METER WIRE HARNESS
6	1	LSF0002-00	FITTING, BULKHEAD PUSH IN, 1/4 ODT X 1/8 NPT FEMALE
7	1	A12411-00	AC LOCKOUT, 3 POLE ISOLATOR SWITCH (6ACO 122-102)
8	1	A1249-01	INTERCONNECT BOARD, RANSFLOW
9	12	73106-05	SPACER, N/CON, 1/4" ODT X 1/4" LONG
10	1	LSM0024-00	ALARM
11	2	41-FRH-1001	BULKHEAD UNION 3/8" ODT
12	4	SS-6509-CD	NUT, 1/2 INCH FLAT WASHER
13	1	LSFA0008-00	NUT, 1/2-13, STEEL, ZINC
14	4	11245-02	HEAT SHRINK, .50 INCH, BLACK
15	1	7352-00	LUG, RING TERMINAL
19	1	41-HDW-1002	BOOT
20	1	A11383-00	FOOT KIT
21	3	7776-12	LOCKWASHER, INTERNAL TOOTH
22	1	77437-00	CONNECTOR, STRAIN RELIEF

BACK PANEL ASSEMBLY

ITEM	QTY	PART NUMBER	DESCRIPTION
23	1	23766-106	PRESSURE SWITCH
24	1	LSM0051-00	TAPE DOUBLE SIDED (CUT TO FIT)
25	2	TR-SSBH-538	TERMINAL BLOCK SEPARATOR
26	1	TR-SSBH-541	TRIO POLE JUMBER
27	1	A12424-00	ENCLOSURE, BACK PANEL
28	6	7734-04	#10 TOOTH SPLIT LOCK WASHER
29	7	SSP-4034-2N	SCREW, #10-32, SLOTTED PAN HEAD, ZINC
30	1	LSM0079	DIN RAIL, SLOTTED (10 INCHES LONG)
31	23	TR-SSBH-183	WIRE DUCT, 1" WIDE X 3" HIGH, WHITE
32	23	TR-SSBH-184	WIRE DUCT COVER, 1" WIDE, WHITE
33	5	TR-SSBH-382	TERMINAL BLOCK, END CLAMP
34	1	TR-SSBH-497	TERMINAL BLOCK, DOUBLE HIGH
35	1	TR-SSBH-539	TERMINAL BLOCK, END CAP
36	1	LSM0079	DIN RAIL, SLOTTED (20 INCHES LONG)
37	1	73837-08	*Vadins*
38	1	78645-00	E/P TRANSOUWER, HIGH SPEED, HIGH FLOW, DIN RAIL MOUNT
39	1	SSM-5504	TABLE
40	1	41-FR-1003	1/8 NPT(M) X 1/8 NPT(F) ELBOW
41	1	41-FR-1011	MALE RUN TEE, 1/8 NPT (M) X 1/4 ODT
42	1	SSP-4027	ELBOW, 1/8 NPT (M) X 1/4 ODT
43	1	A12416-00	SOLENOID MOUNTING PLATE
44	1	A12418-00	SOLENOID MOUNTING PLATE
45	1	A12360-00	MAINFOLD, 20 POSITION SOLENOID VALVE
46	1	A12359-00	SOLENOID VALVE
47	6	TR-SSBH-499	VERTICAL INTERCONNECT
48	2	TR-SSBH-498	10 POSITION JUMBER BAR
49	30 FT	6655-13	WIRE, GA STIMPAD, DDK BLUE, 2094, 30 FT
51	1	A12417-00	POWER SUPPLY, 5 VDC, 5 AMP
52	1	9704-03	TUBING, 1/4 ODT
53	1	9704-03	TUBING, 1/4 ODT
54	1	9704-03	TUBING, 1/4 ODT
55	1	9704-03	TUBING, 1/4 ODT
56	1	9704-03	TUBING, 1/4 ODT
57	1	9704-03 (NVR EXHAUST)	TUBING, 1/4 ODT
58	1	A12439-00	LABEL, TORQUE FOR TERMINALS
59	1	20C-3111	PIPE PLUG, 1/8 NPT, 3/16 SS
60	1	TR-SSBH-633	WIRE LABELS, WRAP AROUND, LOT
61	1	SOLA LABEL	SOLA LED STATUS LABEL (SUPPLIED AS PART OF POWER SUPPLY)
62	6	7486-15	WASHER, FLAT, ZINC PLATE STEEL
63	2	TR-SSBH-417	TERMINAL BLOCK, GROUNDING, PAUL
64	1	TRM-35-038	LABEL, GROUND
65	1	7703-44C	SCREW, MACHINED HEAD HEAD S.S., #8-32
66	1	7724-03	LOCK WASHER, STIMPAD HELICAL SPRING, #8
67	1	7723-06	NUT, HEX, #8-32
68	1	A12463-00	LABEL, WIRING DIAGRAM, RANSFLOW
69	1	TR-SSBH-500	END CAP, TERMINAL BLOCK
70	1	A12527-00	PRESSURE CONTROL E/P TRANSOUWER
71	1	A12528-00	E/P TRANSOUWER END CAP (SET OF 2)
72	1	41-PLG-1001	PLUG, 1/4"
73	1	41-FRT-1015	FITTING, REDUCER, 5/32" X 1/4"
74	1	LSF0060	TEE, 1/4 ODT, UNION

DOOR ASSEMBLY

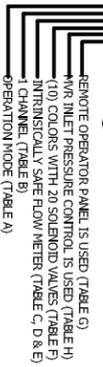
ITEM	QTY	PART NUMBER	DESCRIPTION
75	12	SSP-819-2N	NUT, ELASTIC STOP, #4-40, STEEL
76	1	A12422-00	SEAL, CONDUCTIVE (90/75)
77	1	A12423-00	TOUCH PANEL, 6.4 INCH DISPLAY, PC104
78	8	73106-06	STAND OFF, ANION, 5/8"
79	1	A12356-01	PC BOARD, DIGITAL I/O PC104 INTERFACE
80	1	A12357-01	ANALOG I/O AND DIGITAL I/O, PC104
81	1	A12358-01	HIGH SPEED COUNTER, PC104
82	4	A12413-00	SCREW, #8 X.5, 48mm, MACH, PHILLIPS PAN HEAD
83	12	A12414-00	FASTENER, STUD, NON-ELUSH, #4-40 X .525
84	1	SSP-807	NUT, 10-32 (SAFETY)
85	1	A12205-00	OPTICAL ISOLATOR BOARD A, RANSFLOW
86	1	A12207-00	OPTICAL ISOLATOR BOARD A, RANSFLOW
87	1	A12271-55	50 CONDUCTOR RIBBON CABLE ASSEMBLY (6.50' LONG)
88	1	A12371-52	50 CONDUCTOR RIBBON CABLE ASSEMBLY (3.2' LONG)
89	1	A12371-45	50 CONDUCTOR RIBBON CABLE ASSEMBLY (5.0' LONG)
90	1	A12371-45	50 CONDUCTOR RIBBON CABLE ASSEMBLY (6.50' LONG)
91	1	A12370-7	34 CONDUCTOR RIBBON CABLE ASSEMBLY (2.0' LONG)
92	1	A12366-48	10 CONDUCTOR RIBBON CABLE ASSEMBLY (6.8' LONG)
93	1	A12366-9.5	16 CONDUCTOR RIBBON CABLE ASSEMBLY (9.5' LONG)
94	1	A12367-8.5	16 CONDUCTOR RIBBON CABLE ASSEMBLY (8.50' LONG)
95	1	A12369-12	26 CONDUCTOR RIBBON CABLE ASSEMBLY (12' LONG)
96	1	A12421-00	LABEL, FRONT DOOR
98	4	73106-03	STAND OFF, ANION
99	1	77388-00	SWITCH, OPERATOR, RED MUSHROOM HD,
100	1	LSM0004-00	CLIP W/LOCKING LEVER
101	1	LSM0006-00	CONTACT MODULE, NORMALLY CLOSED

TOP LEVEL ASSEMBLY (A12410)

ITEM	QTY	PART NUMBER	DESCRIPTION
102	4	77460-00	CABLE MOUNT, 3 INCH
103	2	A12415-00	ADHESIVE, HIGH STRENGTH 3M-90
104	3	77935-00	LUG, RING TERMINAL
105	0	-	NUT (CONES WITH A12424-00 CABINET)
106	0	-	WASHER, LOCK, EXTERNAL (CONES WITH A12424-00 CABINET)
107	0.5 FT	7750-04	WIRE, 14 GA., GREEN W/YELLOW STRIPE
108	1	A12371-44.0	50 CONDUCTOR RIBBON CABLE ASSEMBLY (4' LONG)
109	1	A12368-42.0	24 CONDUCTOR RIBBON CABLE ASSEMBLY (42' LONG)
110	1	A12372-56.0	64 CONDUCTOR RIBBON CABLE (56' LONG)
111	4	78909-01	INTERCONNECT CABLE
112	4	77498-00	FUSE COVER, VMV
113	8	77498-00	CLIP, CABLE
114	2	15949-16C	NUT, #5-32
115	1	77454-00	RECEIVER, FIBER OPTIC FLOWMETER ASSEMBLY
116	1	77452-00	CABLE, FIBER OPTIC
117	1	72591-01	CABLE SLEEVE, WHT (NOT SHOWN)
118	1	72591-04	CABLE SLEEVE, BLK (NOT SHOWN)
119	1	6655-05	WIRE, 20 GA, GREEN (GROUND)
120	1	6655-09	WIRE, 20 GA, WHT (NEUTRAL)
121	1	6655-10	WIRE, 20 GA, BRK (HOT)
122	1	A12464-00	FLASH DRIVE, 1 GB MEMORY (INCLUDED BUT NOT SHOWN)
123	1	A12465-00	USB A (MALE) TO USB A (FEMALE) CABLE (INCLUDED BUT NOT SHOWN)
124	1	A12473-00	STATUS, 24' TETHER, RANSFLOW (INCLUDED BUT NOT SHOWN)
125	1	A12436-00	RANSFLOW ENCLOSURE LABEL SET
126	1	A12529-17.0	10 CONDUCTOR RIBBON CABLE ASSY
130	2	41-FRT-1022-01	REDUCER, 3/16 ODT TO 3/8 ODT
131	1	A12199-01	LABEL, METAL CONTROL, PNC
132	1	73837-11	ZENER DIODE BARRIER, HIGH CURRENT
133	1	73837-10	Z-CANAL AC SAFESNP BARRIER
135	2	SSH-7739	SHEET METAL PLUG
136	1	TABLE G	CONVERTER, DC-DC, 24V TO 15V
137	1	A12806-50	CABLE, NON-INTRINSIC SAFE (NOT SHOWN) 50 FT REF.
138	1	TABLE G	CABLE, INTRINSIC SAFE (NOT SHOWN) 50 FT, REF.
139	1	A12355-00	REMOTE OPERATOR PANEL (ROP) (NOT SHOWN)
140	1	TABLE G	CABLE ASSEMBLY, SERIAL, TOUCHSCREEN TO ZENER BARRIER
141	1	SSW-8230	RANSFLOW REMOTE OPERATOR PANEL (NOT SHOWN)
142	1	TABLE G	WATER TIGHT CONNECTOR

FOR ORDERING, USE A12410-80CDEFGH AS INDICATED BY THE TABLES.
 A DESIGNATES OPERATION MODE-TABLE A
 B DESIGNATES NUMBER OF CHANNELS-TABLE B
 C DESIGNATES TYPE OF FLOW METER-TABLES C, D & E
 D DESIGNATES NUMBER OF COLOR SOLENOID VALVES-TABLE F
 E DESIGNATES INLET PRESSURE CONTROL-TABLE H
 F DESIGNATES REMOTE OPERATOR PANEL-TABLE G

EXAMPLE: A12410-011111



REMOTE OPERATOR PANEL IS USED (TABLE G)
 INLET PRESSURE CONTROL IS USED (TABLE H)
 (10) COILS WITH 20 SOLENOID VALVES (TABLE F)
 INTRINSICALLY SAFE FLOW METER (TABLE C, D & E)
 OPERATION MODE (TABLE A)

ITEM	QTY	PART NUMBER	DESCRIPTION
54	1	9704-03	TUBING, 1/4 ODT
55	1	9704-03	TUBING, 1/4 ODT
56	1	9704-03	TUBING, 1/4 ODT
57	1	9704-03 (NVR EXHAUST)	TUBING, 1/4 ODT
58	1	A12439-00	LABEL, TORQUE FOR TERMINALS
59	1	20C-3111	PIPE PLUG, 1/8 NPT, 3/16 SS
60	1	TR-SSBH-633	WIRE LABELS, WRAP AROUND, LOT
61	1	SOLA LABEL	SOLA LED STATUS LABEL (SUPPLIED AS PART OF POWER SUPPLY)
62	6	7486-15	WASHER, FLAT, ZINC PLATE STEEL
63	2	TR-SSBH-417	TERMINAL BLOCK, GROUNDING, PAUL
64	1	TRM-35-038	LABEL, GROUND
65	1	7703-44C	SCREW, MACHINED HEAD HEAD S.S., #8-32
66	1	7724-03	LOCK WASHER, STIMPAD HELICAL SPRING, #8
67	1	7723-06	NUT, HEX, #8-32
68	1	A12463-00	LABEL, WIRING DIAGRAM, RANSFLOW
69	1	TR-SSBH-500	END CAP, TERMINAL BLOCK
70	1	A12527-00	PRESSURE CONTROL E/P TRANSOUWER
71	1	A12528-00	E/P TRANSOUWER END CAP (SET OF 2)
72	1	41-PLG-1001	PLUG, 1/4"
73	1	41-FRT-1015	FITTING, REDUCER, 5/32" X 1/4"
74	1	LSF0060	TEE, 1/4 ODT, UNION

TABLE A - OPERATION MODE

A DASH NO.	DESCRIPTION	J	K	L	M	N
0	MANUAL	2	2	2	4	10
1	AUTOMATIC	0	0	0	0	6

TABLE B - FLOW CHANNEL QUANTITIES

B DASH NO.	D	E	F
1	1	2	3
2	2	4	4
3	3	6	5

TABLE C - NON INTRINSIC QUANTITIES

C DASH NO.	A	B	C	Y
-X10XXXX	29	0	0	3
-X20XXXX	31	0	0	3
-X30XXXX	33	0	0	3

TABLE D - INTRINSIC QUANTITIES

C DASH NO.	A	B	C	Y
-X11XXXX	26	2	0	3
-X21XXXX	26	3	0	3
-X31XXXX	26	5	0	3

TABLE E - FIBER OPTIC QUANTITIES

C DASH NO.	A	B	C	Y
-X12XXXX	33	0	3	0
-X22XXXX	35	0	3	0
-X32XXXX	39	0	3	0

TABLE F - SOLENOID VALVES

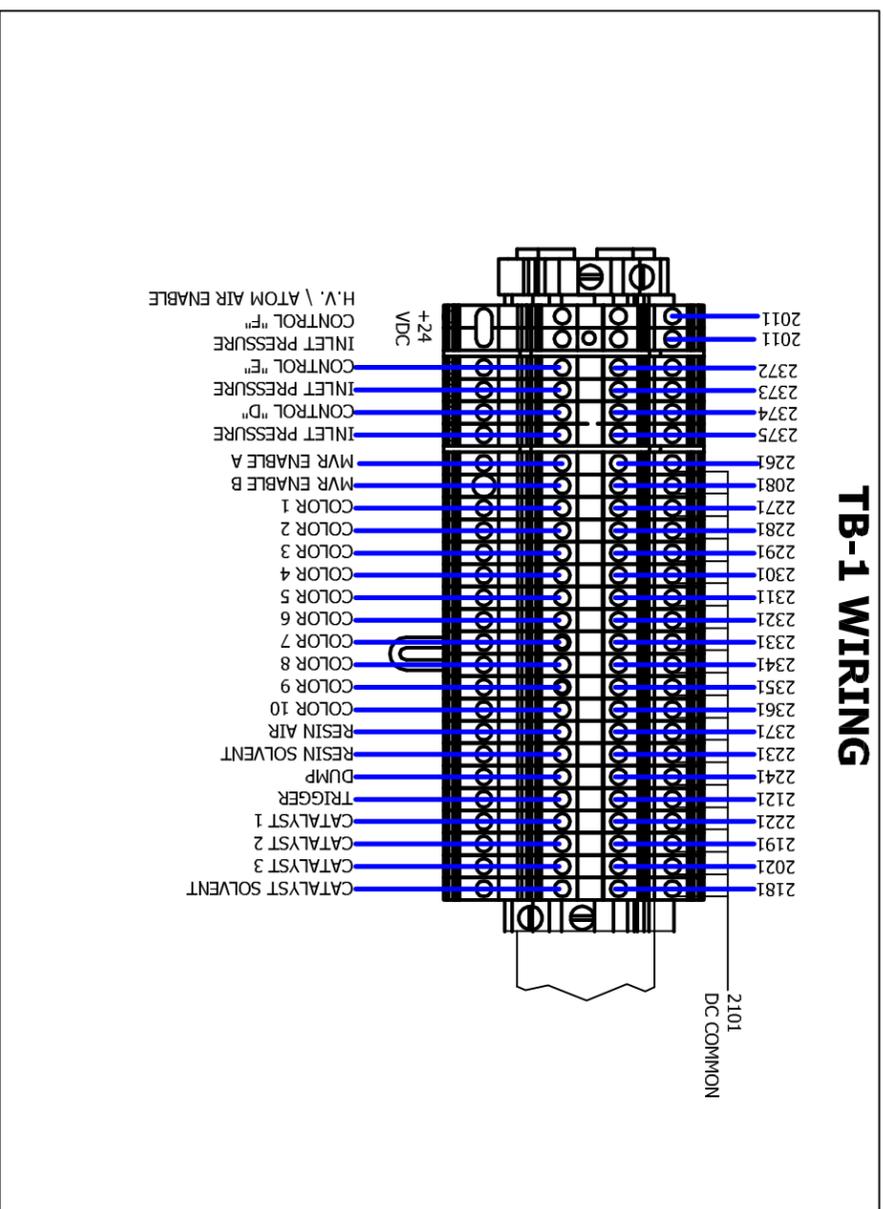
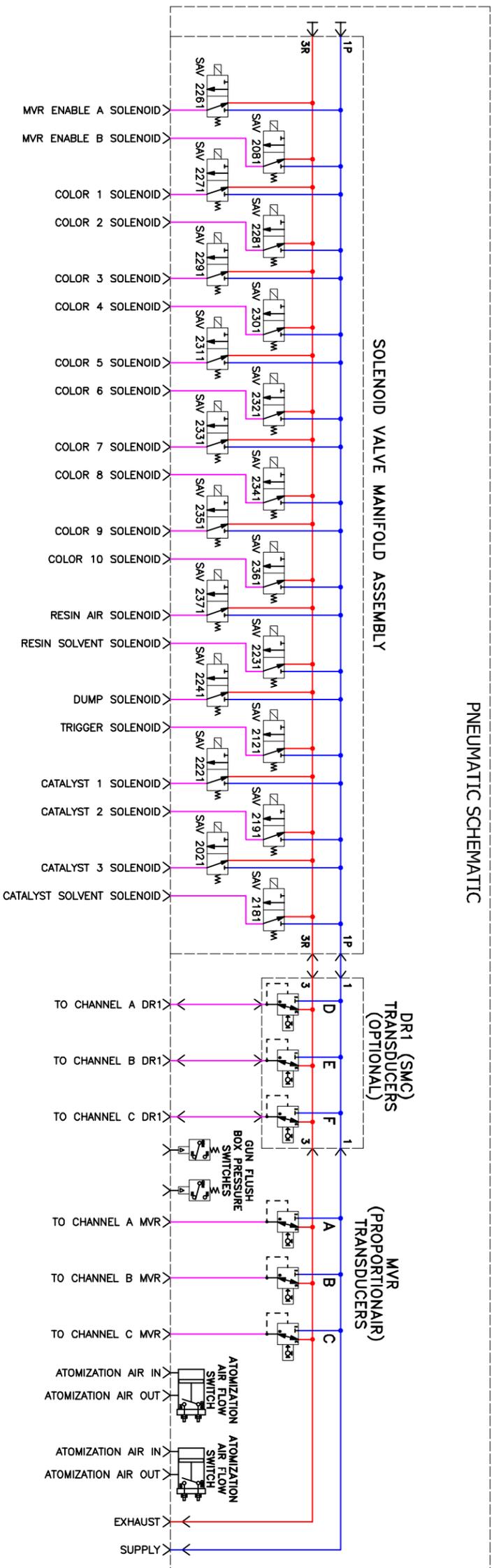
D DASH NO.	G	H	Q
0	0	0	0
1	2	20	1

TABLE G - ROP TABLE

F DASH NO.	DESCRIPTION	*X*1	*X*2	*X*3	*X*4	*X*5	*X*6	*X*7	*X*8
0	NONE	0	0	0	0	0	0	0	0
1	NON-INTRINSICALLY SAFE	1	1	0	0	0	0	0	0
2	INTRINSICALLY	1	1	1	2	1	0	0	1

TABLE H - DR-1 PRESSURE CONTROL

E DASH NO.	R	S	T	U	V	W	X
-X1XXXX	0	0	0	10	3	0	0
-X2XXXX	0	0	0	10	3	0	0
-X3XXXX	0	0	0	10	3	0	0
-X4XXXX	1	1	2	12	4	1	1
-X5XXXX	2	1	2	12	5	2	2
-X6XXXX	3	1	2	12	6	3	3



Fluid Panel Parts List

② (TABLE A) A SIDE, FLOW METER

DASH NO.	DESCRIPTION	A	H	W	A4	B1	B2	B3
00	NONE	-	-	-	-	-	-	-
10	ZHM-02	76805-01	77223-01	-	TR-SSF-052 (3)	SS-1505-CD (3)	77220-00	-
20-25	RF-1 F.O. (1)	77214-00	77223-01	76628-00	7958-16C	SS-1505-CD	AA	13521-01
30	PISTON METER	77226-00	77223-03	-	-	-	77219-00	-
40	RF-1 STD. (1)	76251-01	77223-01	76628-00	7958-16C	SS-1505-CD	77220-00	-

② (TABLE C) B SIDE, FLOW METER

DASH NO.	DESCRIPTION	A	H	W	A4	B1	B2	B3
00	NONE	-	-	-	-	-	-	-
10	ZHM-02	76805-01	77223-01	-	TR-SSF-052 (3)	SS-1505-CD (3)	77220-00	-
20-25	RF-1 F.O. (1)	77214-00	77223-01	76628-00	7958-16C	SS-1505-CD	AA	13521-01
30	PISTON METER	77226-00	77223-03	-	-	-	77219-00	-
40	RF-1 STD. (1)	76251-01	77223-01	76628-00	7958-16C	SS-1505-CD	77220-00	-

(TABLE B) A SIDE, FLUID CONTROL

DASH NO.	DESCRIPTION	E	Z QTY.	U QTY.	V QTY.	X QTY.	Y QTY.
0	NONE	-	0	0	0	0	0
2	#2 WEEPLESS MWR	76624-02C	1	1	1	0	0
3	#3 WEEPLESS MWR	76624-03C	1	1	1	0	0
4	#4 WEEPLESS MWR	76624-04C	1	1	1	0	0
5	#2 WEEPING MWR	78137-02	1	1	1	0	0
6	#3 WEEPING MWR	78137-03	1	1	1	0	0
7	#4 WEEPING MWR	78137-04	1	1	1	0	0
8	CCV FLUID CONTROL	CCV-403-SS	0	0	0	1	1

(TABLE D) B SIDE, MWR

DASH NO.	DESCRIPTION	B	C QTY.	Z QTY.	U QTY.	V QTY.
0	NONE	-	0	0	0	0
2	#2 WEEPLESS MWR	76624-02C	1	1	1	1
3	#3 WEEPLESS MWR	76624-03C	1	1	1	1
4	#4 WEEPLESS MWR	76624-04C	1	1	1	1
5	#2 WEEPING MWR	78137-02	1	1	1	1
6	#3 WEEPING MWR	78137-03	1	1	1	1
7	#4 WEEPING MWR	78137-04	1	1	1	1

(RF-1 FIBER OPTIC ASSM)

DASH NO.	CABLE LENGTH	AA
20	15 FT.	A12409-04 (K)
21	25 FT.	A12409-05 (K)
22	50 FT.	A12409-07 (K)
23	65 FT.	A12409-08 (K)
24	75 FT.	A12409-09 (K)
25	100 FT.	A12409-10 (K)

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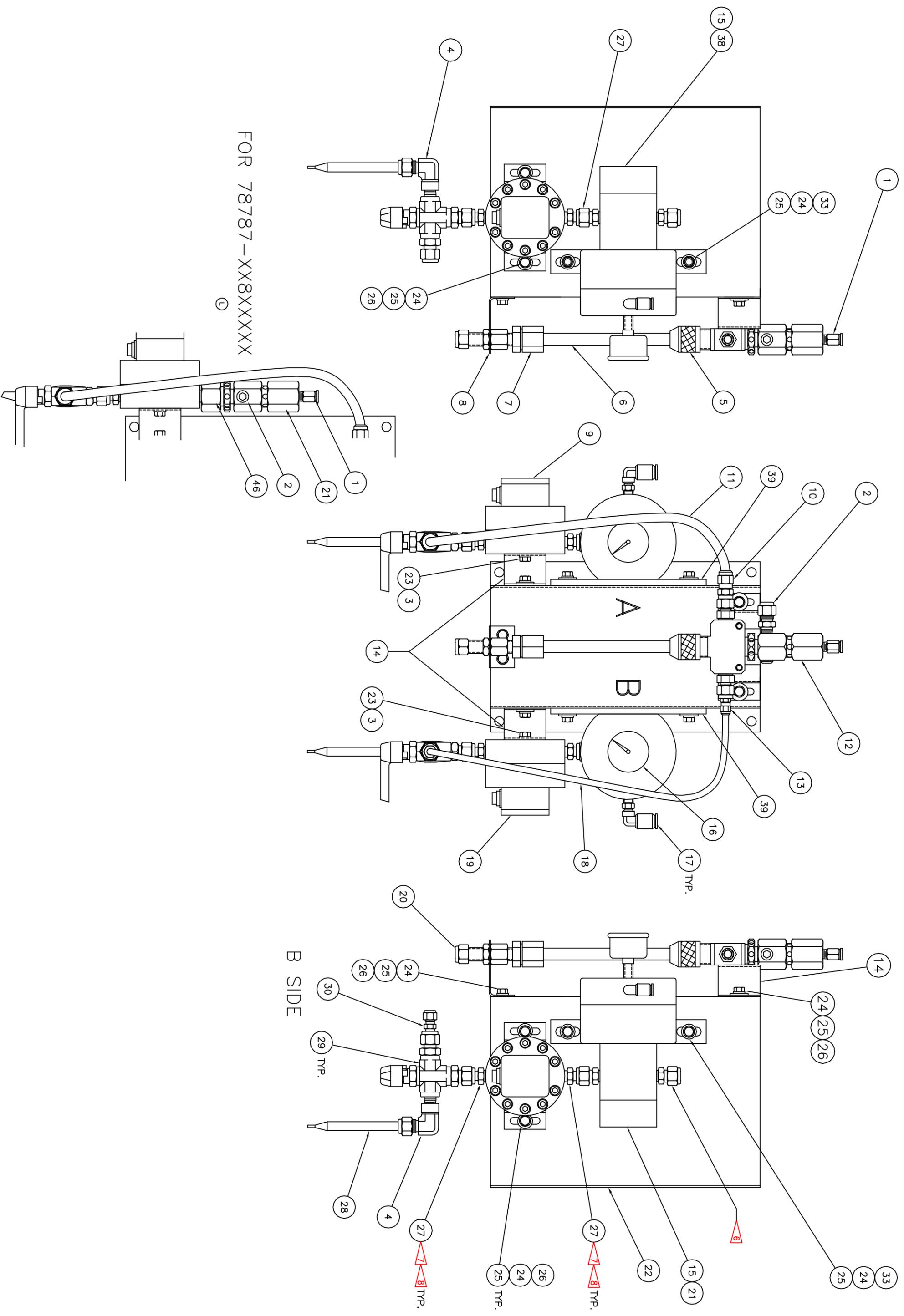
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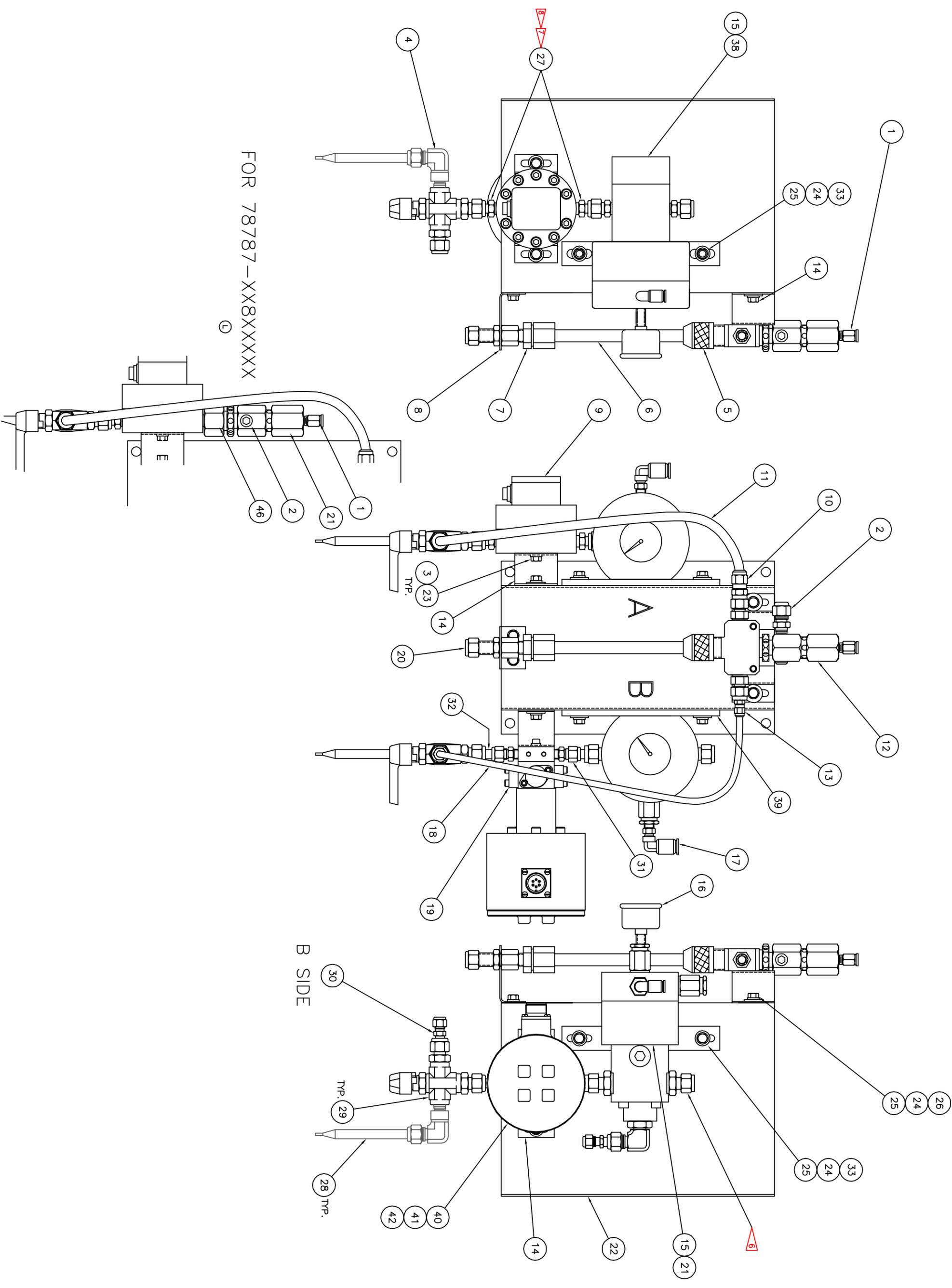
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FOR 78787-XX8XXXXX

B SIDE

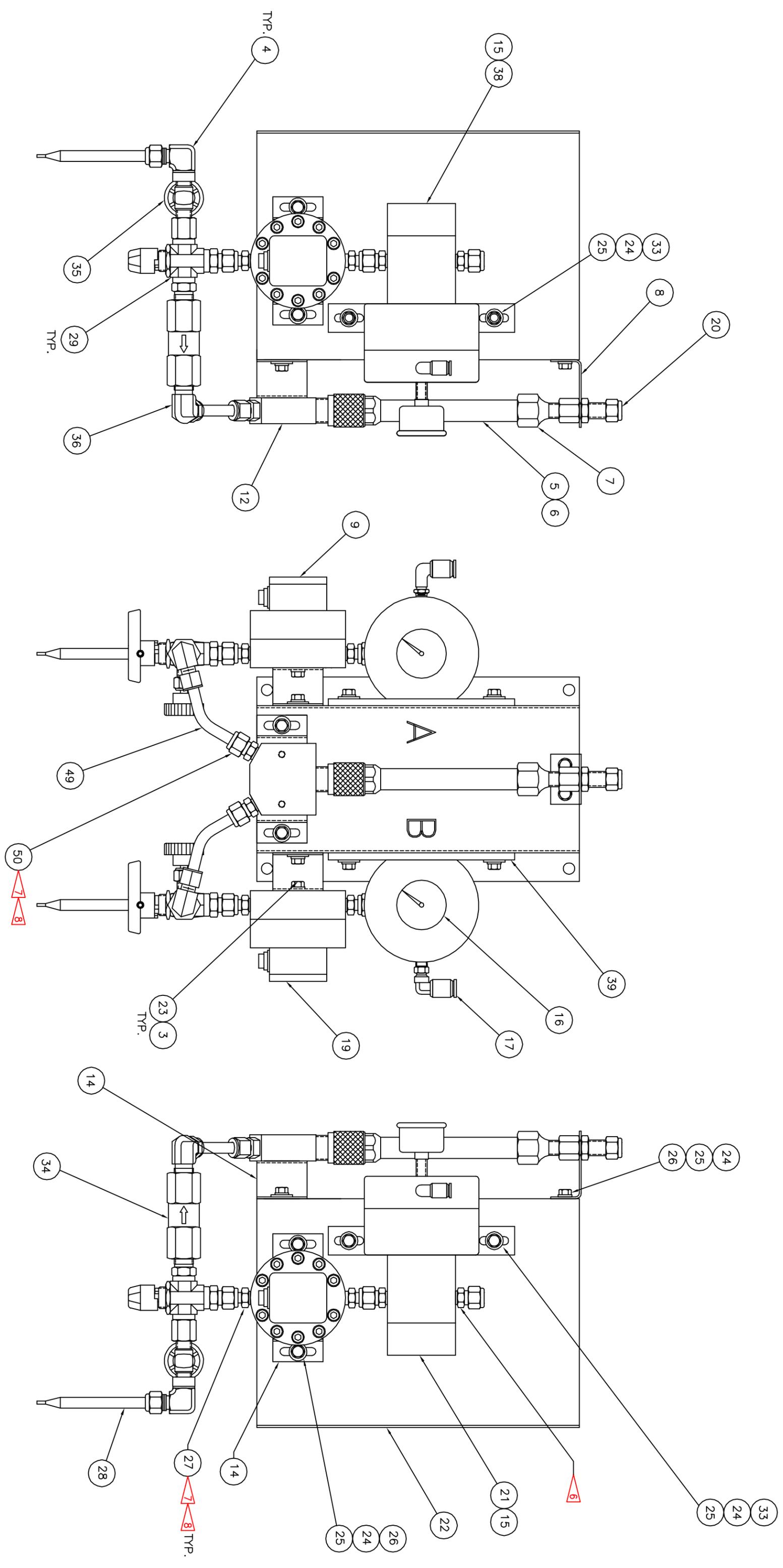


TABLE "H"

ITEM NO.	PART NUMBER	QTY NO.	DESCRIPTION
1	A12592-06	4	3/8 ODT TO 10MM CONVERSION
2	41-FTP-1055	3	NPT TO 4MM CONVERSION
3	A12593-04	3	4MM TO 6MM ODT CONVERSION

FOR PANELS WITH DUAL MVR ASSEMBLIES

REMOVE AND REPLACE FITTINGS AND
INSTALL OTHER FITTINGS AS SHOWN IN
FIGURE 1-1

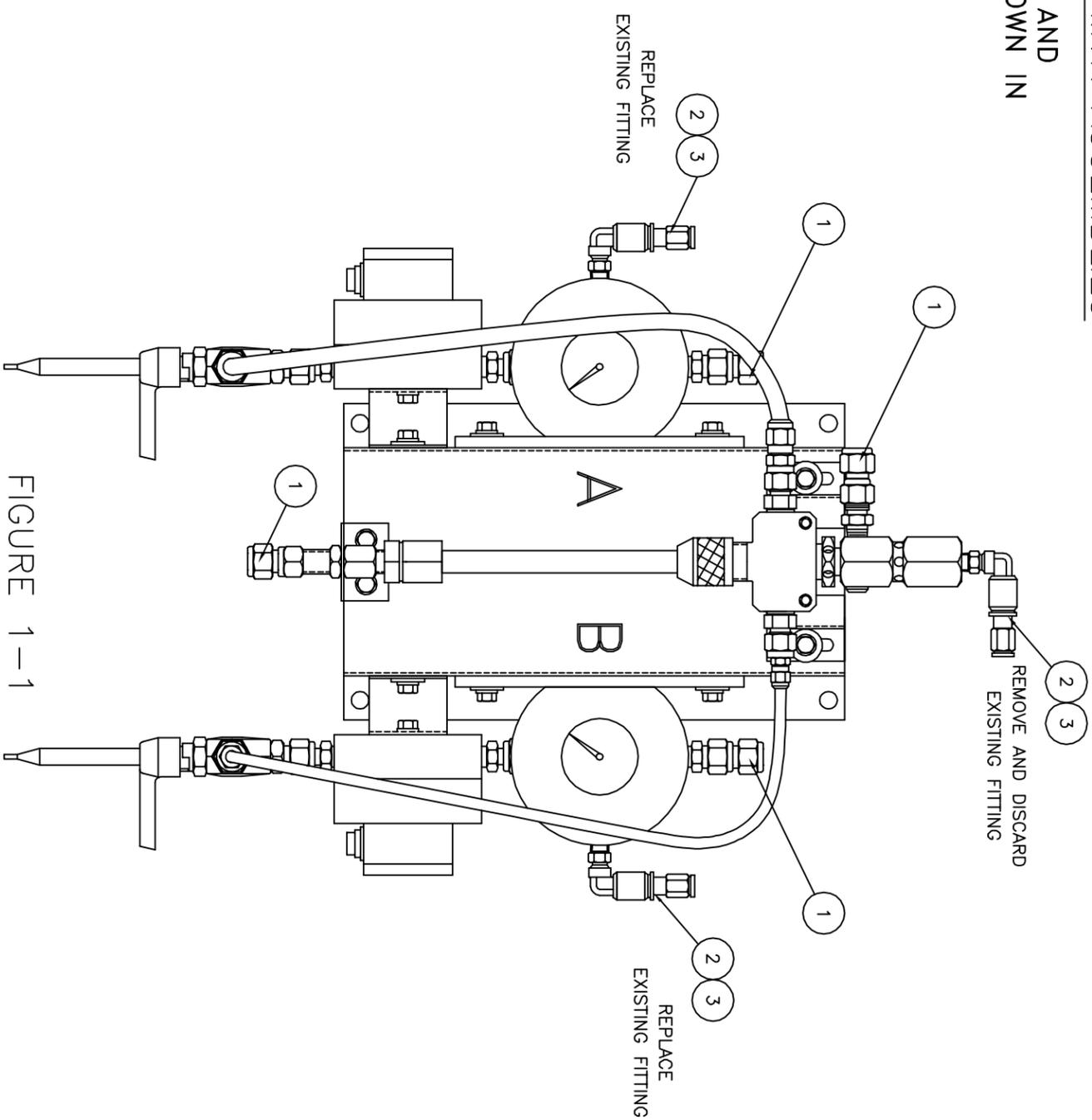


FIGURE 1-1

FOR PANELS W/SINGLE MVR ASSEMBLY

REMOVE AND REPLACE FITTINGS AND
INSTALL OTHER FITTINGS AS SHOWN IN
FIGURE 1-2

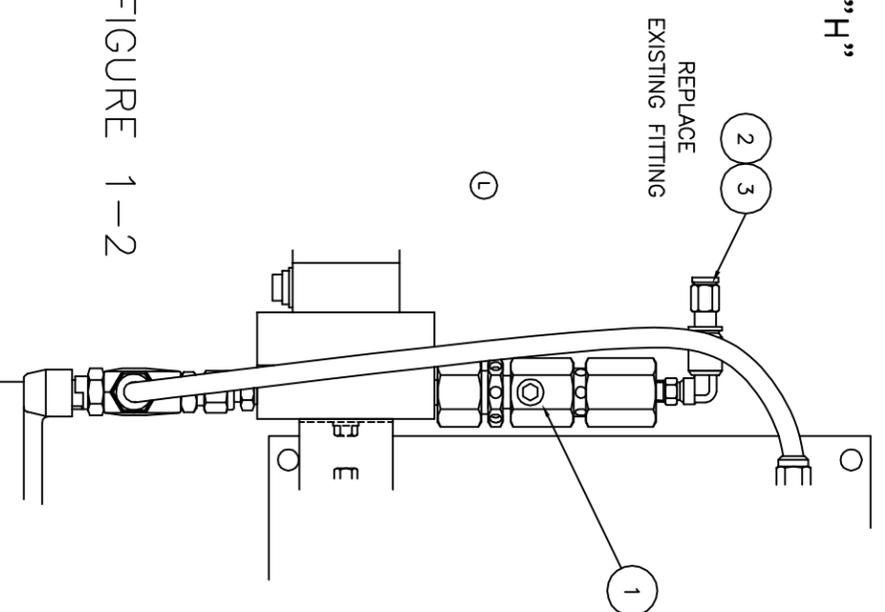
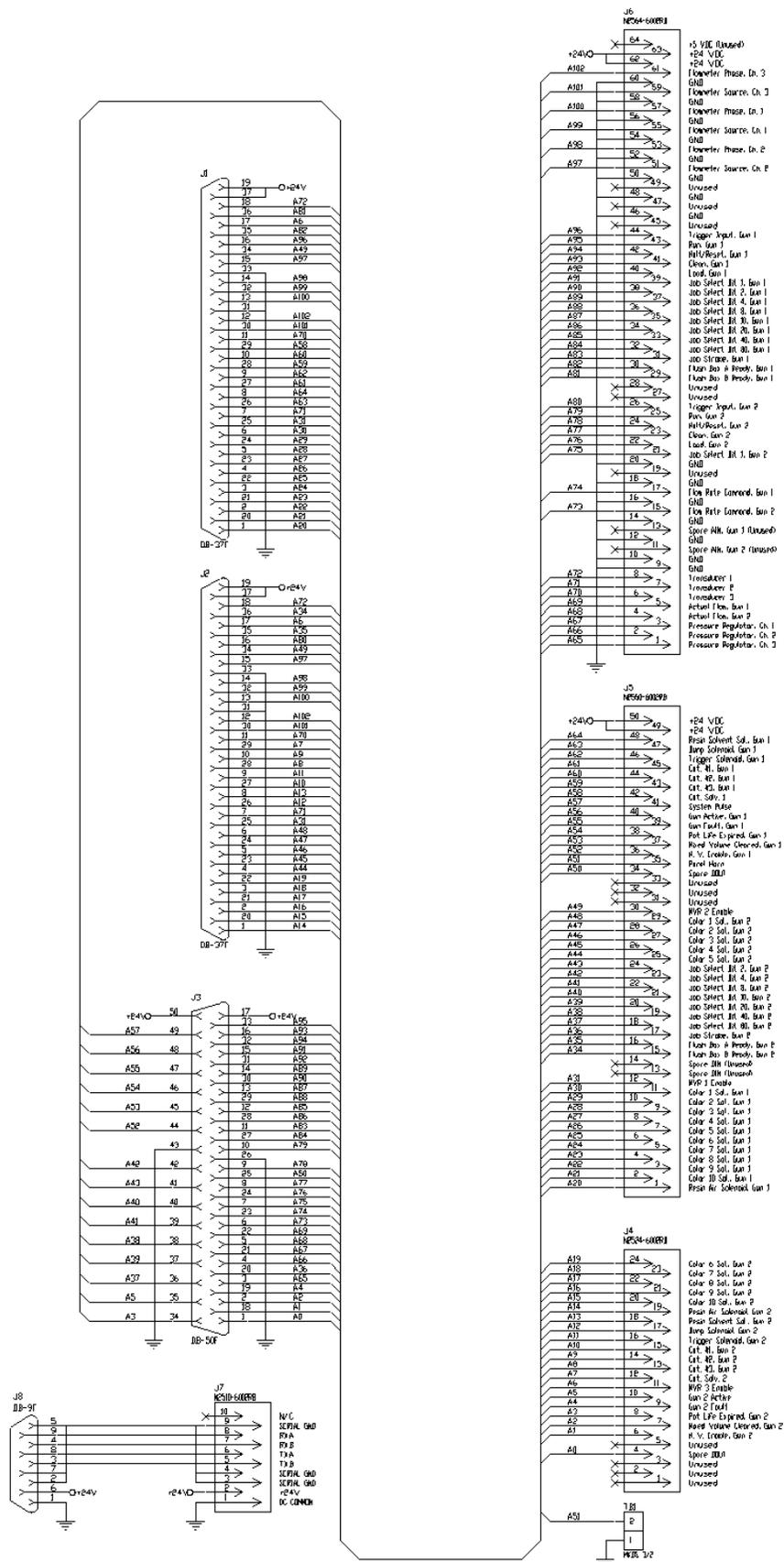


FIGURE 1-2

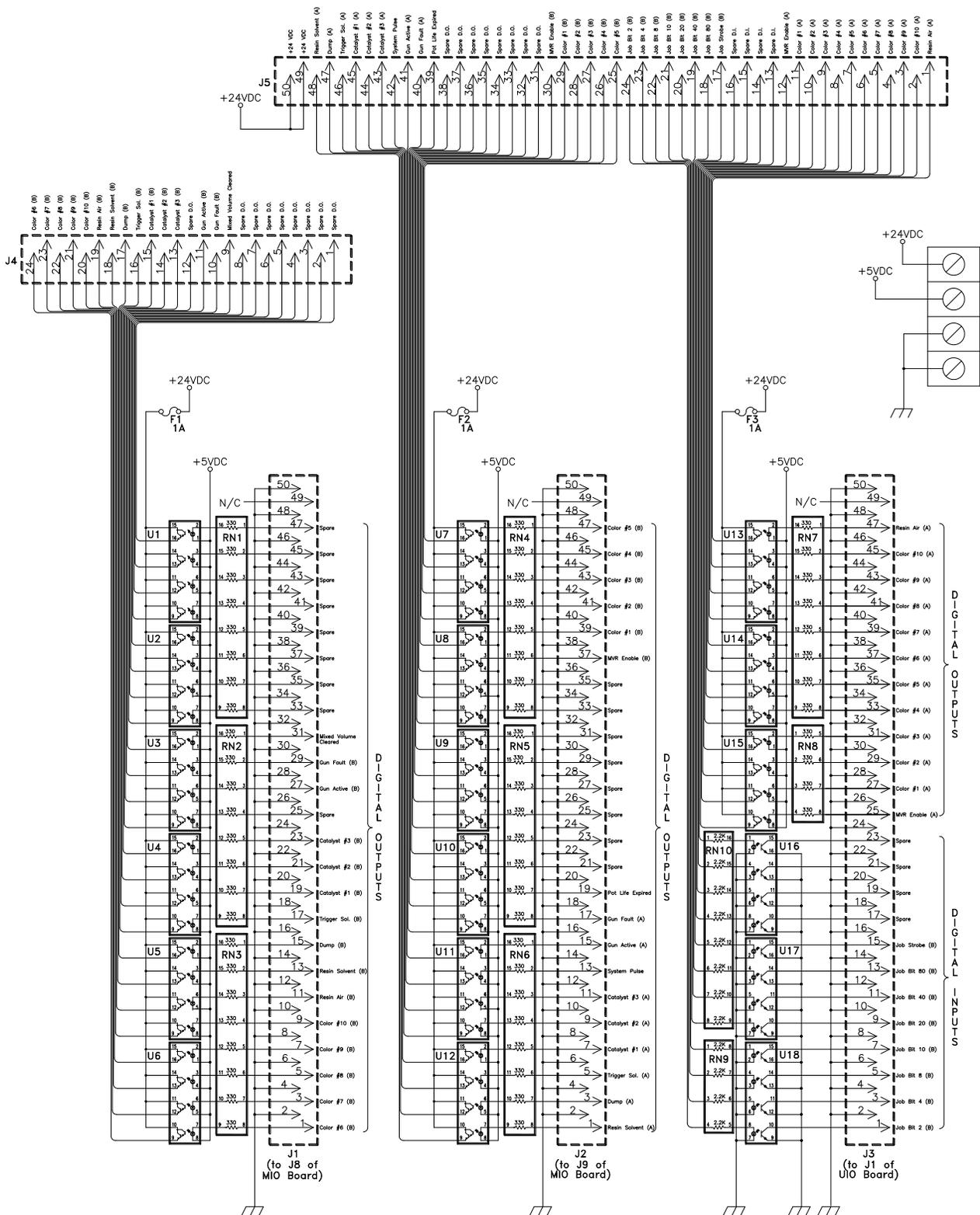
THIS PAGE IS FOR METRIC PANELS ONLY

Pneumatic Interface Panel Parts List

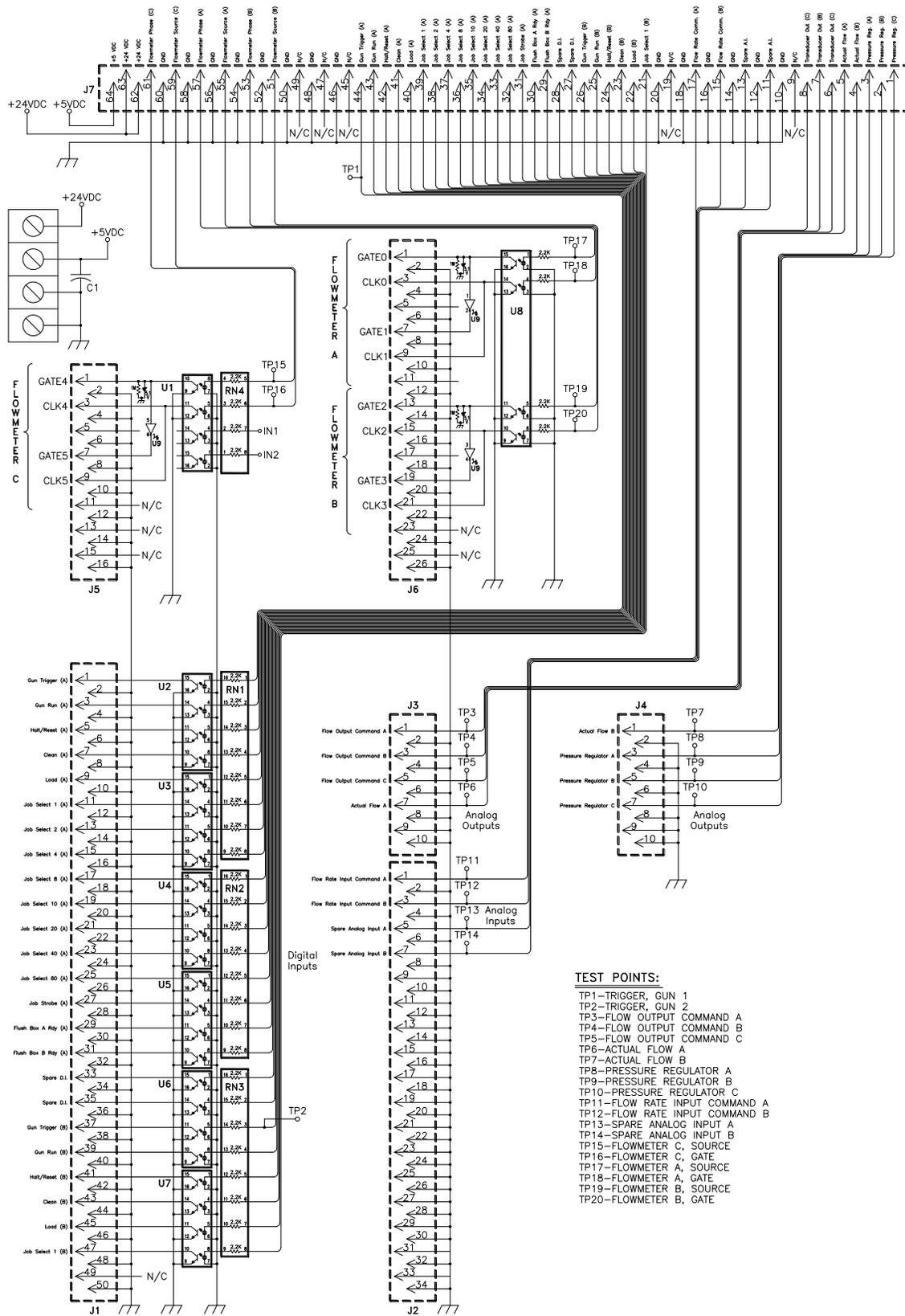
Interconnect Board Schematic



Optical Isolator Board Schematic - A

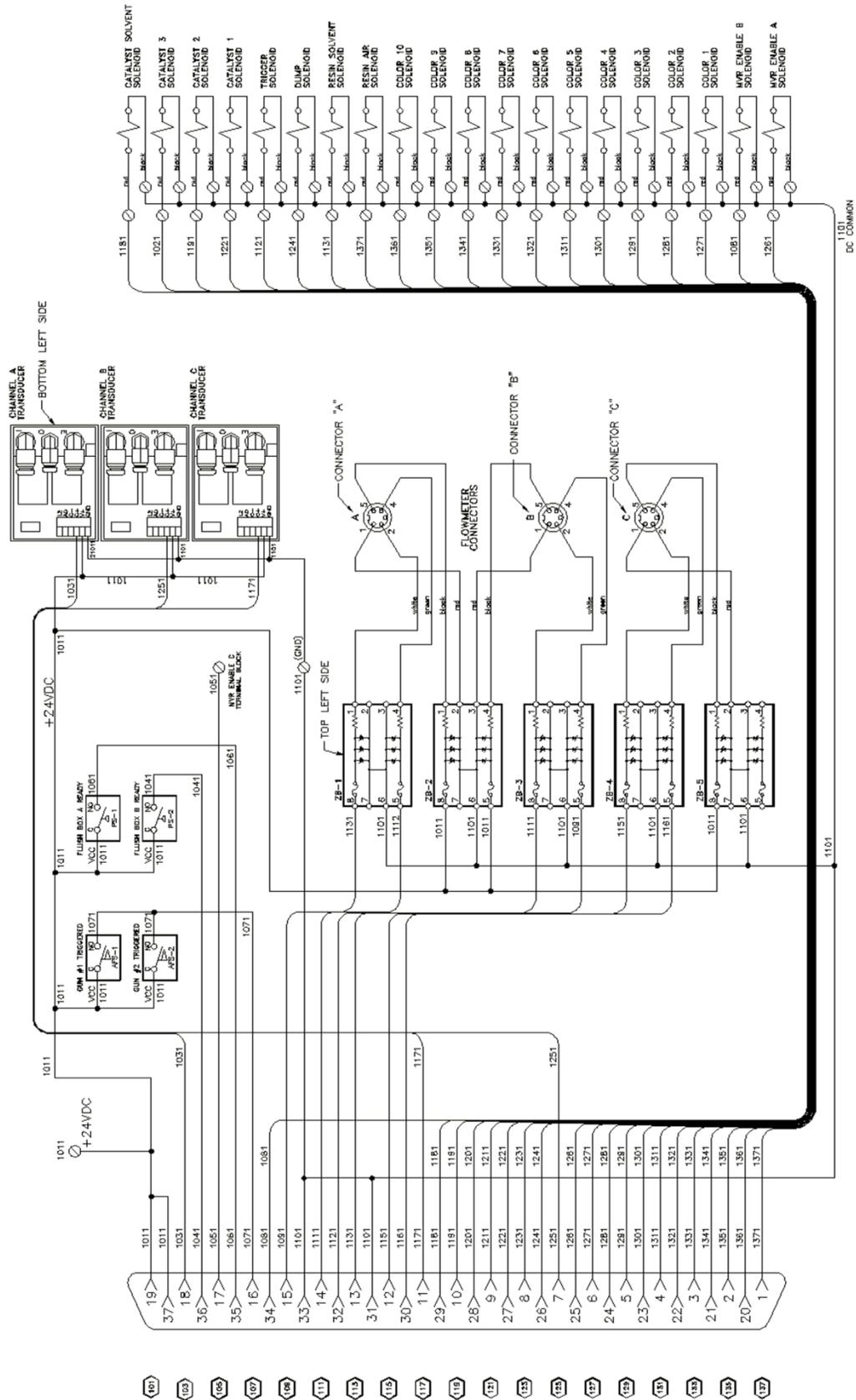


Optical Isolator Board Schematic - B



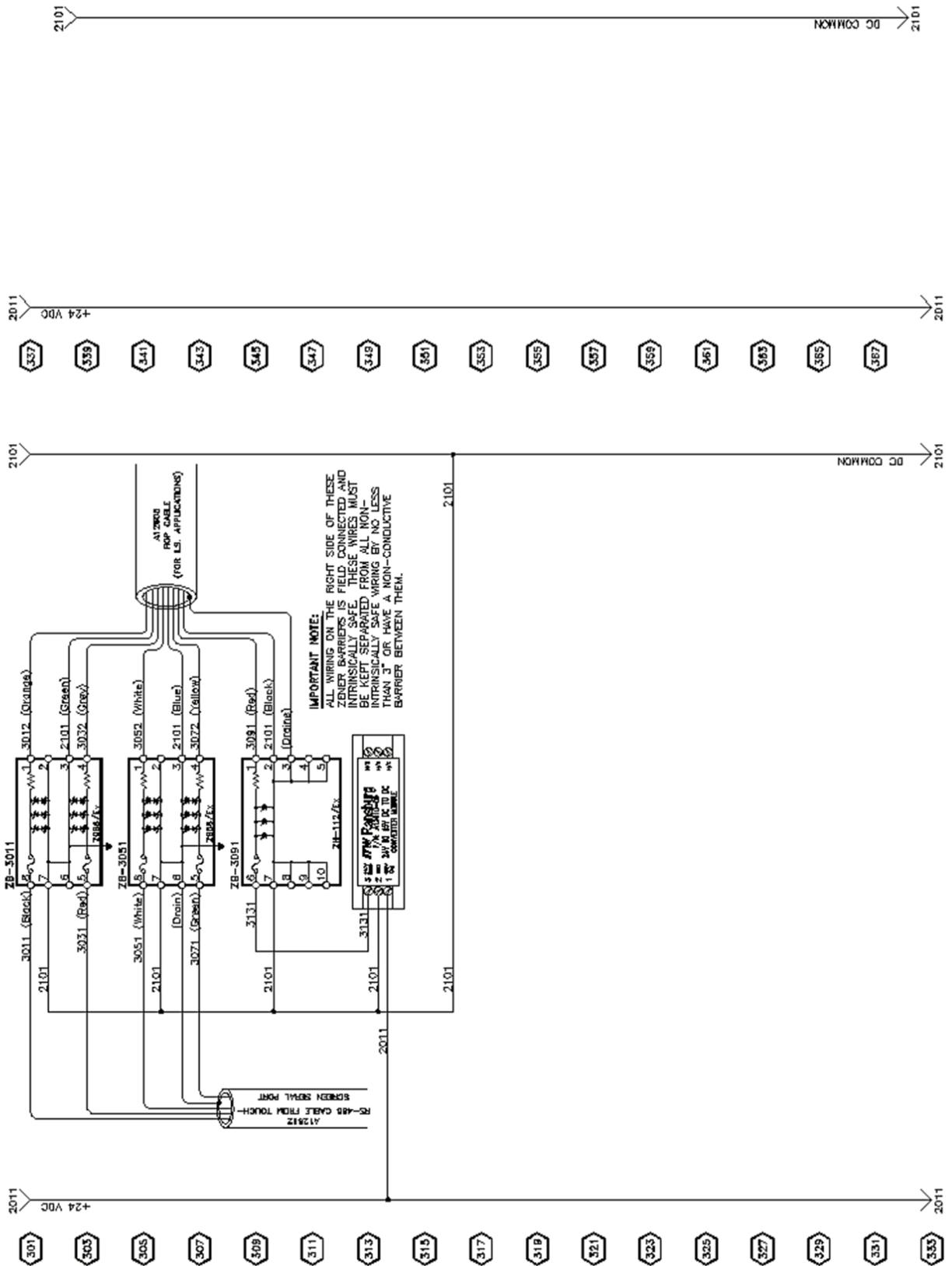
- TEST POINTS:**
- TP1-TRIGGER, GUN 1
 - TP2-TRIGGER, GUN 2
 - TP3-FLOW OUTPUT COMMAND A
 - TP4-FLOW OUTPUT COMMAND B
 - TP5-FLOW OUTPUT COMMAND C
 - TP6-ACTUAL FLOW A
 - TP7-ACTUAL FLOW B
 - TP8-PRESSURE REGULATOR A
 - TP9-PRESSURE REGULATOR B
 - TP10-PRESSURE REGULATOR C
 - TP11-FLOW RATE INPUT COMMAND A
 - TP12-FLOW RATE INPUT COMMAND B
 - TP13-SPARE ANALOG INPUT A
 - TP14-SPARE ANALOG INPUT B
 - TP15-FLOWMETER C, SOURCE
 - TP16-FLOWMETER C, GATE
 - TP17-FLOWMETER A, SOURCE
 - TP18-FLOWMETER A, GATE
 - TP19-FLOWMETER B, SOURCE
 - TP20-FLOWMETER B, GATE

Pneumatic Interface Panel Wiring Diagram

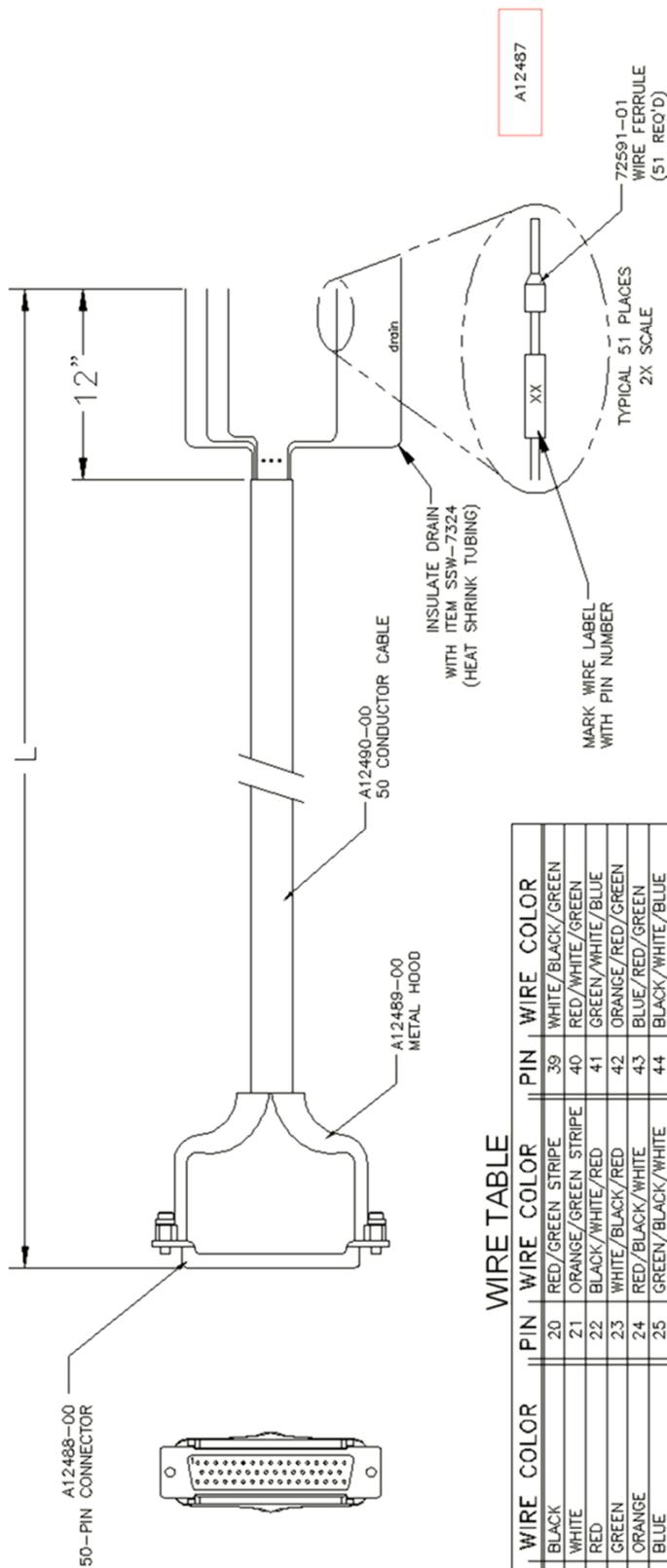


Wall Mount Enclosure Wiring Diagram (continued)

NOTE:
 WIRING AND ZENERS SHOWN BELOW ARE OPTIONAL
 AND ONLY REQUIRED IF THE INTRINSICALLY SAFE
 VERSION OF THE REMOTE OPERATOR PANEL IS
 ORDERED. REFER TO DRAWING: A12410 FOR DETAILS.



50-Conductor System I/O Cable



STANDARD* STOCKED LENGTHS

-L	CABLE LENGTH (FT.)
10	10'-0"
25	25'-0"
50	50'-0"
75	75'-0"
100	100'-0"

*NOTE: OTHER LENGTHS LESS THAN 100' AVAILABLE UPON SPECIAL REQUEST. LENGTHS LONGER THAN 100' ONLY WITH APPROVAL OF R&D.

WIRE TABLE

PIN	WIRE COLOR	PIN	WIRE COLOR	PIN	WIRE COLOR
1	BLACK	20	RED/GREEN STRIPE	39	WHITE/BLACK/GREEN
2	WHITE	21	ORANGE/GREEN STRIPE	40	RED/WHITE/GREEN
3	RED	22	BLACK/WHITE/RED	41	GREEN/WHITE/BLUE
4	GREEN	23	WHITE/BLACK/RED	42	ORANGE/RED/GREEN
5	ORANGE	24	RED/BLACK/WHITE	43	BLUE/RED/GREEN
6	BLUE	25	GREEN/BLACK/WHITE	44	BLACK/WHITE/BLUE
7	WHITE/BLACK STRIPE	26	ORANGE/BLACK/WHITE	45	WHITE/BLACK/BLUE
8	RED/BLACK STRIPE	27	BLUE/BLACK/WHITE	46	RED/WHITE/BLUE
9	GREEN/BLACK STRIPE	28	BLACK/RED/GREEN	47	GREEN/ORANGE/RED
10	ORANGE/BLACK STRIPE	29	WHITE/RED/GREEN	48	ORANGE/RED/BLUE
11	BLUE/BLACK STRIPE	30	RED/BLACK/GREEN	49	BLUE/RED/ORANGE
12	BLACK/WHITE STRIPE	31	GREEN/BLACK/ORANGE	50	BLACK/ORANGE/RED
13	RED/WHITE STRIPE	32	ORANGE/BLACK/GREEN		
14	GREEN/WHITE STRIPE	33	BLUE/WHITE/ORANGE		
15	BLUE/WHITE STRIPE	34	BLACK/WHITE/ORANGE		
16	BLACK/RED STRIPE	35	WHITE/RED/ORANGE		
17	WHITE/RED STRIPE	36	ORANGE/WHITE/BLUE		
18	ORANGE/RED STRIPE	37	WHITE/RED/BLUE		
19	BLUE/RED STRIPE	38	BLACK/WHITE/GREEN		

NOTE: CUT DRAIN OFF AT EDGE OF OUTER CABLE JACKET, INSIDE OF HOOD.

Spare Parts

Recommended Quantity

Based on the number of installed units of:

<u>Item</u>	<u>Part Number</u>	<u>Description</u>	<u>1</u>	<u>2</u>	<u>4</u>	<u>8</u>
<i>Main Control Console:</i>						
4	13742-01	Air Flow Switch	1	1	2	4
22	25766-106	Pressure Switch	1	1	2	4
36	73837-08	Zener Barrier	1	1	2	2
37	78643-00	E/P Transducer,	1	2	2	4
38	SSM-5504	Air Filter	1	2	2	4
42	A12416-00	Power Supply, Solenoid Valve, 24V, Manifold	0	1	1	1
45	A12359-00	Mount	2	4	4	8
50	A12417-00	Power Supply, Touch Panel, 6.4" Display,	0	1	1	1
70	A12423-00	PC104	0	1	1	1
72	A12356-01	Digital I/O Mod- Analog & Digital I/O Module,	1	1	1	2
73	A12357-01	PC104 High Speed Counter Module,	1	1	1	2
74	A12358-01	PC104	1	1	1	2
78	A12205-00	Optical Isolator	0	0	1	1
79	A12207-00	Optical Isolator Switch Operator, Red, Mushroom	0	0	1	1
92	77384-00	Hd. Clip for switch operator, With	1	1	2	2
93	LSME0004-00	Lock	1	1	2	2
94	LSME0006-00	Contact Module,	1	1	2	2
108	77454-00	Reciever, Fiber	0	1	1	1
109	77452-00	Cable, Fiber Op-	0	1	1	1
117	A12473-00	Stylus, 24"	1	2	2	4

Spare Parts (continued)

<u>Item</u>	<u>Part Number</u>	<u>Description</u>	Recommended Quantity			
			Based on the number of installed units of:			
			<u>1</u>	<u>2</u>	<u>4</u>	<u>8</u>
<i>Fluid Panel: (Note: Not all parts below are used on every fluid panel.)</i>						
6	LSMM0056-00	Spiral Mix Element (Low Pressure)	5	10	20	20
	LSMM0056-01	Spiral Mix Element (High Pressure)	5	10	20	20
9	76805-01	ZHM-02 Flow-	1	1	1	2
	77214-00	Fiberoptic RF-1	1	1	1	2
	77226-00	Piston Flowmeter	1	1	1	2
	76251-01	Standard RF-1	1	1	1	2
12	78014-01	Flushable Mix Non-Flushable Mix Block Assembly	0	0	1	1
	78014-02	Mix Block Assembly	0	0	1	1
	LBAL0016-00	High Pressure Low Flow, Weepless MVR Valve	0	0	1	1
21	76624-02	Medium Flow, Weepless MVR Valve	1	1	2	2
	76624-03	High Flow, Weepless MVR Valve	1	1	2	2
	76624-04	Low Flow, Weep Medium Flow, Weep Style MVR Valve	1	1	2	2
	78137-02	High Flow, Weep Medium Flow, Weep Style MVR Valve	1	1	2	2
	78137-03	Low Flow, Weep Medium Flow, Weep Style MVR Valve	1	1	2	2
	78137-04	High Flow, Weep Medium Flow, Weep Style MVR Valve	1	1	2	2
28	LSMM0059-01	Calibration Tube	2	2	4	8
29	LS0067	3-Way Ball Valve	0	0	1	2
	75774-00	3-Way Ball Valve High Pressure Check Valve	0	0	1	2
34	75773-00	Assy.	1	1	2	4
35	76093-00	Needle Valve	0	0	2	2
40	77227-00	Transmitter, Pis-	0	0	1	1
51	A10610-00	MVR Trigger	0	0	1	2

High Voltage Interlock Valve

Normal use of handheld applicators requires the product to go through color changes. During the color change sequence, there may be solvent involved to properly clean all the fluid passages. When solvent is present in the color change process, the electrostatics to the applicator must be off (Refer to the warnings in the applicable applicator manual). A new normally open valve package was released for use with applicators during the color change process. The A12613-00 (1/4 odt pilot) and the A12613-01 (6mm odt pilot) were released for applications that require interlock equipment. Figure 1 shows the features of the A12613 valve assembly.

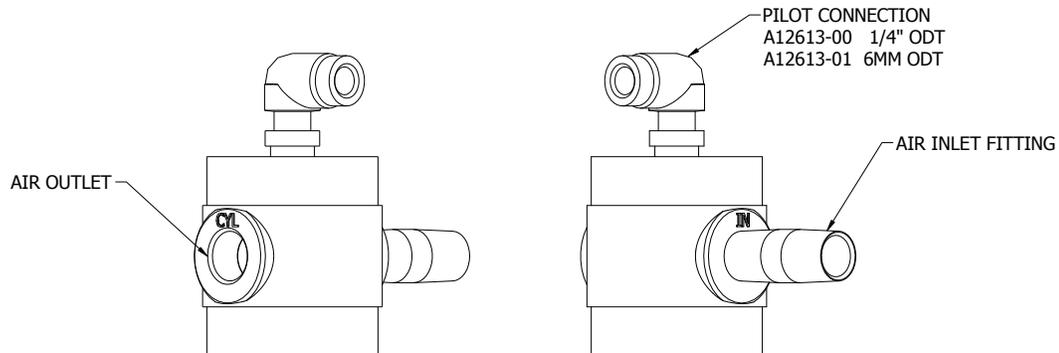


Figure 1- A12613 VALVE FEATURES

Ransflow Connection

When manual applicators are used with the Ransflow product, the valve assembly is installed as shown in figure 2. The "CYL " port of the valve is threaded onto the Inlet port of the flow switch as shown in the illustration. A connection tube is required and must be either 6mm or 1/4 " ODT and connect from the "DUMP" port on the Ransflow to the pilot connection on the valve. This connection is also shown in figure 2.

If more than one applicator is used from the Ransflow, then a second valve assembly must be installed and the pilot lines connected together. See figure 3 for this connection.

Warranty Policies

LIMITED WARRANTY

ITW Ransburg will replace or repair without charge any part/or equipment that fails within the specified time (see below) because of faulty workmanship or material, provided that the equipment has been used and maintained in accordance with ITW Ransburg's written safety and operating instructions, and has been used under normal operating conditions. Normal wear items are excluded.

THE USE OF OTHER THAN ITW RANSBURG APPROVED PARTS VOIDS ALL WARRANTIES.

SPARE PARTS: One hundred and eighty (180) days from date of purchase, except for rebuilt parts (any part number ending in "R") for which the warranty period is ninety (90) days.

EQUIPMENT: When purchased as a complete unit, (i.e. guns, power supplies, control units, etc.), is one (1) year from date of purchase.

WRAPPING THE APPLICATOR IN PLASTIC WILL VOID THIS WARRANTY.

ITW RANSBURG'S ONLY OBLIGATION UNDER THIS WARRANTY IS TO REPLACE PARTS THAT HAVE FAILED BECAUSE OF FAULTY WORKMANSHIP OR MATERIALS. THERE ARE NO IMPLIED WARRANTIES NOR WARRANTIES OF EITHER MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ITW RANSBURG ASSUMES NO LIABILITY FOR INJURY, DAMAGE TO PROPERTY OR FOR CONSEQUENTIAL DAMAGES FOR LOSS OF GOODWILL OR PRODUCTION OR INCOME, WHICH RESULT FROM USE OR MISUSE OF THE EQUIPMENT BY PURCHASER OR OTHERS.

EXCLUSIONS:

If, in ITW Ransburg's opinion the warranty item in question, or other items damaged by this part was improperly installed, operated or maintained, ITW Ransburg will assume NO responsibility for repair or replacement of the item or items. The purchaser, therefore will assume all responsibility for any cost of repair or replacement and service related costs if applicable.

NOTES

Product Manual Price: \$50.00 (U.S.)

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Technical Support Representatives can direct you to the appropriate telephone number for ordering spare parts.

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Form No. AA-09-01

Litho in U.S.A.

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