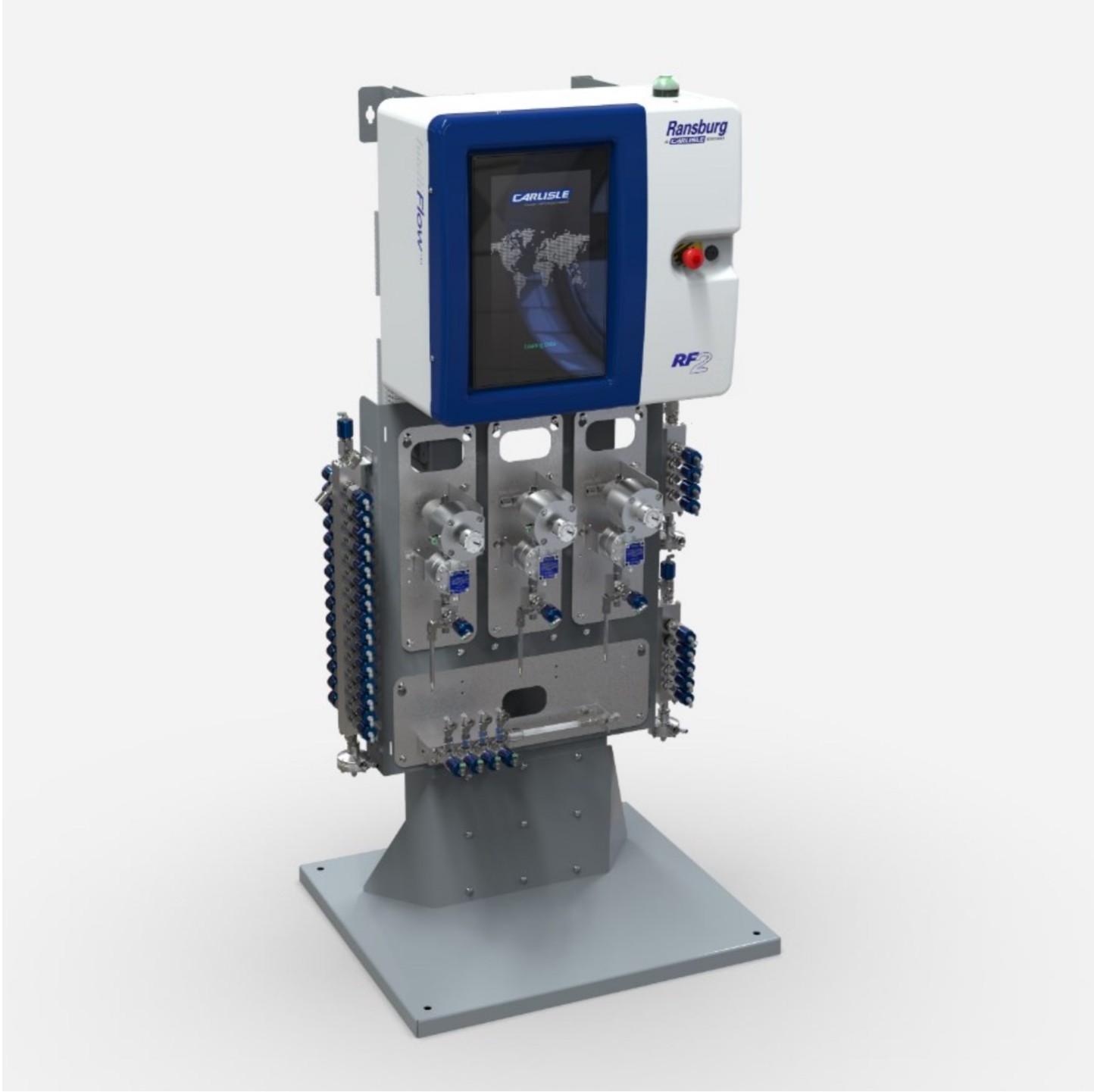
CONTROLS MANUAL

EN

Ransburg
A CARLISLE BRAND

IntelliFlow RF2



CONTENTS

SAFETY

SAFETY PRECAUTIONS

Before operating, maintaining or servicing any Carlisle system, read and understand all of the technical and safety literature for your 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. Please pay particular attention to these sections.

WARNING

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

CAUTION

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

NOTE

A NOTE is information which is relevant to the procedure in progress.

While this manual lists standard specifications and service procedures, some minor deviations may be found between this 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 equipment manuals to reconcile such differences.

WARNING

The user MUST read and be familiar with the Safety Section in this manual and the Ransburg safety literature therein identified.

This equipment is intended to be used by trained personnel ONLY.

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 any applicable country safety standards, prior to installing, operating, and/or servicing this equipment.

WARNING

The hazards shown on the following pages may occur during the normal use of this equipment.

On-Machine Label Descriptions

READ THE MANUAL Understand how to operate and service the equipment before performing these actions.

LOCK-OUT-TAG-OUT Before performing any maintenance on the equipment, lock-out the main electrical disconnect

ELECTRICAL SHOCK Hazardous electrical energy is present inside the main control enclosure. Use caution if performing tasks within the cabinet.

GROUND EQUIPMENT This symbol denotes a connection point for ground.

WARNING

Read the following warnings before using this equipment

AUTOMATIC EQUIPMENT Automatic equipment may start suddenly without warning.

KEEP EQUIPMENT GUARDS IN PLACE Do not operate the equipment if the safety devices have been removed.

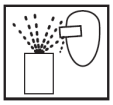
KNOW WHERE AND HOW TO SHUT OFF THE EQUIPMENT IN CASE OF AN EMERGENCY

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

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

NEVER MODIFY THE EQUIPMENT Do not modify the equipment unless the manufacturer provides written approval.

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



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

PROP 65 WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

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

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

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

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

MEDICAL ALERT Any injury caused by high pressure liquid can be serious. If you are injured or even suspect an injury:

- Go to an emergency room immediately.
- Tell the doctor you suspect an injection injury.
- Show the doctor this medical information or the medical alert card provided with your airless spray equipment.
- Tell the doctor what kind of fluid you were spraying or dispensing.
- Refer to the Material Safety Data Sheet for specific information.

GET IMMEDIATE MEDICAL ATTENTION To prevent contact with the fluid, please note the following:

- Never point the gun/valve at anyone or any part of the body.
- Never put hand or fingers over the spray tip.
- Never attempt to stop or deflect fluid leaks with your hand, body, glove or rag.
- Always have the tip guard on the spray gun before spraying.
- Always ensure that the gun trigger safety operates before spraying.
- Always lock the gun trigger safety when you stop spraying.

It is the responsibility of the employer to provide this information to the operator of the equipment.

AREA Tells where hazards may occur	HAZARD Tells what the hazard is	SAFEGUARDS Tells how to avoid the hazard
Toxic Substances	**ISOCYANATE Conditions**	Spraying or dispensing fluids that contain isocyanates creates potentially harmful mists, vapors, and atomized particulates. Workers exposed to isocyanates can develop a range of short and long-term health problems. Read and understand the fluid manufacturer's warnings and Safety Data Sheet (SDS) to know specific hazards and precautions related to isocyanates. Use of isocyanates involves potentially hazardous procedures. Do not spray with this equipment unless you are trained, qualified, and have read and understood the information in this manual and in the fluid manufacturer's application instructions and SDS. Use of incorrectly maintained or mis-adjusted equipment may result in improperly cured material which could cause off-gassing and offensive odors. Equipment must be carefully maintained and operated according to instructions in the manual. To prevent inhalation of isocyanate mists, vapors and atomized particulates, everyone in the work area must wear appropriate respiratory protection. Always wear a properly fitting respirator, which may include a supplied-air respirator. Ventilate the work area according to instructions in the fluid manufacturer's SDS. Avoid all skin contact with isocyanates. Everyone in the work area must wear chemically impermeable gloves, protective clothing and foot coverings as recommended by the fluid manufacturer and local regulatory authority. Follow all fluid manufacturer recommendations, including those regarding handling of contaminated clothing. After spraying, wash hands and face before eating or drinking. Hazard from exposure to isocyanates continues after spraying. Anyone without appropriate personal protective equipment must stay out of the work area during application and after application for the time period specified by the fluid manufacturer. Generally this time period is at least 24 hours. Warn others who may enter work area of hazard from exposure to isocyanates. Follow the recommendations of the fluid manufacturer and local regulatory authority. Posting a sign outside the work area is recommended.

AREA Tells where hazards may occur	HAZARD Tells what the hazard is	SAFEGUARDS Tells how to avoid the hazard
Toxic Substances	**Chemical Hazard** Certain materials may be harmful if inhaled, or if there is contact with the skin.	Follow the requirements of the Safety Data Sheet supplied by coating material manufacturer. Adequate exhaust must be provided to keep the air free of accumulations of toxic materials. 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.
Spray Area	**Explosion Hazard — Incompatible Materials** 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.	Spray applicators require that aluminum inlet fittings be replaced with stainless steel. 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.

CAUTION

Do not operate the RF2 before reading this section.

Additional Safety Information

The RF2 has several interlocks that may be used to halt operations and put the unit in a safe state.

The main safety circuit is a dual channel, automatically resetting circuit. It contains the following input devices, wired in series:

Main operator panel emergency stop (E-Stop) pushbutton. Included with the unit.

Auxiliary dual channel E-Stop or safety contacts. By customer, bypassed if not used.

Fire-Detect circuit. By customer, bypassed if not used.

The safety circuit also contains outputs that can be used by the customer to interlock other equipment if necessary, or used to control a main air supply to the system for a greater level of safety.

In the event of a safety fault, all operations for the RF2 will halt, all solenoid outputs will be turned off, and all pressure pilot signals will go to zero psi/BAR. Recovery from this state requires the user to reload material to reset all solenoids, etc. before resuming operation.

Other process interlocks required are:

1. Spray Interlock (one per station), will not allow any applicators to trigger for the affected station if this interlock is not present.
2. Sequence Interlock (one per station), will not allow a fluid sequence (flush, load, etc.), which typically involves the use of volatile solvents, to occur. This is typically used when electrostatics are in operation.

Finally, the RF2 has Electrostatics-Enable (HV Enable) signals that can be used to prevent electrostatic devices from operating when a station in the RF2 is running a fluid sequence or is not in Run state.

WARNING

Do not contact, disconnect, or other manipulation of electrical connections or devices while the system is under power. The main disconnect on the right side of the controller can be locked out, and proper Lockout – Tagout (LOTO) procedures should be used for any electrical work internal to the controller. If this is not possible for the purpose of diagnosis and troubleshooting under working conditions, then only qualified electrical personnel should perform the work.

NOTE

During initial commissioning of the equipment, and at periodic times throughout the life of the equipment, all fluid fittings should be visually inspected for leaks. Periodically, all pieces of this equipment should be visually inspected for signs of obvious degradation due to chemicals or other conditions that may be present in the environment where the equipment is installed.

WARNING

Local regulations may require fire-suppression equipment to be installed where the equipment is operated.

WARNING

To avoid possible chemical spillage when no personnel are on site, air and fluid supplies for the equipment should be disabled when the equipment is to be idled for an extended period of time (end of day shutdown, etc.).

Product Description / Object of Declaration:	**IntelliFlow RF2**
This Product is designed for use with:	Solvent-based and waterborne materials
Suitable for use in hazardous area:	
Protection Level:	Not applicable
Notified body details and role:	Intertek USA 7250 Hudson Blvd N STE 100, St Paul, MN 55128, USA
This Declaration of Conformity / Incorporation is issued under the sole responsibility of the manufacturer:	Carlisle Fluid Technolgies Inc 7166 4th St. N. Oakdale, MN 55128 USA
Representative authorised to compile the technical file	Sales and Marketing Director. CFT UK Ltd 1 Avenue de Lattre de Tassigny 94736 Nogent, Cedex. France

EU Declaration of Conformity

CE

This Declaration of Conformity / Incorporation is issued under the sole responsibility of the manufacturer:

Machinery Directive 2006/42/EC
EMC Directive 2014/30/EU
RoHS Directive 2011/65/EU
by complying with the following statutory documents and harmonised standards:
EN ISO 12100:2010 Safety of Machinery - General Principles for Design
EN 60204-1:2006 Safety of Machinery - Electrical Equipment of Machines - General requirements.
BS EN 61000-6-2:2019 Electromagnetic Compatibility Generic Standards Immunity for residential/commercial/light industry environments
EN 63000: 2018 Technical documentation for the assessment according to REACH
BS EN 61000-6-4:2019 Electromagnetic Compatibility (EMC) - Generic standards - Emission standard for industrial environments

Providing all conditions of safe use / installation stated within the product manuals have been complied with and also installed in accordance with any applicable local codes of practice.

Signed for and on behalf of Carlisle Fluid Technologies:

F. A. Sutter

1-Dec-21

Executive President: Engineering and Operations, Scottsdale, AZ, 85254. USA

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INTRODUCTION

The IntelliFlow RF2 (or RF2) is a standalone system designed to control material delivery from a supply source (pressure pot or circulation system) to an applicator. It accurately controls material mixture ratio and/or material flow in a coating process, which can include single component, 2k, or 3k materials, and handles flushing and loading of the materials.

The RF2 can include up to four fluid channels (for additional details on Channels, refer to page 20 of this manual) which can be arranged in many ways. The available channels can be configured into 1,2, or 3 component mixes (guns), using any combination of these mixes to utilize all the available channels. The RF2 can be configured to include anywhere from 32 to 128 solenoids, all of which are fully addressable to be used in various ways to control the process (examples include applicator triggers, dump, solvent flush, color-valve selects, etc.).

The channels and fluid mixes can be grouped into up to two stations with individual sets of color stacks, which can be controlled completely independently of one another.

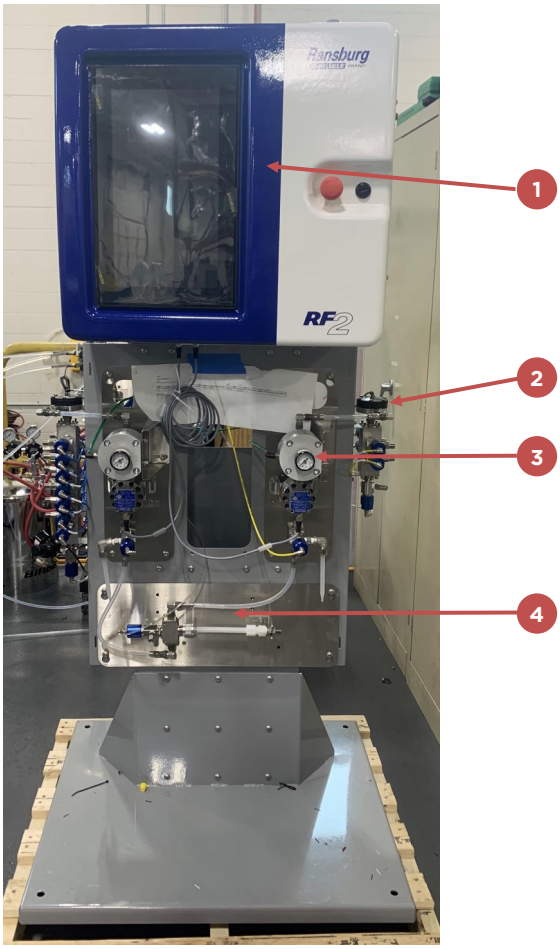
The RF2 can be operated locally, from its included 15-inch touch screen, or it can be easily integrated into an automated process by use of discrete signals for simple systems, or by multiple different industrial fieldbus protocols for more advanced control.

The RF2 can be connected to the cloud, allowing access to Carlisle Fluid Technologies technical experts for the purpose of remote troubleshooting. This access may also be granted to local plant personnel.

Data gathered by the RF2, including alarms and flow-totalization data is stored in an onboard SD card, and can be accessed via FTP, or other methods.

SYSTEM COMPONENTS

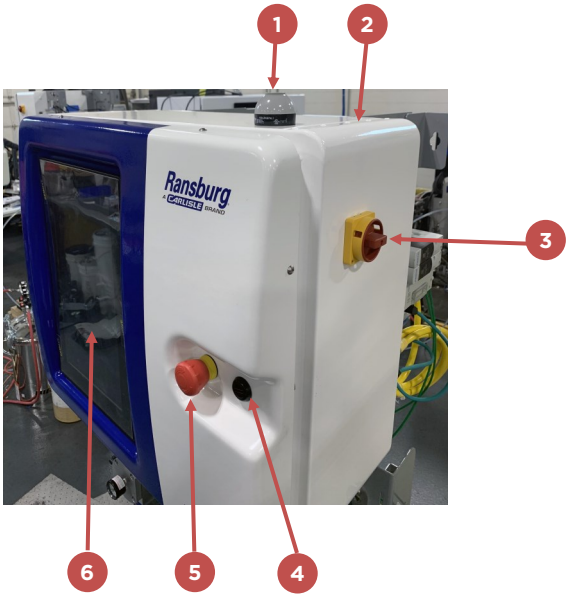
1. Control panel
2. Valve stacks
3. Fluid control module
4. Mixing module



CONTROL PANEL

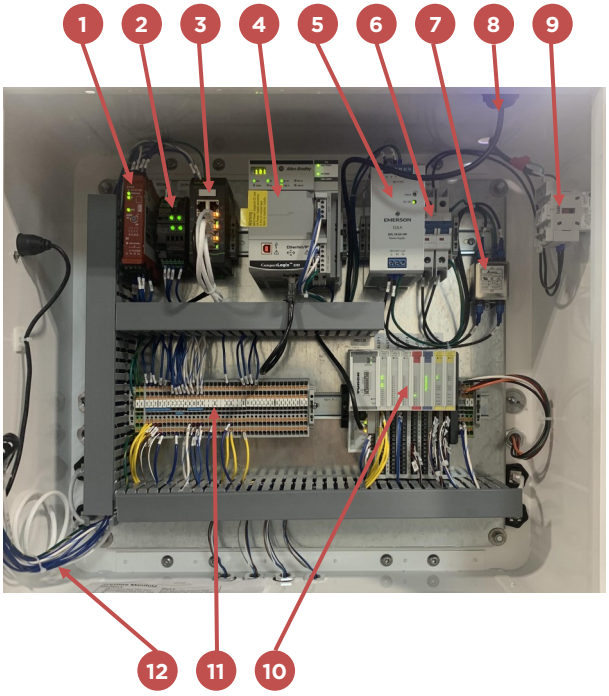
External components

1. Status light
2. Main power entry
3. Main power disconnect switch
4. Panel opening latch
5. Emergency stop button
6. HMI



Internal components

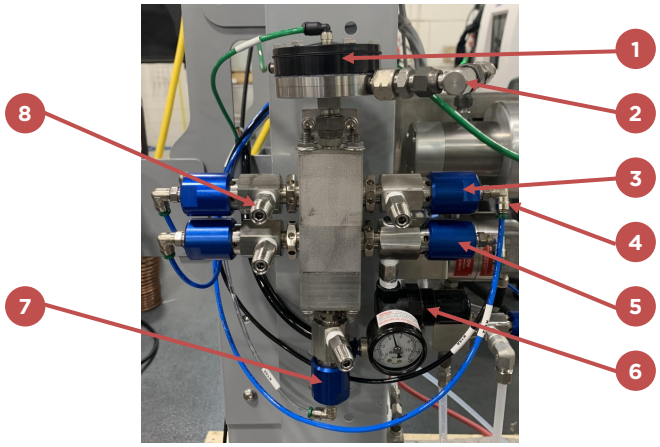
1. Safety relay
2. Electronic circuit protector
3. Local ethernet switch
4. CPU/Controller
5. DC Power supply
6. Main power circuit breaker
7. Line filter
8. Connection to status light
9. Main power disconnect switch connector
10. I/O block and additional terminals
11. Terminal blocks
12. Connection to HMI and emergency stop button



FLUID COMPONENTS

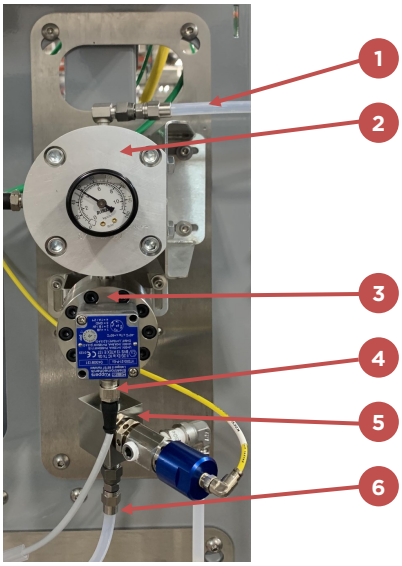
Valve stack

1. Fluid pressure regulator (Optional)
2. Connection to fluid panel
3. Fluid valves
4. Connection to solenoids
5. Air push valve
6. Air regulator
7. Solvent flush valve
8. Material input connection



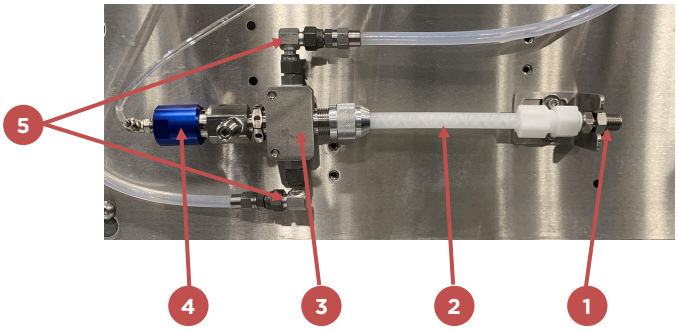
Flow Control Module

1. Connection to valve stack
2. MVR (Material Volume Regulator) with air gauge
3. Flow meter
4. Connection to control panel
5. Calibration block
6. Connection to mix module



Mix Manifold

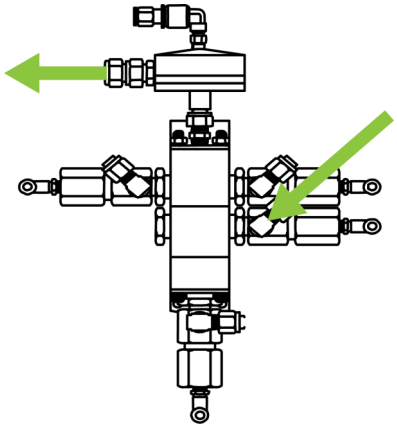
1. Connection to gun
2. Static mix tube
3. Mix block
4. Solvent flush valve
5. Connections to flow control modules



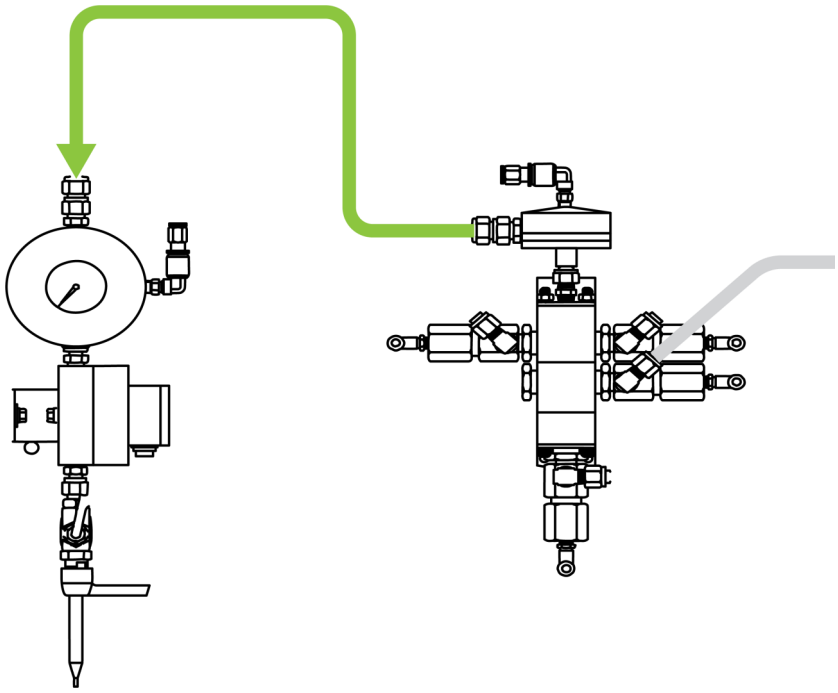
THEORY OF OPERATION

The RF2's operating principle is as follows:

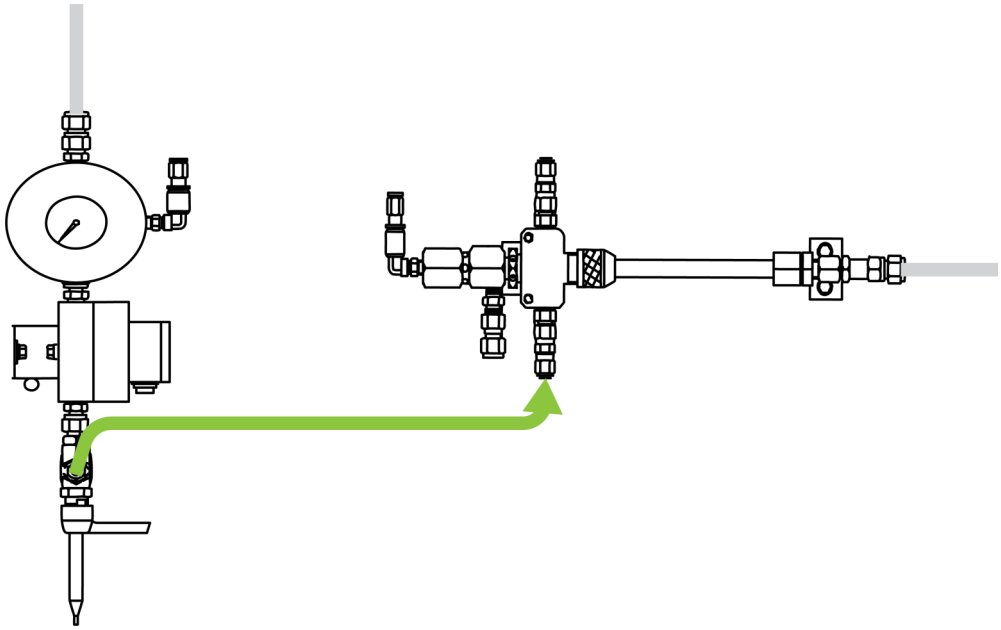
1. The material is fed through the hoses towards the material valves in each stack.
2. If multiple materials are being used of the same type (Resin, Hardener, or Reducer), each valve will control its flow separately.



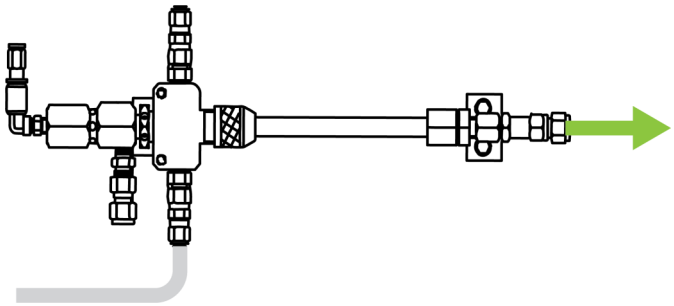
3. The material valves are normally closed. When material flow is needed, the system controller opens the valve via the solenoid addressed to it.
4. The material flows from the valves to the flow control module.



5. The flow meter sends a signal to the control panel indicating the material's current flow rate.
6. The control panel determines if the flow rate is within specification or not.
7. Through the MVR, the control panel increases or decreases the flow rate of material passing through, to reach the desired value.
8. The material proceeds to the mix manifold where it combines with the second and/or third material.



9. The mixed material then flows to the gun's inlet connection.

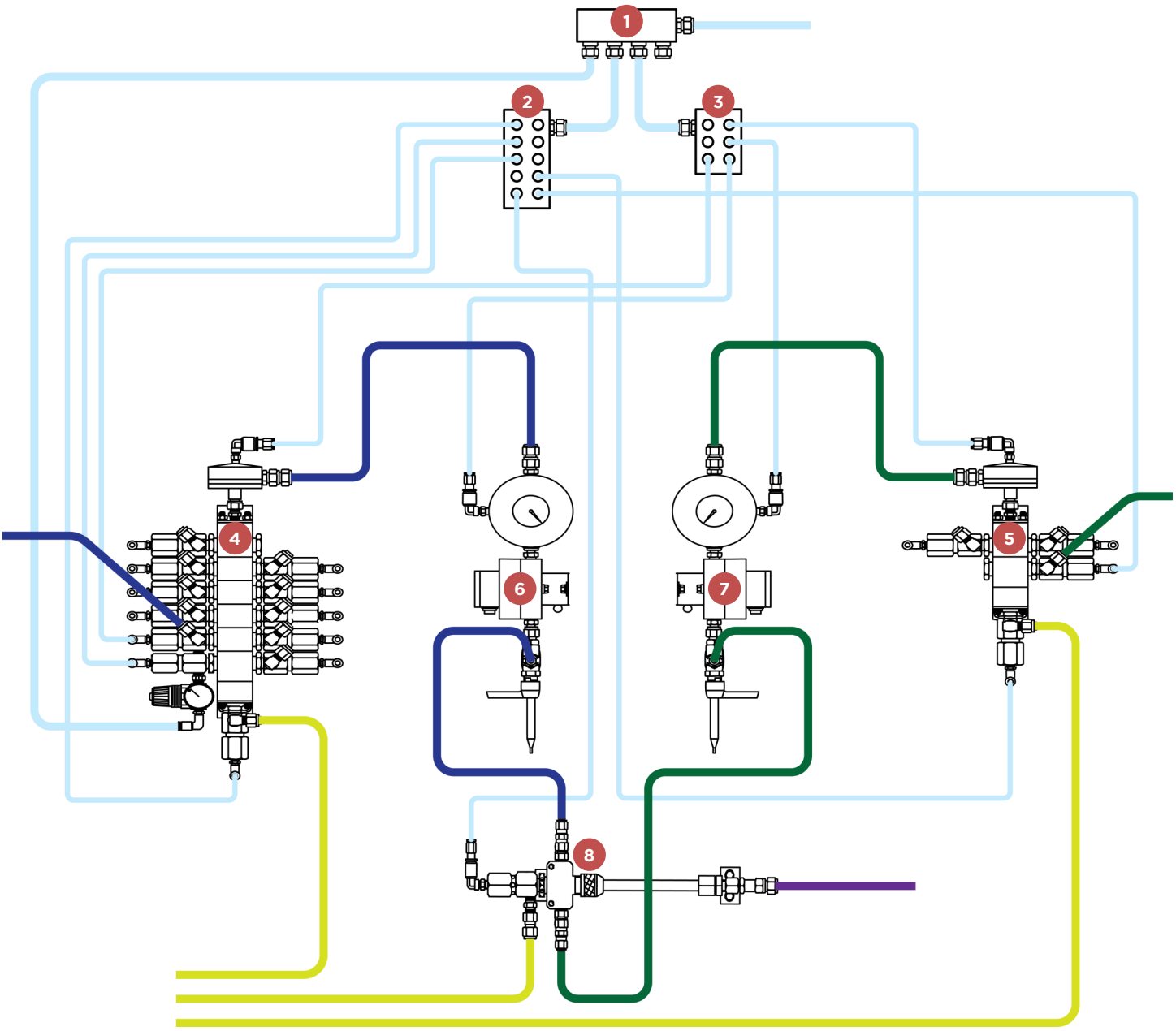


10. If needed, the system can flush only mixed material through the mix manifold, or through the valve stack for color changes.

Fluid connections diagram

- *Air hosing*
- *Solvent hosing*
- *Material A lines*
- *Material B lines*
- *Mixed material lines*

1. Air manifold
2. Valve stack solenoid manifold
3. Pressure solenoid manifold
4. Material A valve stack
5. Material B valve stack
6. Material A fluid panel
7. Material B fluid panel
8. Mix chamber



SYSTEM CONFIGURATION

The RF2 is a versatile system that can be configured in many ways. This section details the terminology of the various components that make up a system and process.

It should be noted, that although the following is relatively complex, the vast majority of RF2 units will be factory-configured based on the fluid components that were purchased, and will only require slight modifications, if any, before operating the system.

Terminology

In demonstrating the ways to configure and operate the RF2, the following terminology will be used throughout the manual.

Outputs

Outputs are discrete signals that are assigned to pneumatic solenoids (up to 128 can be controlled by the RF2 via four separate manifolds) or hardwired digital signals.

Outputs can be configured as several types:

- Unused
- Sequence Output (used in flush, load, etc. fluid sequences)
- Standard – output is active during a sequence but has no special effect on flow control (examples are solvent, air valves).
- Dump – output is used as a dump, which operates much like a trigger, system expects flow when this is active.
- FL. OVRD. (Fluid Override) – used when a DR-1 or HGB air-piloted fluid regulator is used as the flow control device. Fluid override port forces the unit open for cleaning. Flow control functionality is stopped.
- Material Select - used on a mix manifold to allow or disallow a material channel from entering the mixed section.
- Color Valve (CCV) – used on a material stack to select different materials. Each CCV output has a number associated with it coding for the valve number on the color stack.
- Pass Through – allows the user to assign a solenoid to a user defined input, basically giving direct control of the solenoid to external processes.
- Flow Test – used by each channel as an automated calibration port.
- Trigger – triggers an applicator

Functions

Functions of different types are assigned to the programmed outputs and operate on them in different ways. Functions are called during fluid sequences. Types are:

- Unused
- Simple – output assigned to the function is active while the function is active during a fluid sequence.
- Latch – when the function is activated during a fluid sequence, the output assigned to the function turns on and holds on until an unlatch command is given.

Continued in next page...

- Unlatch – opposite of latch - when the function is activated during a fluid sequence, the output assigned to the function turns off and stays off.
- Chop – this function contains two outputs, and when active, alternates between the two. This is typically used with stack solvent and air solenoids.
- Pulse – the assigned output turns on for a set period (programmable) when the function becomes active.
- Wait – (future feature) – the function causes the fluid sequence to pause until the assigned input is true.

Functions can be made available to any of the available fluid sequences.

Sequences

A sequence consists of twelve steps with programmable times per step. During each step, specific functions can be activated or deactivated, causing their outputs to react according to the function setup.

Channel

A channel is a single flow-control path for fluid. Channels can be grouped together to build a gun or mixer. The Ransflow 2 controller can handle up to four channels.

Channels have multiple possible configurations – options include:

- Flow Control Type
    - MVR – the channel uses a 0-100psi pressure pilot signal to control an MVR (Material Volume Regulator) to control flow.
    - DR1 – the channel uses a 0-100psi pressure pilot signal to control a DR1 pressure regulator to actuate flow.
    - Gear Pump (Future) – the channel uses a gear-pump to actuate flow.
    - Pulse (Future) – for manual slave channels only – the channel uses a pulsing valve to regulate ratio of the mixture – note in manual applications, flow control is carried out by the handgun.
    - Feedback Only (Future) – for manual master channels only – no flow regulator is used.
- Feedback Type
    - Square Wave – a flowmeter that produces a quadrature signal is used for reading flow.
    - 4/20 mA (future) – a flow meter that produces a 4/20 mA analog signal is used for reading flow.
    - Open Loop (future) – no flowmeter is used – flow is controlled by a simple pilot command – this would only be used in 1 component systems.
- Inlet Pressure Regulation
    - Enabled or disabled to control the fluid pressure to the inlet of the flow control device.

Gun / Mixer

A gun or mix is a combination of 1-3 fluid channels. Depending on ratio setpoints, etc. the flow command of the gun is divided into flow rates for the assigned channels, to accurately mix the material.

Configurations for gun/mixers are:

- Fluid Type
    - Unused, 1K, 2K, 3K
- Control Type
    - Automatic – an automatic gun is used, triggered by an external request of some type – flow and ratio are controlled.
    - Manual Pulse (Future) – a manual gun is controlled, using pulse channels to modulate the secondary materials. Only ratio is controlled.
    - Manual Analog (Future) – a manual gun is used, using MVR channels to modulate the secondary materials. Only ratio is controlled.

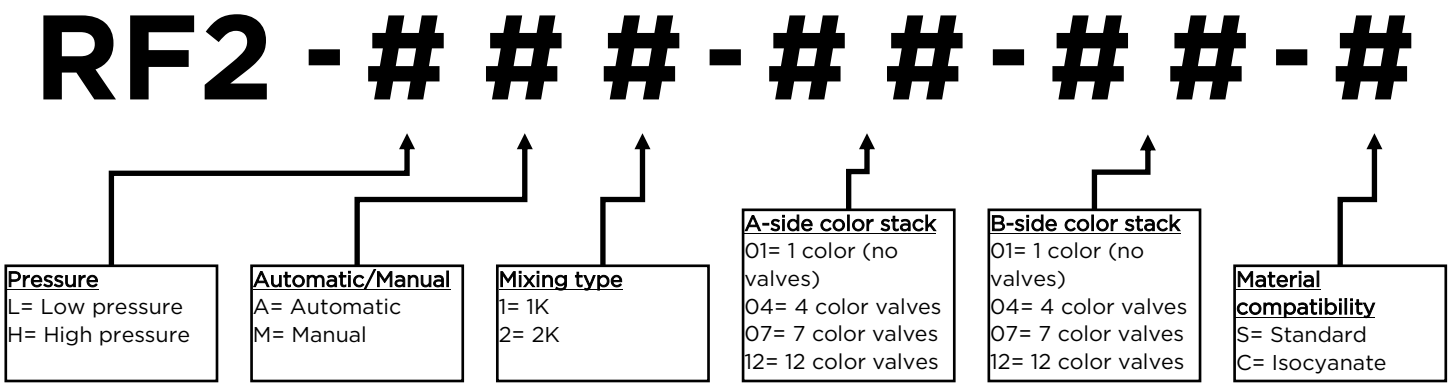
The Ransflow 2 can have up to four gun / mixers configured. Note that these can be built out of only four channels, and each channel can only be assigned to one mixer. So, there could only be two 2k mixers, but four 1k mixers.

Station

A station is a collection of guns / mixers – up to four, which are built from their assigned channels, and several outputs and fluid stacks. The RF2 can control up to two stations (with independent color stacks) – essentially making it a two-applicator controller.

Again – note that any configuration of Stations and Guns must be built out of the components available – four fluid channels and up to 128 solenoid outputs.

COMPLETE SYSTEM PART NUMBERING



TECHNICAL SPECIFICATIONS

Item	Details
Dimensions	Main control console: 24”x 24”x 10” Pneumatic interface panel: 24”x “12”x 9”
Weight	150-250 lb (Depending on added components)
Operating temperature	40˚F to 104˚F (5-40˚C)
Operating humidity	5% to 85% RH (non condensing)
Environmental conditions	Indoor use, pollution degree 2, installation category II
Maximum Altitude	6500 FT (2000M)
Air input pressure	75 to 105 PSI (5.17-7.24 BAR)
Air filtration	5 micron or better, -40˚F (-40˚C) dew point
Ratio tolerance	<=1% (Ratio accuracy can be affected by process factors such as hardware configuration, extremely low flow rates, etc.)
Mixing ratio range	1:1 to 50:1
Power input	100-240 VAC +/- 10% 2.8 / 1.4A 50 / 60 Hz
LCD display	15” True Glass Capacitive Multitouch display, 1366x768 pixels, HD
Flow capacity	<10 ml/min to 3500 ml/min per channel (depending on material and flowmeter limitations)
Viscosity range	<1 cp to >500 cp (depending on flow meter & hardware selected)
Fluid filtration	100 mesh or better (150 micron)
I/O update time	5 ms (200 times/s), Process scan at 10ms
Recipe tables	250 per station (2 stations available)
Wetted parts	300 & 400 series stainless steel, PTFE, perfluoroelastomer, UHMW polyethylene

PROCESS CONFIGURATION

In addition to the configurability of the RF2's physical hardware, the flow control processes can vary greatly from one application to another. The RF2 software can be configured through global setup parameters, which affect system behavior independently of the material being used, and through 'recipe' parameters, which can be modified per the material in use.

Recipes

A recipe is a set of material-specific parameters used to govern system operations. Each Station (see above) can store up to 250 recipes. The parameters for each recipe are organized into three groups:

Materials – parameters that apply to the system as a whole

- Channel A (Resin) – CCV Number – The color valve assignment for the resin stack for the selected recipe.
- Channel B (Catalyst) – CCV Number – The color valve assignment for the catalyst stack for the selected recipe. Available only for 2 or 3 component materials.
- Channel C (Reducer) – CCV Number – The color valve assignment for the reducer stack for the selected recipe. Available only for 3 component materials.
- Pot-Life Time: The amount of time, in minutes, that a mixed material can remain in the line before it must be flushed from the system. This dictates the pot-life warning alarm. Setting this to zero disables the feature.
- Ratio (A, B, C) – the ratio for 2 or 3 component mixers. A: B (resin: catalyst) are given in parts – Channel C is given in percentage of total flow.
- Sequence Assignments
    - Flush A Only: Programmable sequence number that is run when a 'purge A only' command is given. This occurs when a new material is loaded that uses the same catalyst and reducer.
    - Flush All: Programmable sequence number that is run when a 'purge all' command is given. This occurs when a new material is loaded, requiring either a change in catalyst or reducer.
    - Load: Programmable sequence number that is run when a 'load' command is given. This occurs when a new material is loaded, after any necessary purges have been completed.

Gun / Mix – parameters that apply to the gun or mixers that are used by the station selected.

- Trigger-On Delay: When a trigger occurs, the applicator trigger solenoid opens this amount of time prior to the actuation of flow.
- Trigger-Off Delay: When a trigger stops, the applicator trigger solenoid will remain on for this amount of time after flow has been shut down.
- MVR Hold: For channels that use an MVR type controller, the MVR will hold at its previous value after a 'trigger-off' event for this amount of time, before returning to the 'minimum control pressure' value.
- Minimum / Maximum Flow: These parameters scale an optional analog (0-10V or 4/20mA) flow command between these values. These parameters are also used to scale the gauges on the main status screen showing the flow feedback.
- Default Flow: If not flow command is given by either fieldbus signal, or analog input, this flow will be used.
- Flow Rate Tolerance: The percentage error in flow rate for the gun/mixer or any of its channels that is tolerable.

Continued in next page...

- Flow Rate Tolerance Time: The amount of time the flow rate must be out of tolerance before a flow rate tolerance alarm will occur.
- Ratio Tolerance: The percentage error in mixture ratio that is tolerable.
- Ratio Tolerance Volume: The amount of volume that ratio is measured over before producing a ratio alarm.

Channel – parameters that apply to the individual fluid channels used by the mixer selected.

- Flow Calibration:
    - For quadrature flow meters – this is the number of pulses per liter. There are four pulses per flow- meter cycle, so if a flowmeter is rated for 14000 cycles / liter, the pulses per liter = 56000.
    - For analog flow meters – this is given in a simple scaling (In high, In Low, Scaled High, Scaled Low)

      NOTE: Flow calibration can be done by an automated process, in which a measured output of material can be inputted and compared with the counts during a calibration cycle to fine-tune the calibration for different materials. See more about flow calibration below.
- Flow Control PID parameters:
    - Kp / Ki: The P and I components of the PID which govern flow control. While these may need to be adjusted slightly based on different materials and nominal flow rates, good numbers to start with are 2000 and 150.
    - C-band: Given in cc/min – if the flow rate error is greater than this, than the Flow control PID Kp value will be multiplied to give a faster response.
    - I-Band: Given in cc/min – if the flow rate error is greater than this, the Ki value will be multiplied to give a faster response.
    - C-band and I-band, typically for higher flow rate channels a setting of 5-6 will suffice, for lower flow rate (typically catalyst) channels, a lower setting may be used. If too low of a setting is used, it may cause oscillations in flow rate, and unstable operation. A zero setting disables this feature.
- Minimum Control Pressure: This is the lowest pressure that an MVR pilot valve will operate. This should be set at slightly below the 'cracking pressure' of the MVR to give a faster response. Typically, with weep-less MVRs, a value of 10psi is used, weeping MVRs use a value closer to 20psi.
- MVR Enable: This feature, available only when an MVR is used for the flow control of a channel, allows the channel's color valves to shut off when no trigger exists.
- Inlet Pressure Control: If Inlet pressure regulation is used, this is the pressure that the channel will operate. Note: In gear-pump systems, this value represents the 'delta' above or below the outlet pressure of the pump.

Global parameters

Global parameters affect operation independently of the material(s) being used. These are organized into several groups:

Gun / Channel Parameters:

- Mixed Volume: Given in cc or mL, the volume of tubing between the mix block and the applicator. This is used to track material pot-life time.
- Default Flow Meter Calibration: PPL or Analog scaling values – in the event a recipe is loaded that has not been appropriately defined, these values will be used in calculation of actual flow rate.
- Inlet / Outlet Pressure Scaling: Used to calculate inlet and outlet pressures from pressure sensors. Used only with gear-pump systems.
- Reverse Flow Volume: The amount of volume (cc or mL) that is allowed before a fault is generated – this is used to protect against stuck check valves that might allow material to feed backward in circulation lines.

Alarm Masking

- This allows various alarms to be used as warning only, or as 'spray-shutdown' alarms which halt the system.

Fluid System Setup

- Outputs: Defines the description, type, and interlocks for each output in the fluid system. See more about configuring the fluid system below.
- Functions: Description, function type, outputs acted upon, sequences which use the function are defined here. See more about configuring the fluid system below.
- Sequence Definitions: Description, and whether the sequence is used or not in the system, as well as global times for 'chop air' and 'chop solvent' are given here. See more about configuring the fluid system below.
- Sequences: Timing, and which functions are active per step in each fluid sequence.

Display Preferences

- "Show Summary Page On Startup": When enabled shows a configuration summary page for the system when powered up.
- Flow Totals Units: Liters or Gallons – units for material total display.
- Pressure Units: PSI or Bar – units for pressure display.
- Default Max-Y Values for Flow Trend Displays – when a trend display is open, it will revert to this value for scaling the flow feedback.
- Language: Language shown on the display.

  Note – some items that are defined by user entry will not be translated, but these values are editable by the user.

Security

The system administrator has access to settings not available to other users. This includes the ability to add, delete, or modify users, as well as the ability to assign access to various features to different user groups (levels 1-10).

Functions that can be access-controlled are:

- Edit Recipe: User can enter the recipe edit menu and make changes.
- Copy Recipe: User can copy recipe parameters from one location to others.
- Setup Menu: User can access the global setup menu (besides administrator only functions)
- Edit Fluid System: User can access fluid system configuration pages (Sequence Definition, Function Definition, Output Setup).
- Edit Fluid Sequences: User can modify sequence timing for sequences that have been defined.
- Edit Active Flow Settings: User can modify the active parameters (recipe driven) pertaining to flow.
- Edit Active Mix/Gun Settings: User can modify the active parameters (recipe driven) pertaining to a mixer or gun.
- Edit Active Inlet: User can modify the active parameters (recipe driven) pertaining to inlet pressure.
- Calibrate Flowmeter: User can calibrate the flow meter.
- Hardware Browser: User can access the 'hardware browser' page, which gives access via a webpage for various internal system components.

INSTALLATION

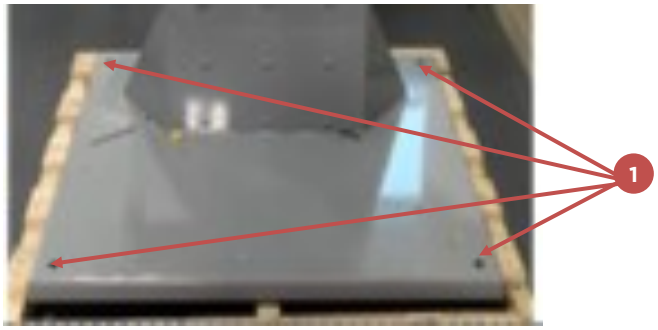
Before operating the RF2, ensure all the below installation steps are complete. Schematics and further information are provided separately from this manual.

WARNING

This equipment is intended to be installed outside of classified hazardous areas. While there are accessories for this equipment, sold separately, which will allow devices such as flowmeters to be installed within the hazardous zone, this should only be done following the instructions that are provided with those accessories.

LOCATING / MOUNTING

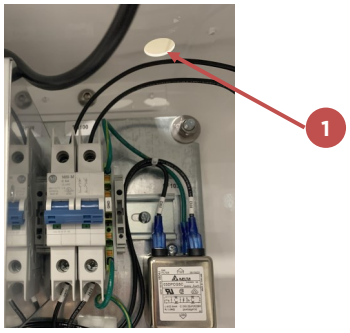
For standard packages, it is recommended that the RF2 be anchored to the floor, using the anchoring holes provided in the base of the stand.

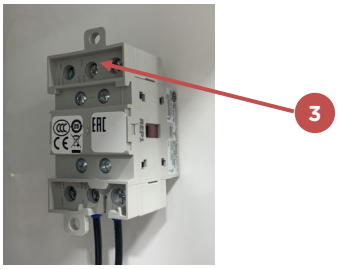


ELECTRICAL

The RF2 can accept either 120VAC or 240VAC as a power source. Its internal 24VDC power supply automatically detects the input voltage and produces control power accordingly.

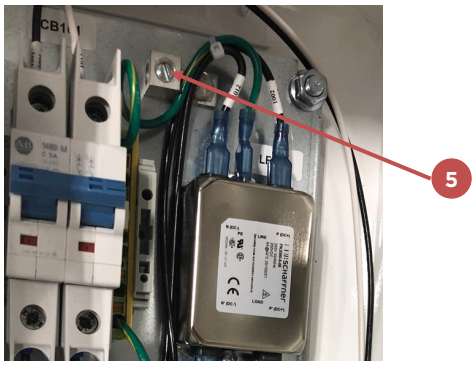
Main power entry to the cabinet is located at the top right-hand side of the cabinet. A 1/2" hole is pre-drilled in the enclosure to accept a conduit or cord-grip, etc..





Process

1. Locate the main power entry in the upper right section of the cabinet
2. Using a plug, insert a wire with minimum 16 and maximum 10 gauge into the slot
3. Locate the disconnect switch connector inside of the control panel
4. Using the wire, connect the L1 and N lines to the top lugs opposite their secondary connections
5. Connect ground wire to the grounding lug located directly on the backpanel.



NOTE

Any conductive parts within 2.5m of this equipment (ladders, rails, fences, etc.) shall be bonded appropriately to ground.

PNEUMATICS

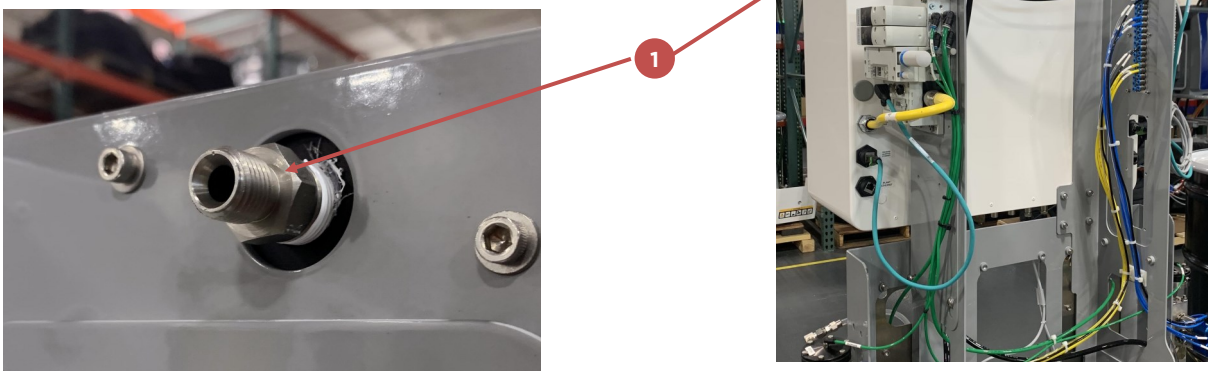
For convenience, all necessary air input connections are centralized in a single manifold, so that incoming air pressure can be managed in one place.

Always use clean, dry air to operate the RF2.

The maximum air input pressure is 105 PSI / 7 BAR.

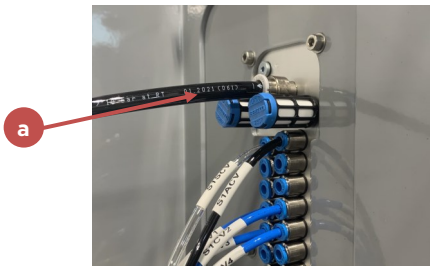
Pneumatic connections

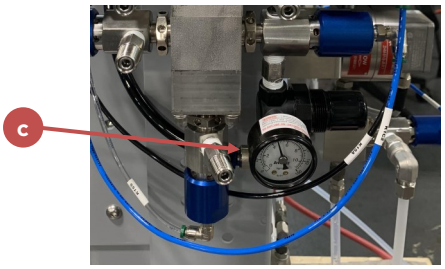
1. Locate the air manifold inlet connection at the top right corner of the system chassis
3. Attach a 3/8" main air line with 1/4" NPS swivel connection to the main air inlet



The following steps may have been completed by the factory before shipment.

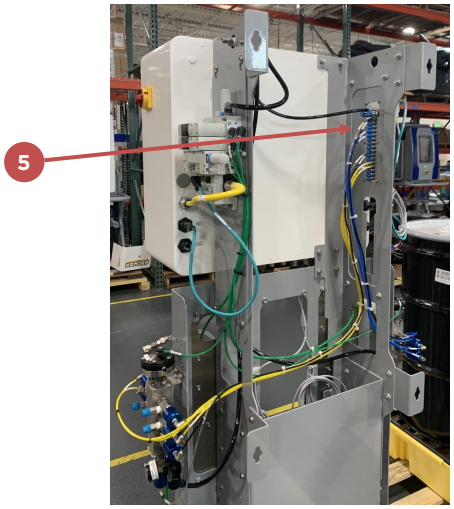
4. On the opposite side of the air inlet, locate the manifold fittings for the interconnected air tubing
5. Connect the manifold to each destination:
    a. Resin and catalyst solenoid manifold
    b. Flow & pressure solenoid manifold
    c. Resin air flush valve
    d. Depending on your gun type, the gun's air regulator

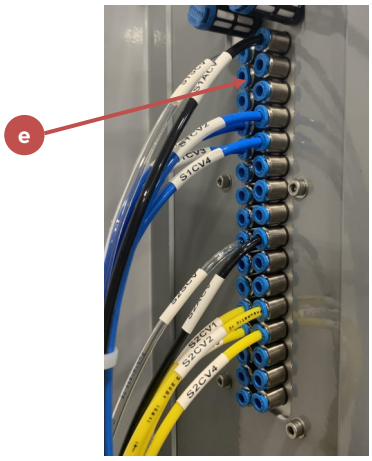


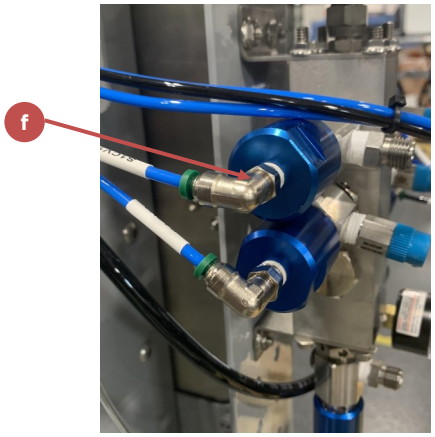


Resin and catalyst solenoid manifold and valve stacks

5. Locate the solenoid manifold on the back left side of the system. This manifold houses all the air outputs to the valve stacks for the three materials
6. Using the desired mapping, connect the manifold outputs (e) to each resin/catalyst valve (f)

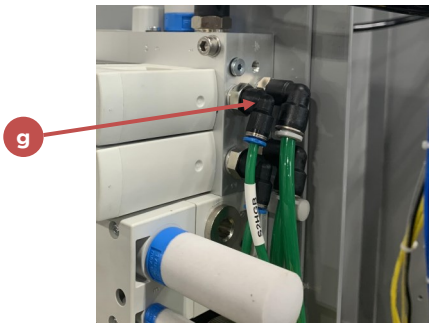


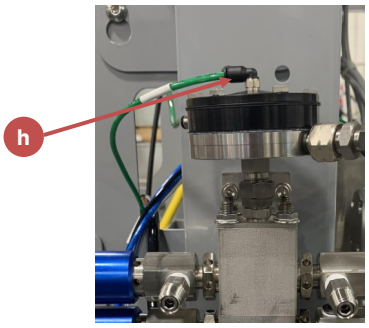


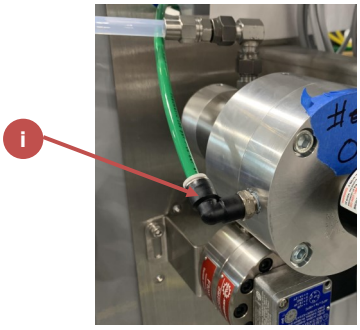


Flow and pressure solenoid manifold

7. Locate the solenoid manifold on the back right side of the system. This manifold houses all the air outputs for the fluid regulators and MVRs.
8. Using the desired mapping, connect the manifold outputs (g) to each material pressure valve (h)
9. Using the desired mapping, connect the manifold outputs (g) to each MVR (i)







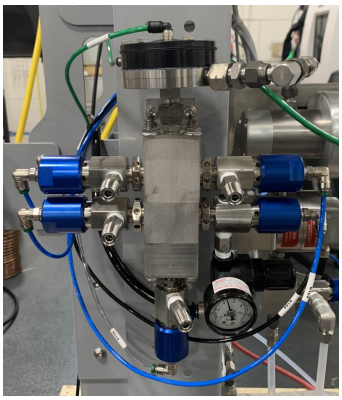
PAINT MATERIALS

Your system may include up to three valve stacks for three different channels. The process to connect each is the same; repeat the steps below as needed. The number of valves each stack will have depends on your application and needs.

Paint Material Connections

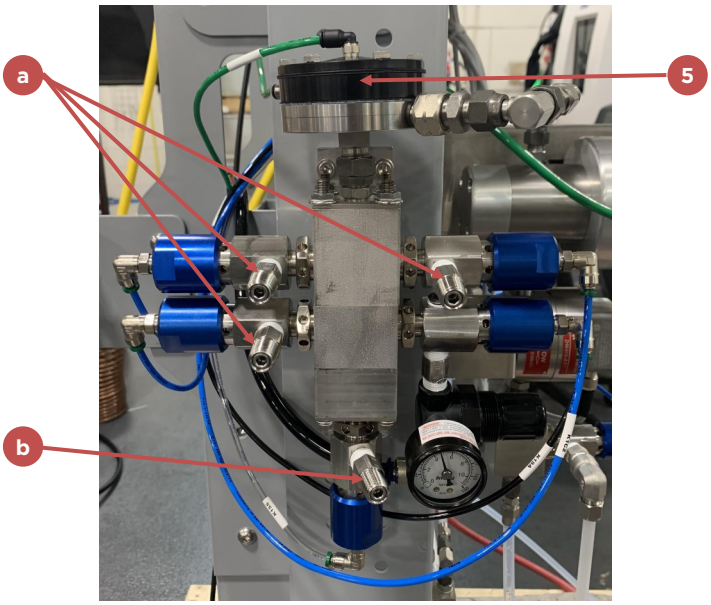
1. Locate the valve stack you want to connect. Either side of the system may posses two different stacks; one above the other.

One stack config.

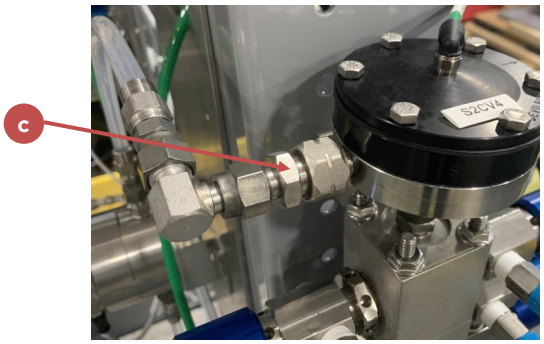


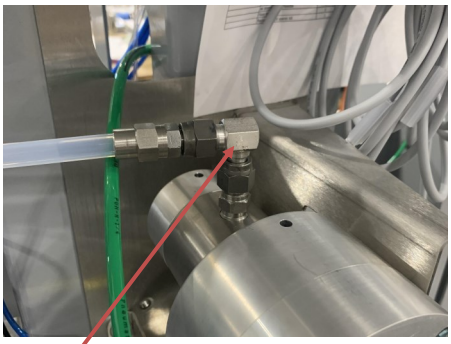
Two stack config.

2. Locate each of the material input connections on each valve on the stack (a).
3. Connect your material supply to the material input connection according to your desired mapping. Be careful not to mix different kinds of materials into the same stack. Each material (Resin, Catalyst and Reducer) must have his own.
4. Connect your solvent supply to the input valve below the stack (b).
5. Locate the fluid pressure regulator on the top of the stack.

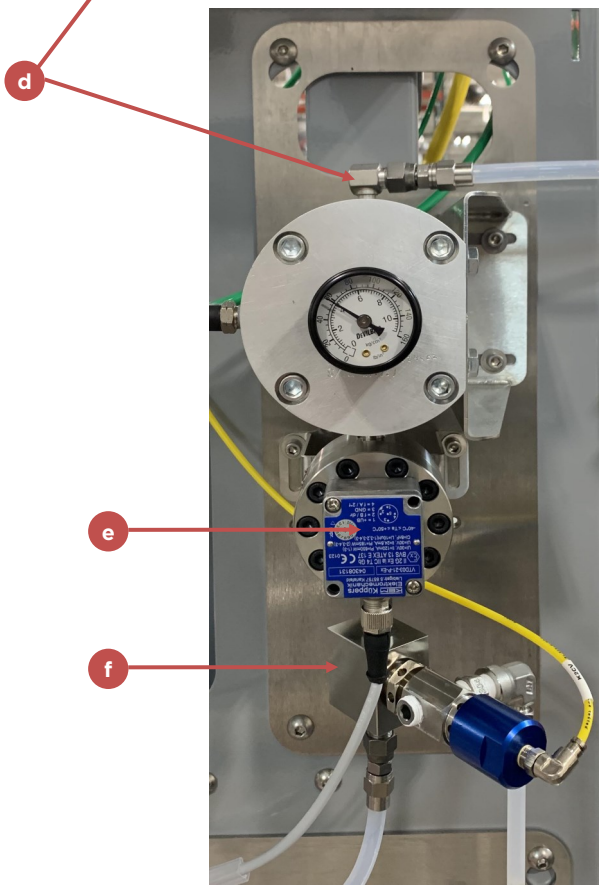


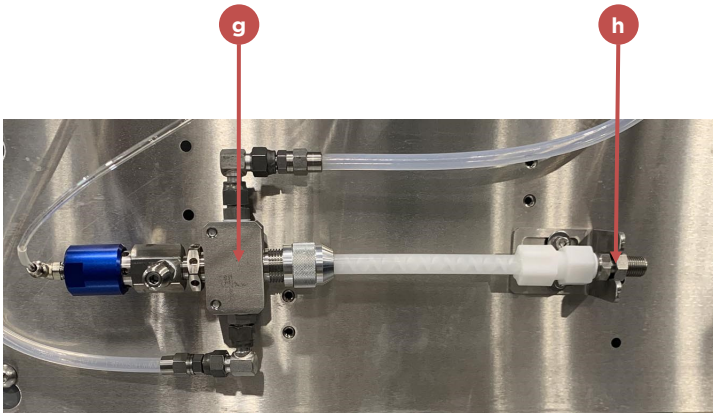
6. Connect the regulator (c) to the MVR (d) in the fluid panel.





7. Depending on your configuration, connect the flow meter (e) below the MVR to the calibration block (f). If not using a calibration block, skip this step and connect the flow meter to the mixing block (g) directly.
8. If you are using a calibration block, connect it to the mix block (g).
9. Plug your gun's material input to the mixing tube's output connection (h).





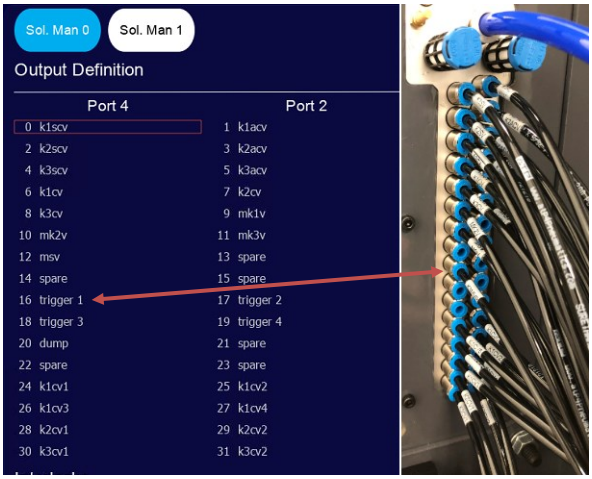
EXTERNAL AIR CONNECTIONS

The RF2 can (and in some cases must) control air signals that are external to the RF2; these include gun trigger and dump signals.

Every solenoid controlled by the RF2 is programmable, so the individual port location for any signal depends on the programmed location for that signal.

The RF2 will be pre-programmed from the factory with a standard list of signals for the purchased configuration. A list will be provided showing the air connections as programmed. It is also possible to view and modify this list as desired. To view the list of connections:

1. Navigate to the Setup Menu -> Output Configuration (see 'Running the System' section below for more information).
2. Select the manifold (along the top of the output configuration menu) to view. Note the RF2 can control up to four solenoid manifolds, but in many cases the system will only be configured to have one. Only manifolds that are present will be shown.



3. The list of outputs shown as Port 4 and Port 2, with 16 rows represent the possible 16 modules (each having two solenoids) in the selected manifold. The orientation is the same as the view of the air connections at the base of the solenoid manifold. For example, in the pictures below, the trigger signal (trigger 1), is shown on the ninth row of the Port 4 column, making it solenoid number 16.

All air signals that control elements that are provided with the RF2 will be pre-programmed, and their air tubing will be pre-installed if possible. But their solenoid locations may also be viewed or modified using the same procedure as above.

If a solenoid fails due to wear, or other damage, etc., a quick 'output swap' process is provided so that any two outputs configurations and functionality can be swapped. This function is located in the Output Configuration section of the System Setup Menu. Normally, the system will be provided with some unused solenoids that can be used for this purpose. Refer to the Setup section of this manual for more details.

More information about output configuration is given below in 'System Configuration' and 'Running the System' sections.

AUXILIARY SIGNALS

The RF2 is designed to be placed inside a larger process to take commands from paint / assembly lines, robotic cells, etc. Commands and Status information can be communicated to and from the unit via discrete wiring or by fieldbus. Both methods can be used simultaneously if desired.

While it is possible to fully run the RF2 system with hardwired signals, much more functionality is available through fieldbus communications.

Hardwired I/O

If it is desired to use hardwired signals to give basic commands and receive basic status information, the following digital signals are available.

Slot 1 (Digital Inputs)	
1	Station #1 Sequence Interlock - 24V = Interlock OK
2	Station #1 Spray Interlock - 24V = Interlock OK
3	Station #1 Recipe Strobe - 24V Pulse loads selected Recipe
4	Auto gun = Station #1 Applicator ready; Manual Gun = Station #1 Flush box
5	Station #2 Sequence Interlock - 24V = Interlock OK
6	Station #2 Spray Interlock - 24V = Interlock OK
7	Station #2 Recipe Strobe - 24V Pulse loads selected Recipe
8	Auto gun = Station #2 Applicator ready; Manual Gun = Station #2 Flush box

Slot 2 (Digital Inputs)	
1	User Input #1 (For Pass-Through)
2	User Input #2 (For Pass-Through)
3	User Input #3 (For Pass-Through)
4	User Input #4 (For Pass-Through)
5	Auto Gun = Mix #1 Trigger Cmd, Manual Gun = Mix #1 Manual Trig Flow Switch
6	Auto Gun = Mix #2 Trigger Cmd, Manual Gun = Mix #2 Manual Trig Flow Switch
7	Auto Gun = Mix #3 Trigger Cmd, Manual Gun = Mix #3 Manual Trig Flow Switch
8	Auto Gun = Mix #3 Trigger Cmd, Manual Gun = Mix #4 Manual Trig Flow Switch
9	Job Data Binary 1
10	Job Data Binary 2
11	Job Data Binary 4
12	Job Data Binary 8
13	Job Data Binary 16
14	Job Data Binary 32
15	Job Data Binary 64
16	Job Data Binary 128

Slot 3 (Digital Inputs)	
3	System Fault Reset Pulse
4	Station 1 Run Pulse
5	Station 1 Halt Pulse
6	Station 2 Run Pulse
7	Station 2 Halt Pulse
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	User Input #5 (For Pass-Through)
13	User Input #6 (For Pass-Through)
14	User Input #7 (For Pass-Through)
15	User Input #8 (For Pass-Through)
16	User Input #9 (For Pass-Through)

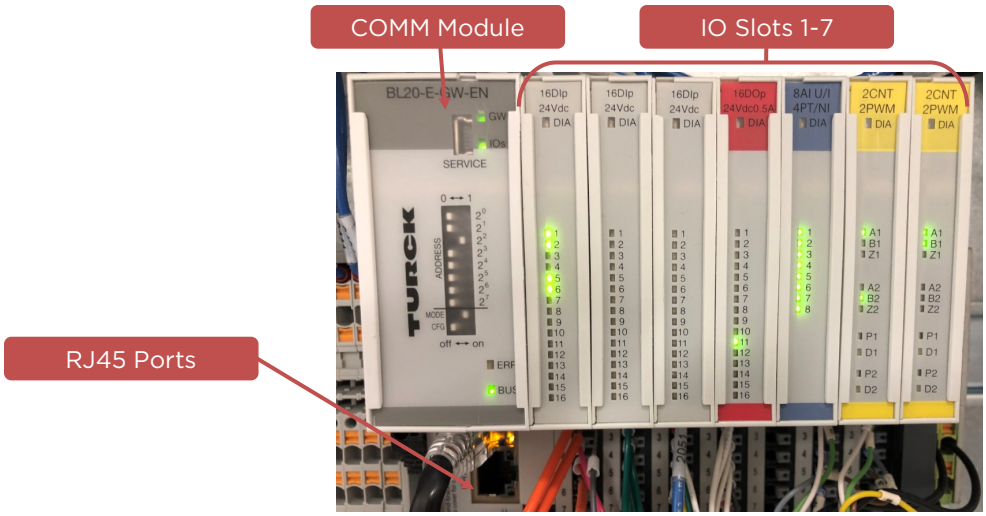
Slot 4 (Digital Outputs)	
1	Station #1 HV Enable
2	Station #2 HV Enable
6	Station #1 Run Mode
7	Station #2 Run Mode
13	Gun / Mix #1 Pot Life Expired
14	Gun / Mix #2 Pot Life Expired
15	Gun / Mix #3 Pot Life Expired
16	Gun / Mix #4 Pot Life Expired

Slot 5 (Analog Inputs)	
1+, 2-	Programmable Analog Input #1
3+,4-	Programmable Analog Input #2
5+,6-	Programmable Analog Input #3
7+,8-	Programmable Analog Input #4
9+,10-	Programmable Analog Input #5
11+,12-	Programmable Analog Input #6
13+,14-	Programmable Analog Input #7
15+,16-	Programmable Analog Input #8

Slot 6 (High-Speed Counter)	
1-5	Channel #1 Flow Meter
6-10	Channel #2 Flow Meter

Slot 7 (High-Speed Counter)	
1-5	Channel #3 Flow Meter
6-10	Channel #4 Flow Meter

The table on the preceding pages references I/O slot and pin numbers. These correspond to the physical location of the connection. Slots being cards, numbered low to high from the left, and pin numbers being the connection from low to high from the top of a given slot.

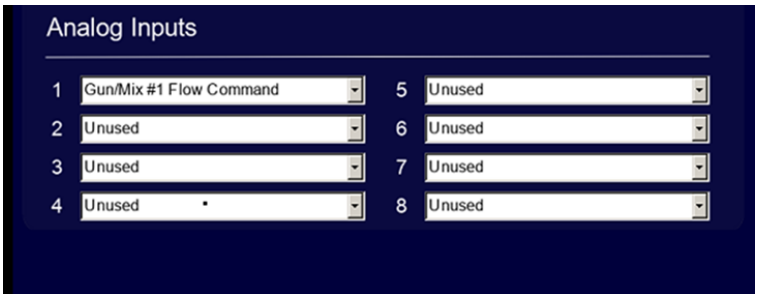


Analog Hardwired Inputs

Additionally, the RF2 has eight analog inputs, which can be configured for various system functions, including flow command for a gun or mixer. The analog input module used by the RF2 will be pre-configured for eight 2-wire 4/20mA signals, but each channel can also be configured as a 0-10V, 1-5V, etc. input type. Changing the configuration of the input itself requires the user to access the onboard webpage for the Turck I/O module. Only qualified personnel should perform this procedure.

Assignment of an analog input to a given function is done through the following procedure:

1. Log in as an administrator
2. Navigate to Setup -> System Configuration
3. Press 'next' until reaching the fourth page, which contains the assignments for analog inputs.
4. Assign each analog input as desired. See screenshot to the right.
5. Press 'Finish' to store the configuration—the system will reboot.



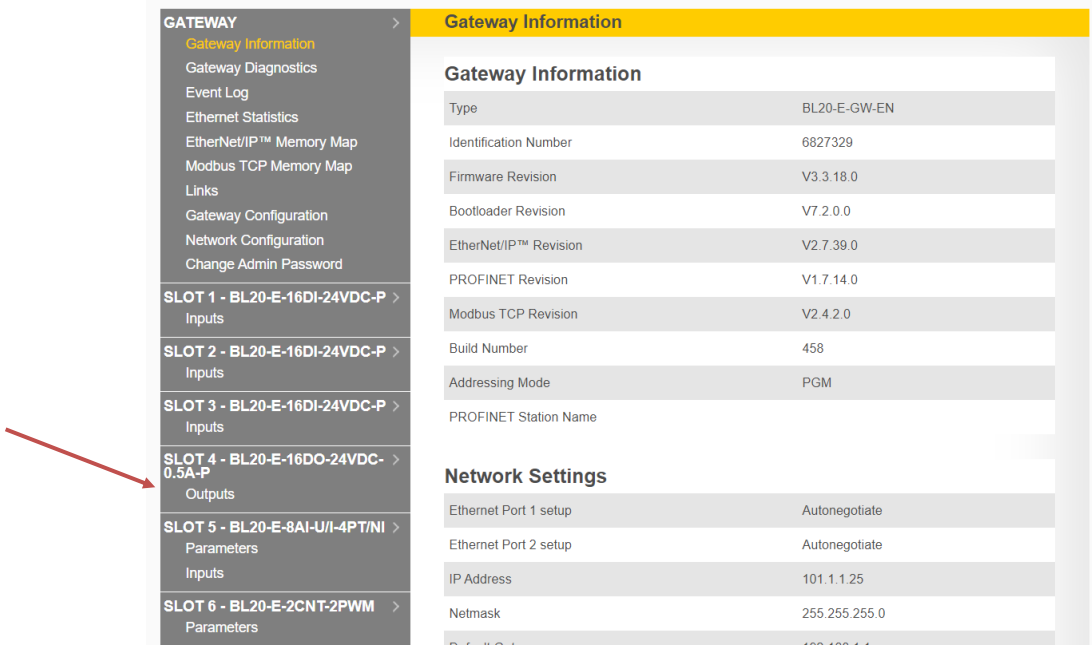
Analog Types available are:

- Inlet Pressure (Channel 1 to Channel 4) – used by gear-pump (future addition) channels to read inlet pressure.
- Outlet Pressure (Channel 1 to Channel 4) – used by gear-pump (future addition) channels to read outlet pressure.
- Flow Command (Gun/Mix 1 to 4) – used as the overall flow command for the indicated gun or mixer.
- Flow Feedback (Channel 1 to 4) – analog flow feedback sensor if used instead of a pulsing sensor (future addition)
- Solvent Flowmeter (Station 1 or 2) - used as a solvent flowmeter for verification of a flush, etc.

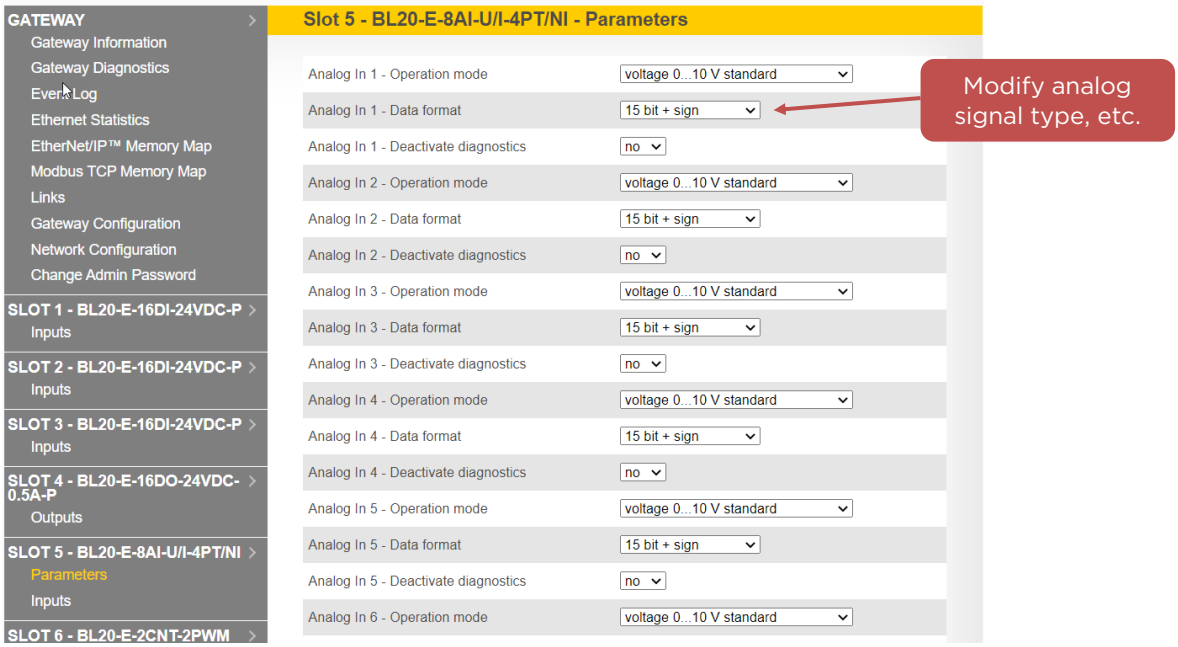
Wiring for the analog signals is done on slot 5, pins (1+, 2- for input 1, 3+, 4- for input 2...) See schematics for more details

To modify the type of analog input:

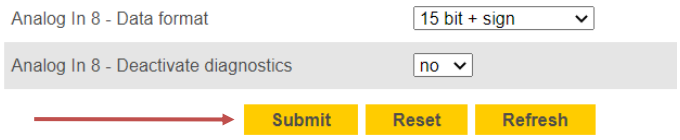
1. Connect a laptop to the open RJ45 port on the Turck I/O Block.
2. Set the laptop IP address to 101.1.1.99
3. Open a web browser, such as Google Chrome, and type 101.1.1.25 in the URL.
4. Log in with the password = 'password'
5. Select the analog input module **Slot 5 – BL20-E-8AI-U/I-4PT/NI**



6. Modify the channels as necessary (consult Turck BL20 IO manual for more details).



7. Press Submit



NOTE

For analog current inputs, both 2-wire and 4-wire styles are possible, but note that if using 4-wire channels, it eliminates another input channel, reducing the number of inputs available. Therefore, it is recommended to use only two wire current inputs, or voltage inputs with the RF2.

Fieldbus Communications

The RF2 can communicate via fieldbus through its RJ- 45 plant ethernet connector.

In its most basic configuration, the RF2 uses Ethernet / IP communications protocol. The plant or supervisory PLC can utilize CIP Data Transfer Read or Write commands via a Message instruction (MSG - Rockwell) or equivalent to get status information or give commands.

If desired, the RF2 can be configured to use a gateway module which establishes an implicit communications path between the RF2 and some other industrial protocol, such as ProfiNet, Modbus TCP, CC-Link, etc.

Sample code may be available from Carlisle that can be imported into the supervisory PLC to facilitate communications more quickly with the RF2 and provide data structures for the information that is communicated.

Signal lists and more detailed information for establishing communications with the RF2 are given at the end of this manual.

Setting the IP Address for Fieldbus Communications (No Gateway)

Series 1 RF2 control units use an Allen Bradley – Compact Logix PLC, which has two separate ethernet networks as the main controller. Network A1 is used for local communications to RF2 devices such as I/O and solenoid manifolds. Network A2 is used for communications to a plant. To set the IP address, it is necessary to download RSLinx Classic software from Rockwell Software. There will be a free version (Lite) available.

Use the following procedure for setting the IP address for Network A2 on Series 1 RF2 units:

1. Set the IP address of the user's laptop or PC to 101.1.1.99, subnet Mask 255.255.255.0
2. Open RSLinx software
3. Select Communications - > RSWho
4. Select the ethernet IP driver and scan the network (Most likely this will be named AB_ETHIP1). If the protocol is not present – see instructions below.
5. Find the RF2 controller at IP address 101.1.1.20 – right click and select module configuration.
6. Select Port Configuration Tab
7. Select Network A2 – WARNING: Do not modify anything in Network A1 as it could render the system inoperable.
8. Set the IP address as desired to communicate to the Plant controller and click OK
9. When finished, set the IP address of the PC back to its original setting.

If RSLinx has not yet been configured to have an ethernet IP driver – do the following:

1. Select Communications -> Configure Driver
2. In the 'Available Driver Types' pulldown, select Ethernet/IP Driver, click 'Add New'
3. Click OK – the new driver will be added.

Setting the IP Address for Fieldbus Communications (With Gateway)

When the Anybus communications gateway is installed in the system – the RF2 will already be configured to communicate with it. The gateway itself must be configured on the plant side to talk to the plant.

To configure the plant side of the gateway, download and install HMS IPconfig Software from:

www.anybus.com/support

Connect the PC with HMS IPconfig software loaded to the plant side network ports of the gateway device. Set the IP address of the laptop to the network that you wish to place the gateway on. Start HMS IPconfig software.

When HMS IPconfig is started it will automatically scan for compatible and active HMS devices. To change the IP configuration for a device, click on the device in the list.

Pressing 'refresh' in the IPconfig software will cause the software to rescan the network. When selecting a device, pressing the 'wink' button will cause the device LEDs to flash, verifying that the correct device has been chosen.

IP and DNS settings can be configured manually or dynamically using DHCP by modifying them in the right hand section of the page and pressing apply

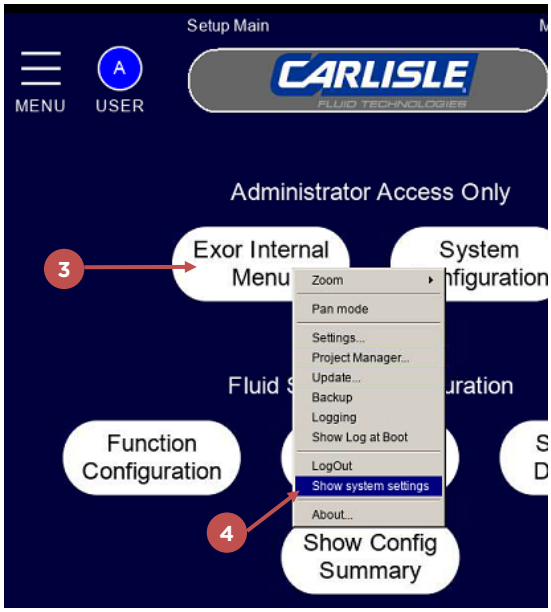
See the User Manual for HMS IPconfig software for more detailed information.

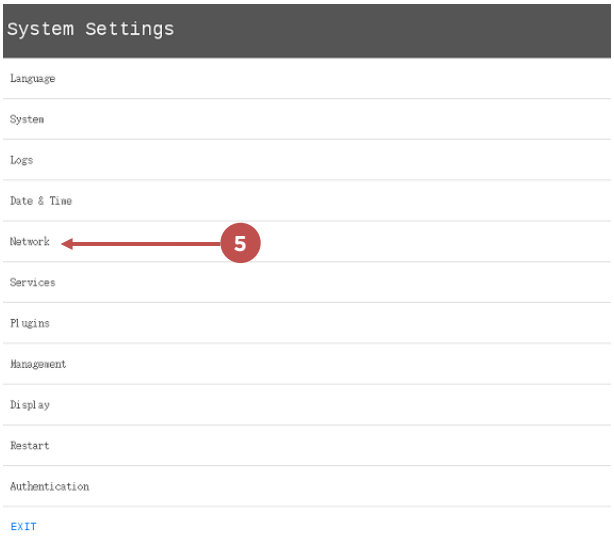
Internet

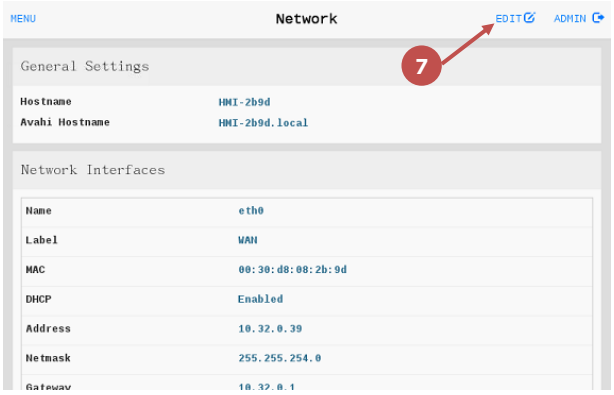
The RF2 has an RJ-45 port for internet communications. The network connected to this port is preconfigured as DHCP client and will accept an IP address from a DHCP server on the network. This port can be used both for connecting the RF2 to the cloud for remote support from Carlisle, or to access it through the customer's network for FTP (File Transfers) or VNC (Screen Mirroring), etc.

If a DHCP server is available, connecting to the RF2 to the network is all that is necessary. However, in some plants it may be desirable to assign the WAN network for the RF2 to a static IP address. To do this, do the following:

1. Log into the RF2 as an administrator
2. Navigate to Setup
3. Press 'Exor Internal Menu' – this will open a small popup window.
4. Select 'Show System Settings' – the internal settings menu for the Exor operator interface will be shown
5. Select 'Network'
6. Open Network Interfaces
7. Select 'Edit'
8. The only connection that may be used for connection to the internet for remote support purposes is eth0. Modify this network as desired.
9. Press Save and Exit the menu system.



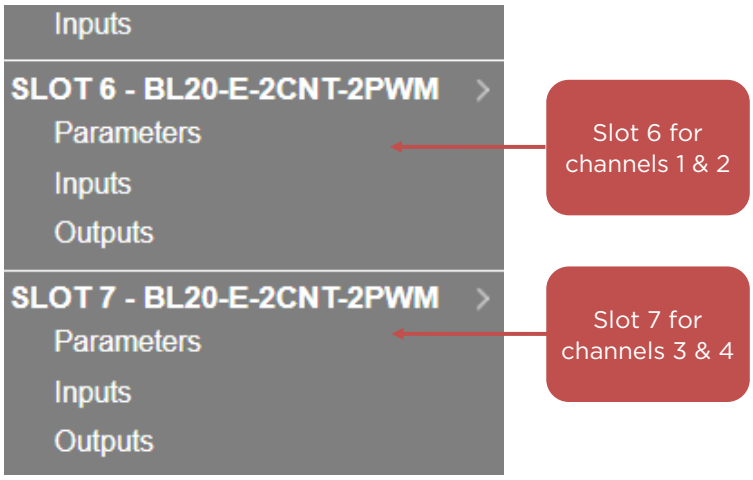


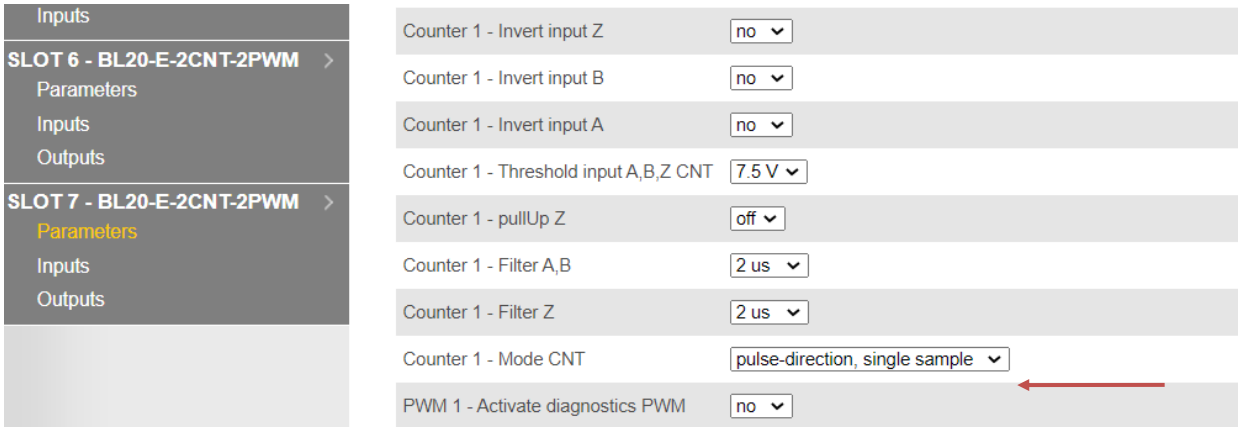


Configure High-Speed Counter I/O for Non-Quadrature Flowmeters

In some installations, the standard flow meter may not be used. Some pulsing flow meters do not have quadrature output. If this is the case, the channel must be modified in order to accept a single pulse input. To do this:

1. Connect a laptop PC to the open RJ45 connector on the Turck I/O block. Set the laptop IP address to 101.1.1.99
2. Using a web browser, enter 101.1.1.25 into the URL.
3. In the Login field, enter 'password'.
4. Click 'Parameters' for the slot you wish to modify. Channels 1 and 2 are connected to slot 6, channels 3 and 4 are connected to slot 7.
5. Find Counter 1 or Counter 2 – Mode CNT. Counter 1 will be for the first channel connected to the slot, Counter 2 is for the second – for example Slot 7, Counter 1 is for channel 3.
6. The default setting for this field is 'AB Mode – 4 samples', for a single pulse – change this to 'pulse -direction, single sample'





7. Click Submit. The counter is now configured.

NOTE

In this mode – for the count direction to be positive, the D2 pin for the channel (pin 2 or 7) must be connected to 24Vdc. If the flowmeter has a direction output, this can be used for direction, otherwise connect a 24V jumper to the direction pin.

DISPOSAL INFORMATION

Prior to disposal of this equipment at the end of it's life cycle, all components containing electronic printed circuit boards (PCBs), sensors, and any wetted parts that may contain hazardous materials should be separated from the unit and recycled/disposed of according to local regulations.

OPERATION

POWERING UP THE SYSTEM

Before powering-up the system, ensure that main power has been installed correctly. See section on electric installation for more details.

To power-up:

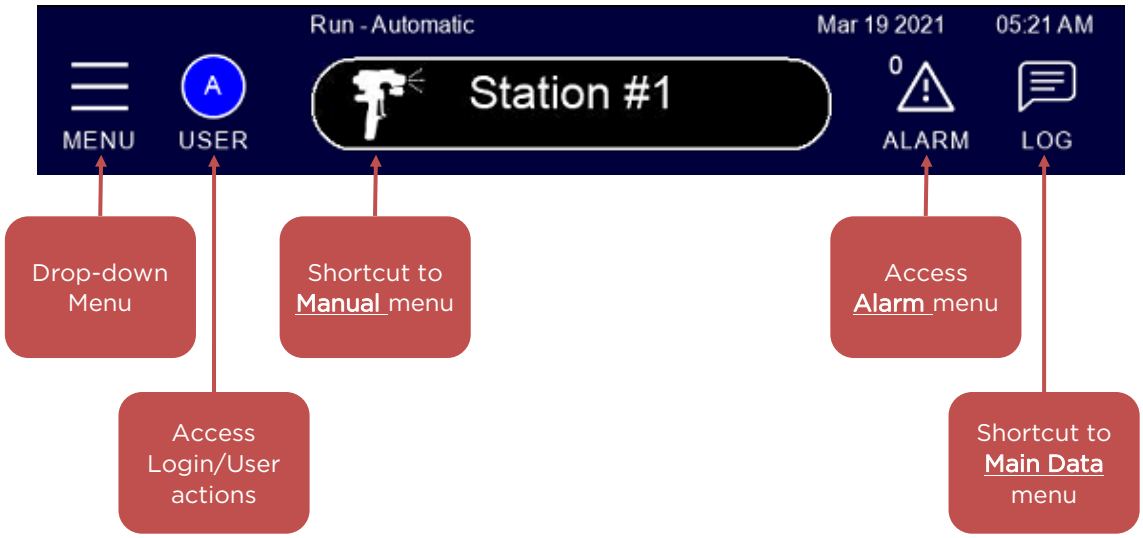
1. On the righthand side of the control module enclosure, turn the rotary disconnect switch clockwise. The system will go through a boot-up sequence. When ready, a button will be shown on screen to access the 'Main Menu'.
2. On the power-up menu, along the bottom, change the language of the display by pressing the 'flag' icons for the appropriate country / language.
3. On the bottom-right-hand side of the power-up menu, press the 'config summary' button to access the configuration summary page – which briefly describes how the system hardware has been configured.
4. Pressing the Main Menu button will:
    a. Open the main **Run** menu if the system has been configured and the user-preference to 'show configuration summary on startup' **is not** set.
    b. Open the **Configuration Summary Menu** if the system has been configured and the user-preference to 'show configuration summary on startup' **has been** set.
    c. Open the **System Configuration Menu** if the system **has not** been configured.

NOTE

If the system has not been configured, please refer to the configuration section of this manual before proceeding.

NAVIGATION BAR

Except on certain menus that have special purposes, the navigation bar shown below will be visible in the upper section of the screen. Each section will be discussed separately in this manual.



Continued in next page...

Pressing the **Menu** button opens a drop-down menu to access other menus.

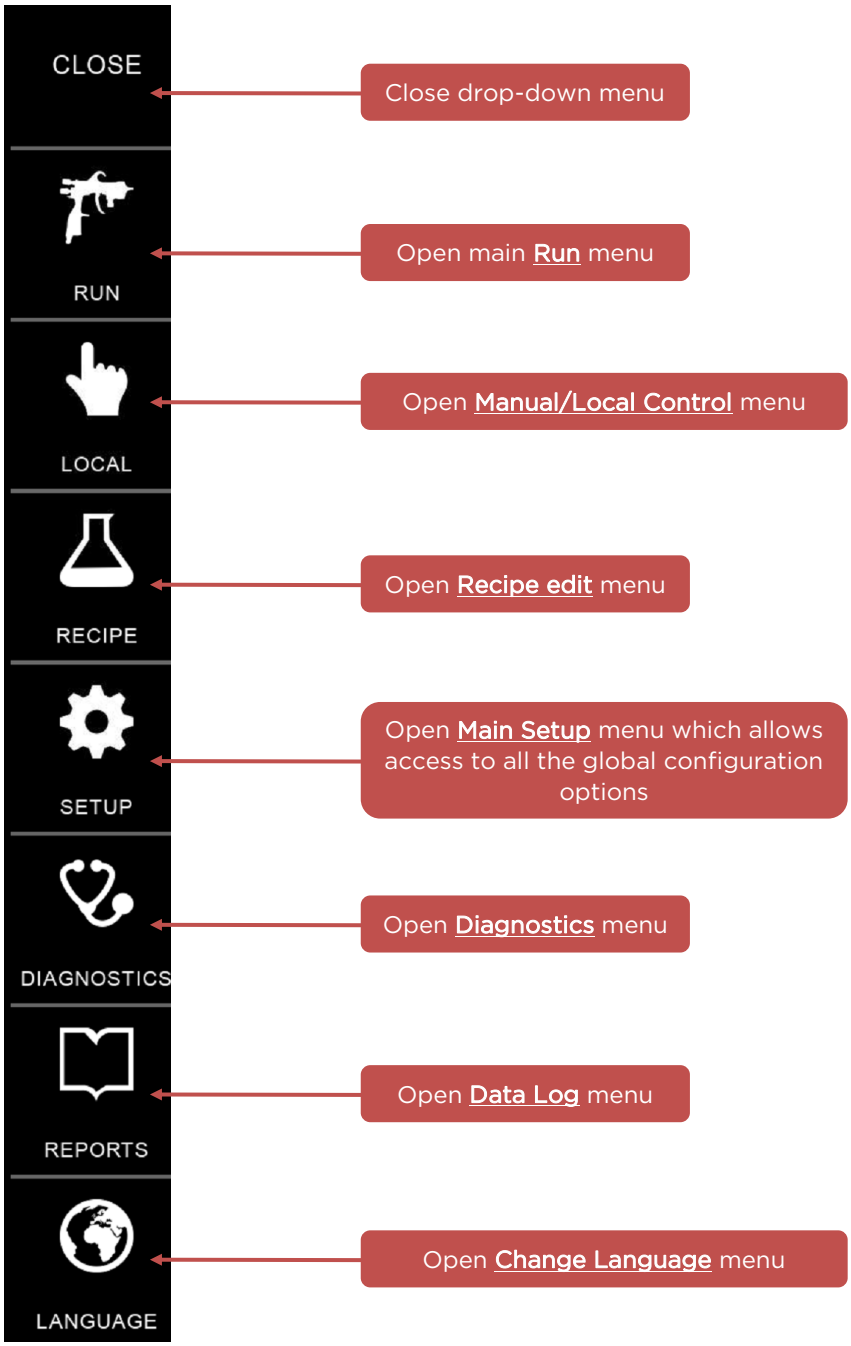
Pressing **User** opens a dialog menu that allows log-in, log-out, and other functionality available to the administrator.

Pressing **Alarm** opens the alarm status/history menu.

Pressing **Log** opens the main data-logging menu.

Drop-down menu

Options available on the drop-down menu are shown below. Access to specific functions may be limited by the administrator for some users.



LANGUAGE SETTINGS

System Languages can be chosen by selecting the 'language' icon (a) at the bottom of the menu drop down, and selecting the desired language from the list (b) to the right.

NOTE

Some objects, such as user-editable fields (station, gun, channel, and output names for example), as well as some menus that are not part of the run-time project such as Exor's internal HMI menus can not be translated in run-time

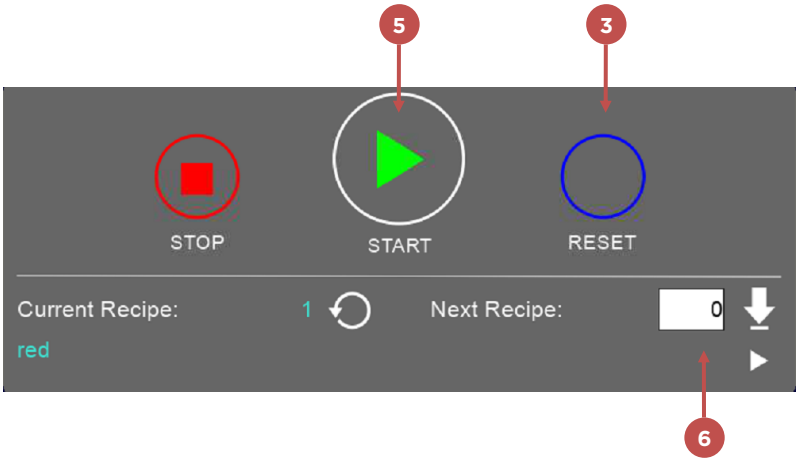
RUNNING THE SYSTEM

Loading recipes

For each station, up to 250 user recipes may be stored. It is recommended that each material being used will have a dedicated recipe. Recipes may be loaded from the operator interface of the RF2, or through commands from a supervisory control process.

To load a recipe from the operator interface, perform the following steps in order:

1. Navigate to the **Run** menu using the drop-down menu
2. Ensure all faults are reset
3. The Run menu will show a brief list of active alarms if any exist. If not, press the 'Reset' button to clear any alarms, or perform further troubleshooting if necessary.
4. If the RF2 has been configured for two stations, select the appropriate station
5. Press the 'Start' button to place the station in run-state. (Text will change to "Running")
6. Select the appropriate recipes from the dialog.
7. Press the 'Load' button to start the load sequence.



When the load sequence starts, the station will determine if a flush is needed prior to running a load sequence, and then run the appropriate sequences to load material. While this is happening, the bottom of the Run menu will show which sequence is loading, and all Start/Stop/Reset and recipe-select functionality will be unavailable during this time.

When the load sequence has been completed, the material is loaded and the station is in run-state, the system will respond to trigger and flow commands for any Guns/Mixers that are configured for the station, and control accordingly.

Editing recipes

To modify or view recipe parameters, select **Recipe** from the drop-down menu.

The **materials** section of the recipe menus will open. Along the top of this menu, and the other recipe menus, Mix / Guns will be available if configured in the selected station or greyed out if they are not configured.

Access to channel-recipe data is located at the bottom of the 'Mix/Gun' recipe menus and will be available based on the number of channels that are configured for the selected Gun/Mixer. Channel A, B, or C will navigate to the settings page for the physical channels 1-4 depending on which channel is configured for each gun/mix channel.

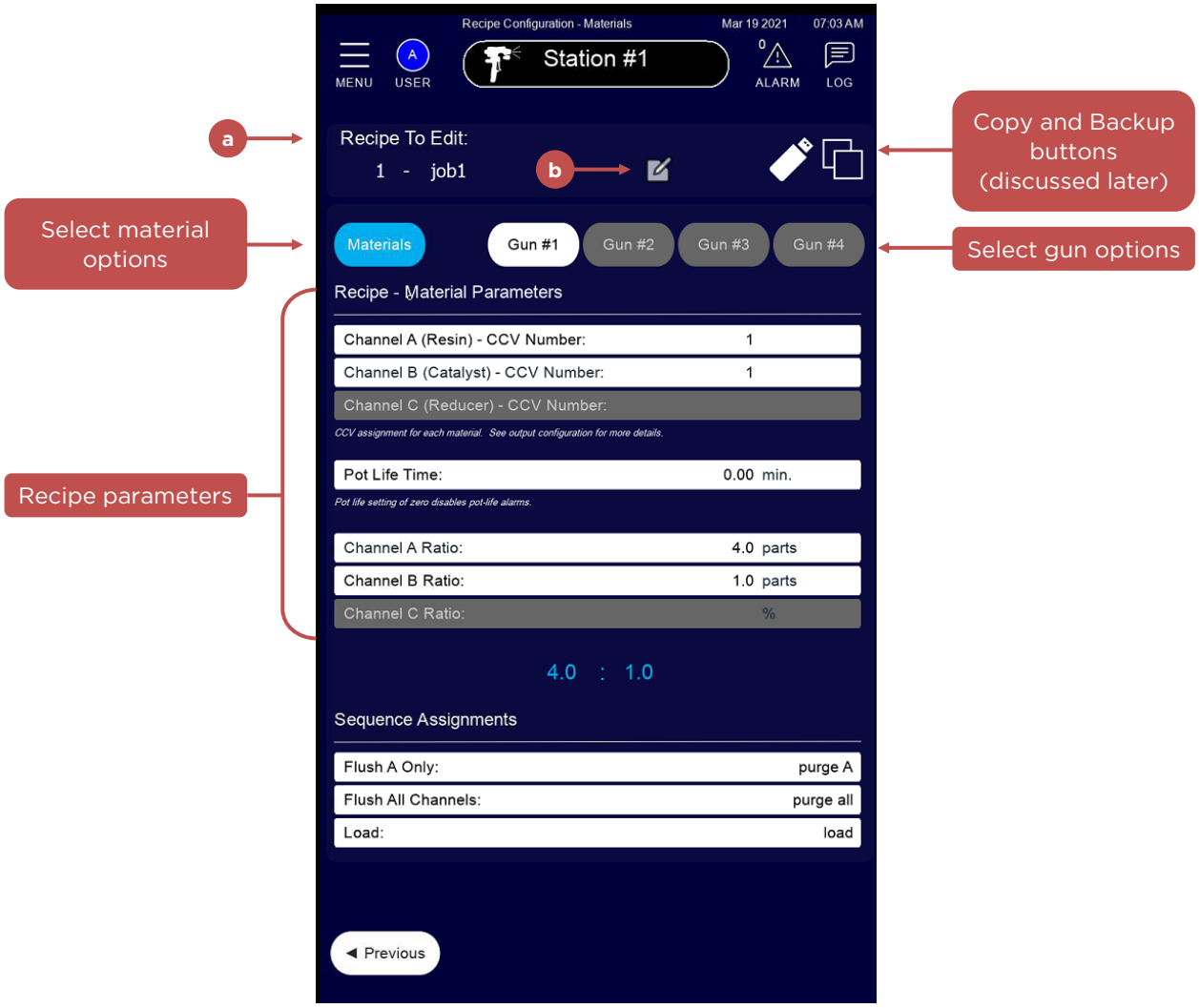
To select a recipe to modify, press the field showing the 'Recipe to Edit' (a) which will open a pop-up dialog which allows the selection from the list of recipes. Use the arrow buttons to scroll through the list – there are 250 recipes available per station.

To modify the selected recipe's description, press the 'pencil' (b) icon next to the current recipe description to open the dialog.

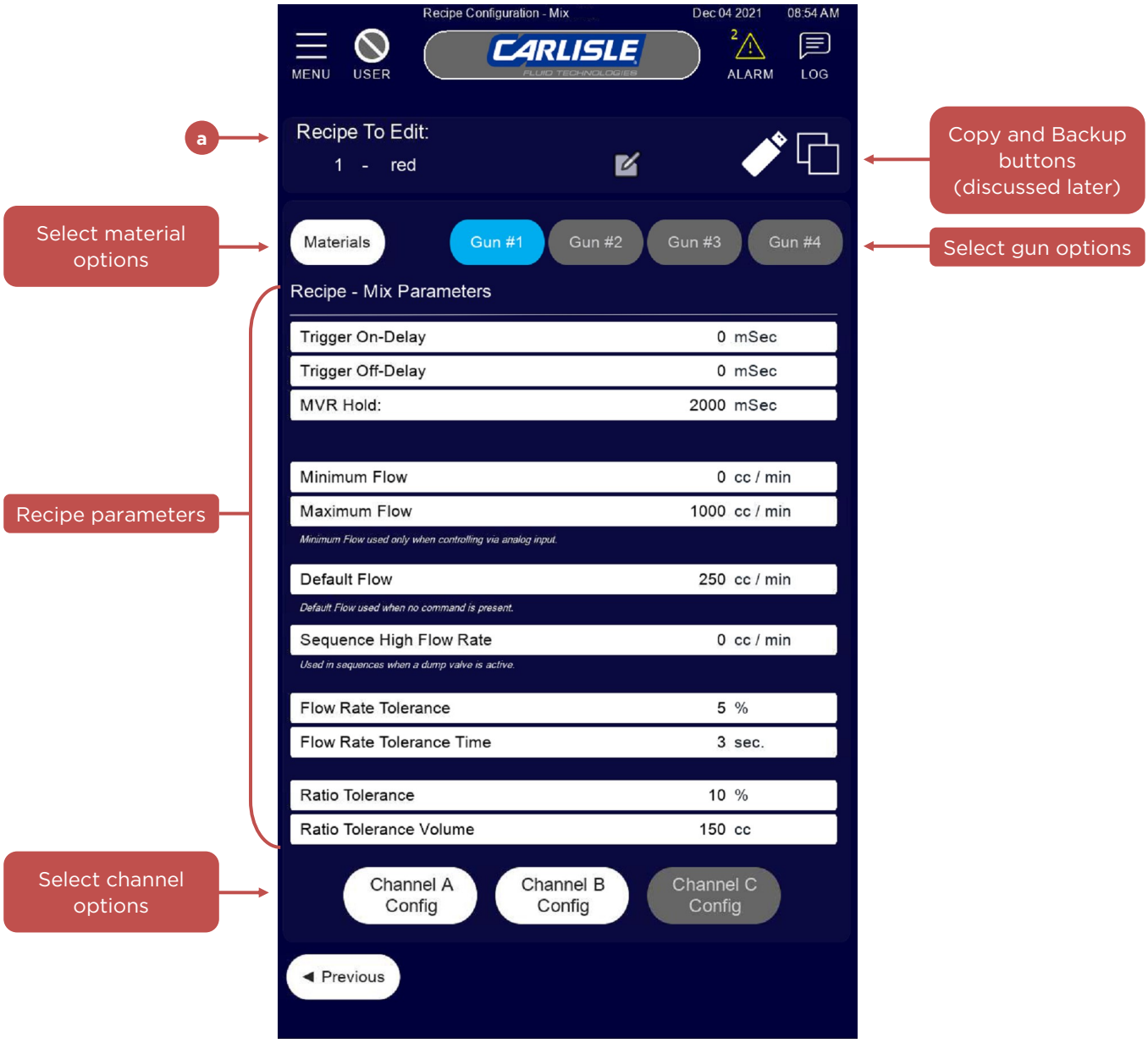
Modify the recipe parameters as desired in each of the recipe menus. See the 'Recipes' section of the 'Process Configuration' chapter for more information about the individual recipe parameters.

Screens may vary depending on whether you are modifying materials, guns/mixers or channels within a recipe.

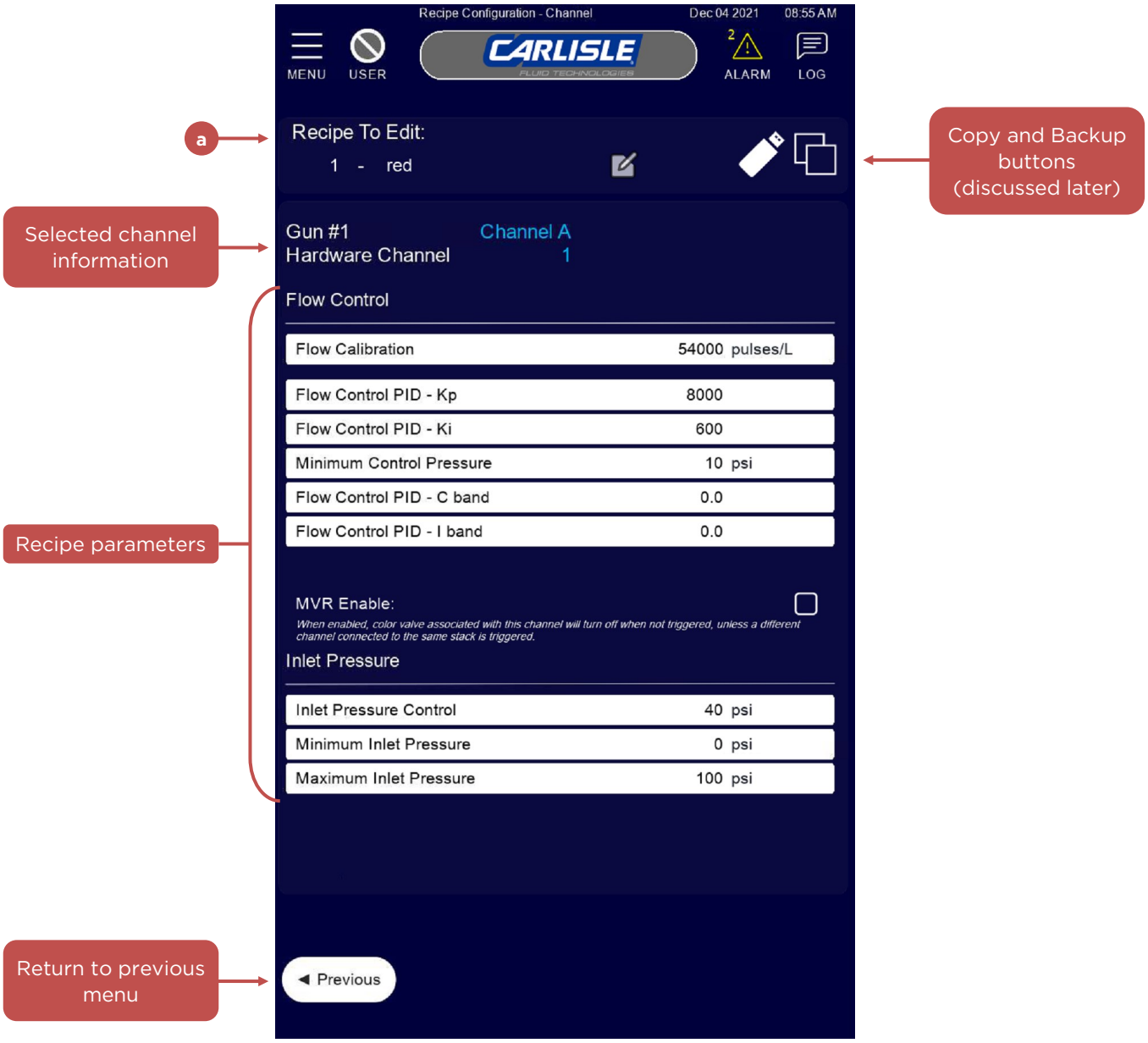
Material editing screen



Gun/Mixer editing screen



Channel editing screen



NOTE

In this screen, accessing the calibration settings for the flowmeter will open the calibration dialog allowing a calibration process to be performed

Copying recipes

Pressing the **Copy** icon near the top of the recipe edit menu will open the copy dialog. From this menu, choose the 'source' recipe and the destination locations (1-250) which represent the 250 recipe data registers that are available in the selected channel. Multiple destinations may be chosen at once but may result in longer processing times.

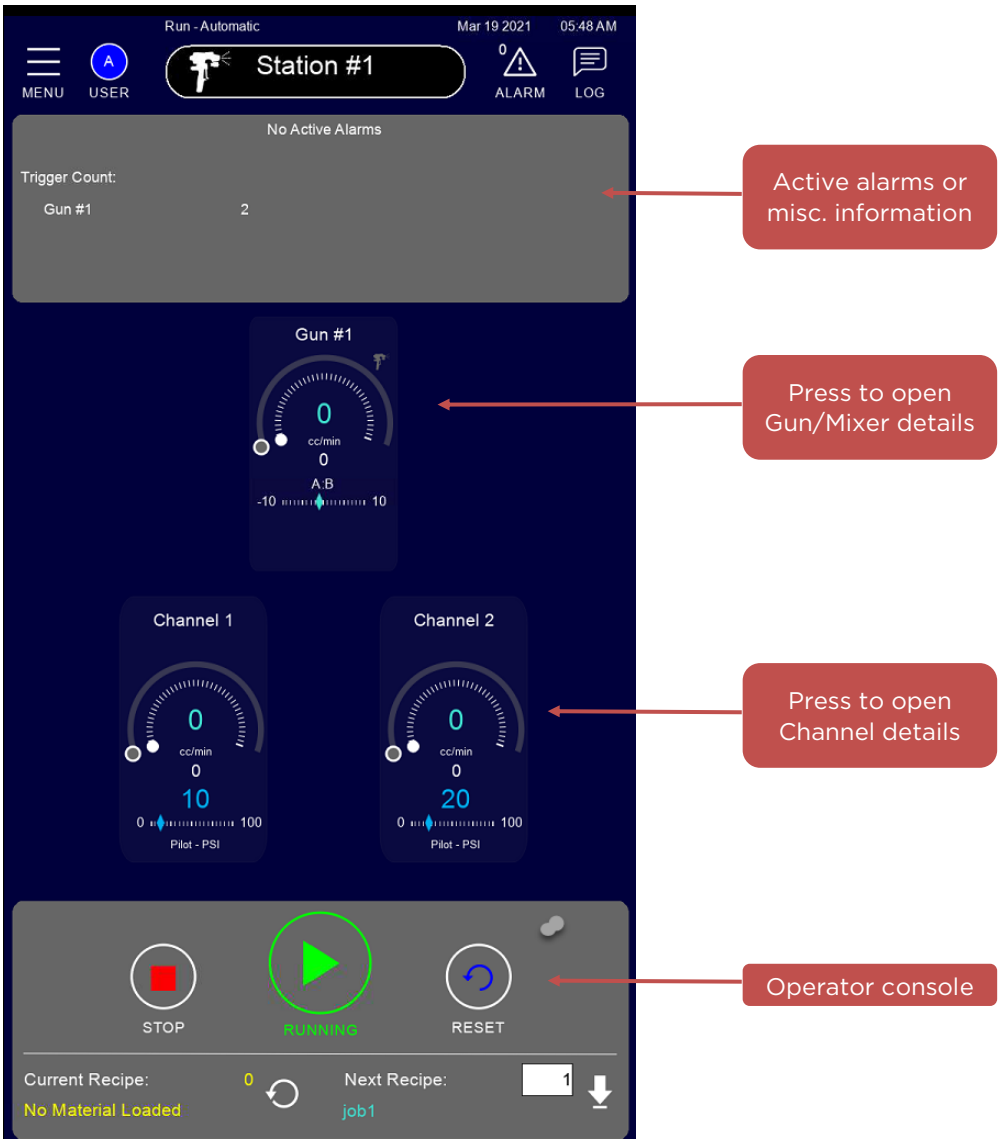
When the source and destination fields have been set, pressing copy will copy all data from the source recipe to each destination location in the range, adding a "#" to the description for each.

Operating the system manually/locally

Though the RF2 will most commonly be placed within a process where it will receive automatic commands, such as trigger, flow rates, and load recipes / materials, it is possible to operate it from the local interface as well.

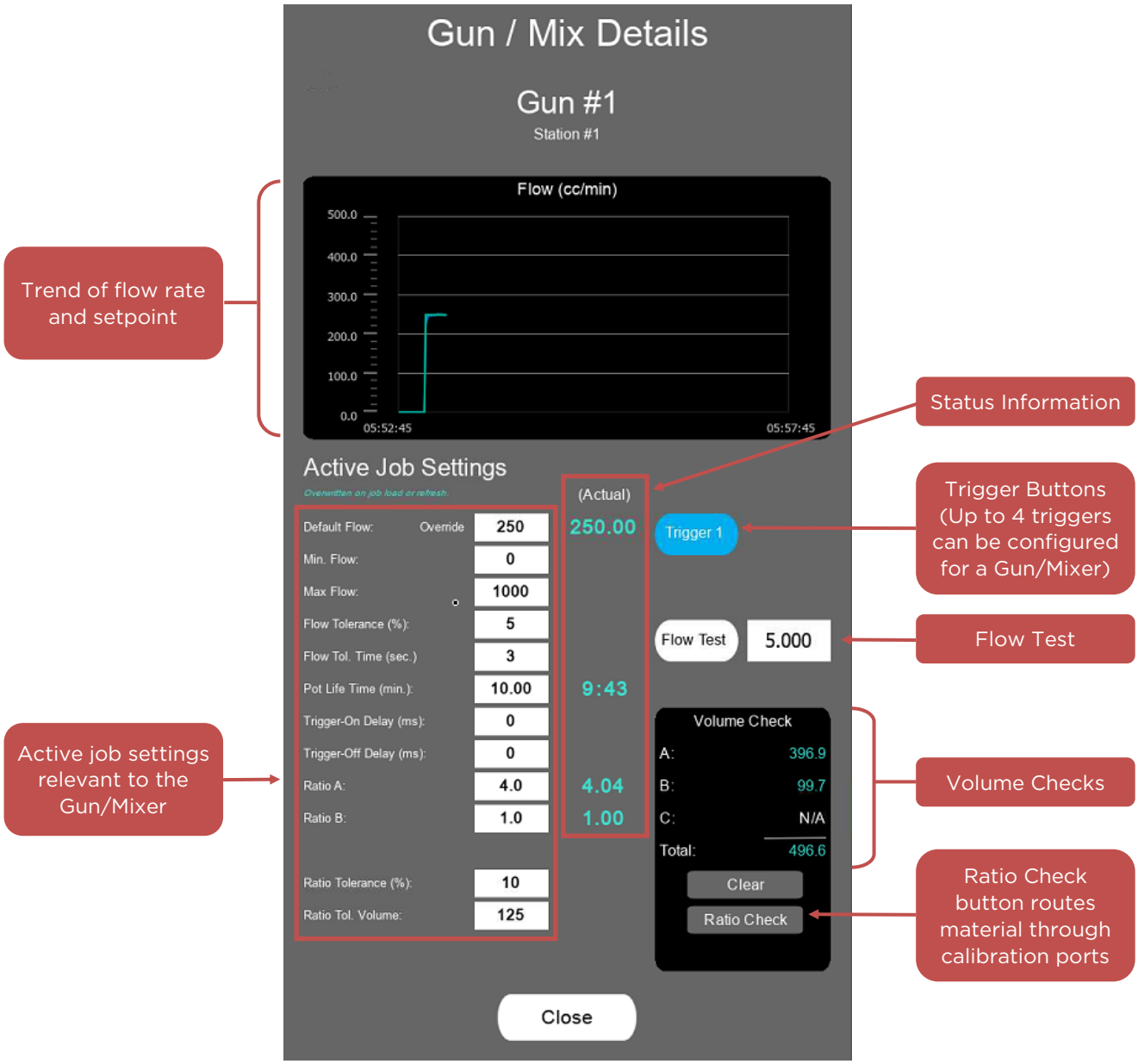
To operate the RF2 from the main panel, after a material has been loaded:

1. Navigate to the Run Menu.



2. If the RF2 is configured as a multi-station controller, select the station you wish to control.

3. Press the 'Gun / Mix' panel for the unit you wish to control, this will open a popup dialog that shows details for the selected gun or mixer.



4. If the logged-in user has permission, the active setpoints from the recipe that has been selected will be editable. If not, the settings will be view-only.

    - One of these settings is the default flow rate for the recipe – if operating from the interface, it may be desirable to press the override button, which allows this setting to take precedent over any auxiliary setting that may be coming to the RF2 either through a discrete analog signal, or via a fieldbus command. The active flow rate command is shown to the right of the default flow setpoint.

5. On the right side of the panels are 'trigger' buttons which will trigger the applicators assigned to this gun/mixer. If multiple triggers are active at once, the flow rate for the gun/mixer will be the command multiplied by the number of triggers active. Pressing the trigger button will toggle the trigger active / inactive.

NOTE

Only triggers that have been assigned to the gun/mixer will be visible on this menu – in most cases only one will be configured

6. Pressing 'Flow Test' will cause 'Trigger 1' to turn on for a given period of time, which can be set here as well.
7. Status information for the gun / mixer is shown throughout this display.

In the volume check, running totals for all materials are shown in cc or mL. When not triggering, press 'Clear' to clear the totals.

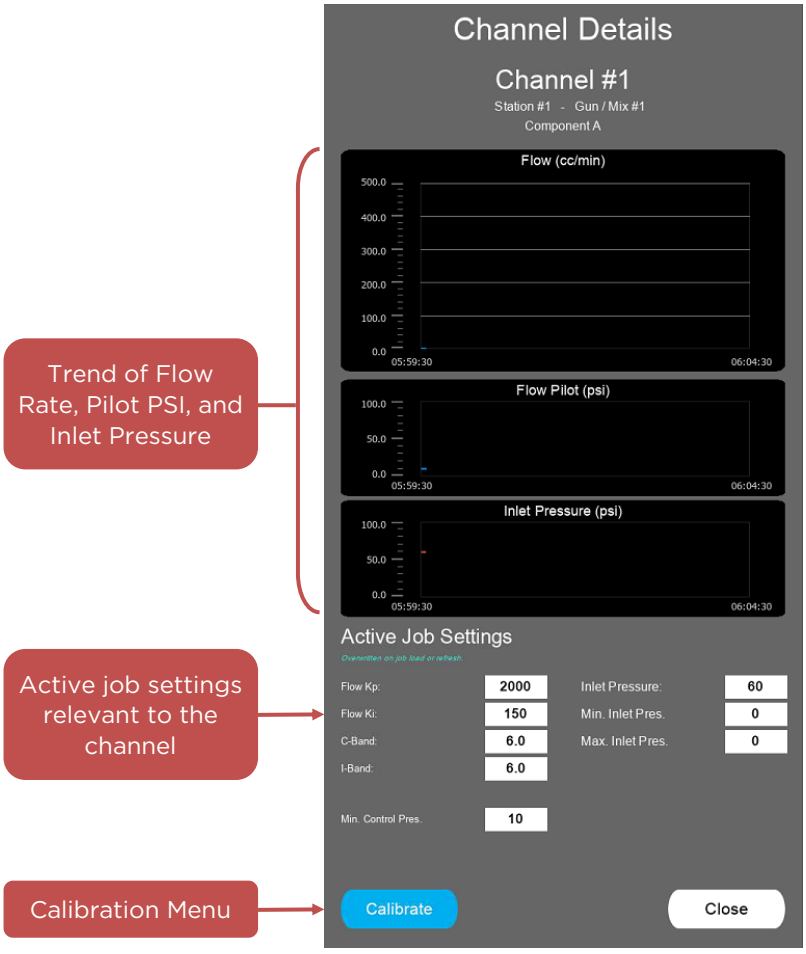
The 'Ratio Check' button will cause material to be diverted from the gun trigger to the calibration test ports for all materials (if configured). This allows the user to position beakers under these ports to catch the material to do a quick flow check on all materials to compare them to the calculated volumes.

Channel menu

From the Run Menu, pressing any of the 'channel' panels that are shown will open a pop-up dialog showing status and active settings for that channel.

If the user has permission, they will be able to **modify** the active recipe parameters. Without permission, the values will be **view only**.

Status information is shown throughout this display.



Alarms menu

On the main navigation bar, the alarm icon (a) will change color and show an alarm count if an alarm exists. Pressing the icon will open the following menu.

On the Alarm menu, the top list shows active alarms, and the bottom list shows historical alarms.

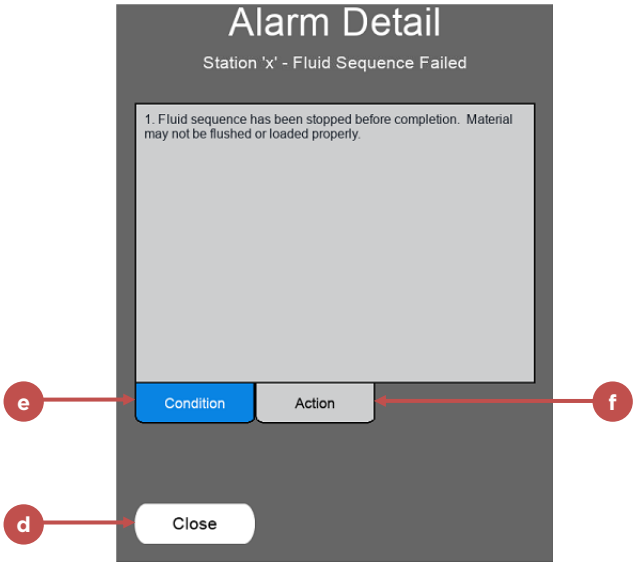
To see more details about an alarm: In the active alarms list, on the right side of any row containing an alarm is a button under the 'Action' column (b). Pressing this button will open a pop-up dialog which explains the condition and gives some actions.

Active Alarms: If an alarm is active, it will be listed in the top list on the Alarm Menu.

Historical Alarms: In the historical alarms list, the duration of the list can be selected through the drop-down combo box. Additionally pressing 'Backward' and 'Forward' will scroll through the list, as will sliding the list up and down.

To reset an active alarm: Press 'Reset Alarms' (c) above and to the left of the active alarms list, or press 'Reset' on the Run Menu. If the alarm condition has been cleared, the alarm will clear from the list and be shown only in the historical alarm list.

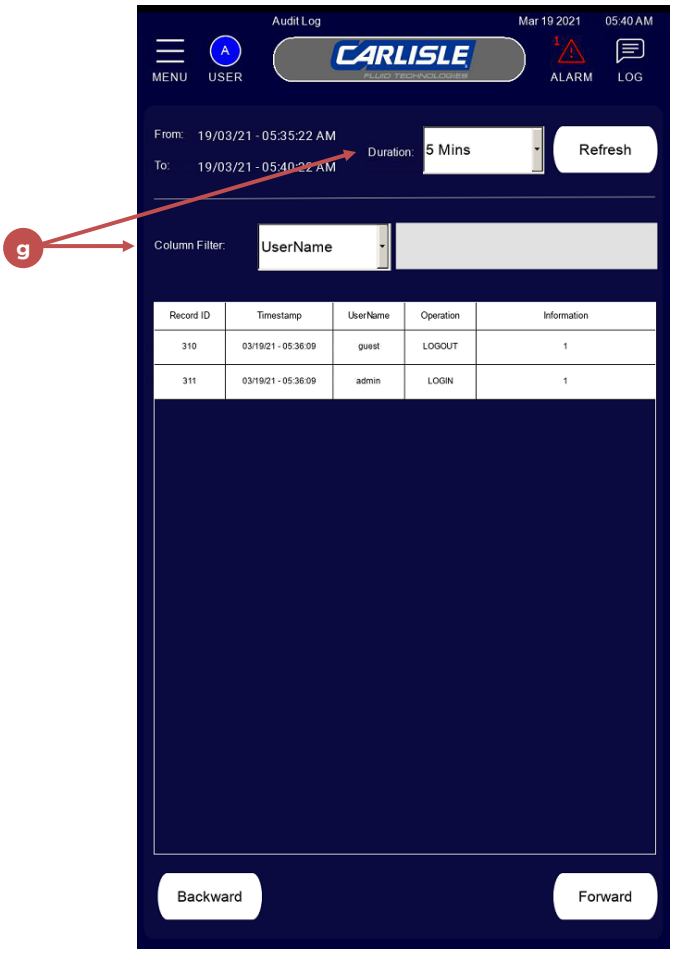
In the alarm detail pop-up menu, press ‘Close’ (d) to exit the menu, ‘Condition’ (e) to see the list of conditions that may cause the indicated alarm, and press ‘Action’ (f) to see a list of potential corrective actions.



Audit log

On the top-right of the Alarm menu, the ‘Audit Log’ button will open a menu showing events that have been captured by the system.

The audit log menu can be filtered (g) by user, and duration.



CALIBRATION

Flow Meter calibration

Calibration of the flow meter is recommended for each individual material that is run. This is because materials of different viscosities may cause the gears within a flow meter to turn more or less than others.

Further, at low flow rates (less than 100 cc/min) flow meter operation can depend on the flow rate. Therefore, it is also recommended to calibrate material at close to the nominal flow rate for the process.

Calibration data is stored in recipe data. The calibration menu may be accessed from the recipe-edit menu or from the channel detail pop-up menu, accessed from the Run menu.

To calibrate a square wave flow meter:

1. Load a recipe / material into the system
2. Access the calibration menu, by going through the channel detail popup, or through the recipe edit screen.

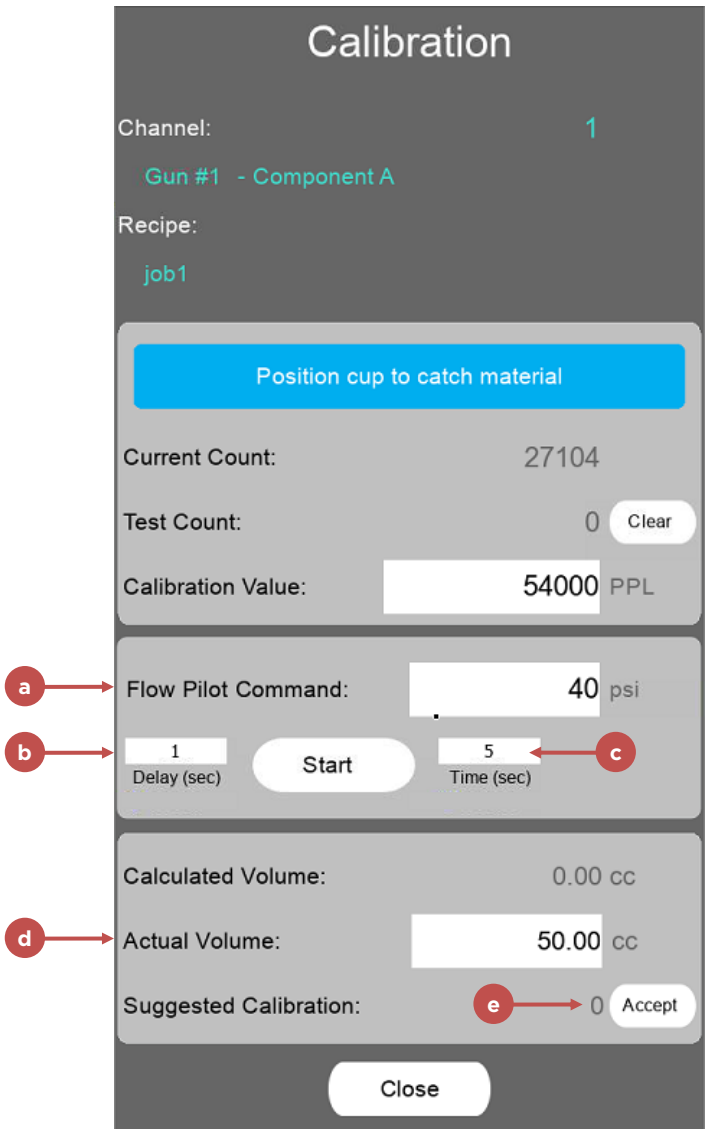
NOTE

A different calibration dialog may open based on the flowmeter type (square wave, or 4-20mA)

3. Place a cup under the calibration port for the channel being calibrated.
4. Set a flow command pilot signal 0-100psi (a)– this will be the command given to the flow-control device during the calibration process. 35psi is a good starting number.
5. Set a delay time (b) (if desired) and a trigger time (c).
6. Press Start. The delay time will occur (in case this time is needed to position the beaker under the calibration port), then the calibration port will open for the set amount of time. The volume of material will be calculated (based on current calibration settings).
7. When complete, enter the measured amount of material into the 'Actual Volume' field (d). A suggested calibration will be calculated based on the amount of flow-meter pulses that were counted, and the actual volume entered.
8. Press 'Accept' (e) to accept the suggested calibration as the Calibration Value.

Alternatively, the calibration value can be directly entered from this menu if desired.

Changes made to the calibration are stored to the recipe parameters for the recipe loaded.



MANUAL OVERRIDE / LOCAL FLUID CONTROL

The manual-override menu can be accessed from the main dropdown menu – or by pressing the mode icon button (a) at the top of the menu bar (not available from every menu).

The Local Fluid Control menu, shown below, allows the operation of individual functions and outputs for maintenance and troubleshooting purposes.

To operate functions manually – press 'Manual Override' (b) – the button will turn yellow, and the icon at the top of the menu (c) will change states to indicate manual override is active.

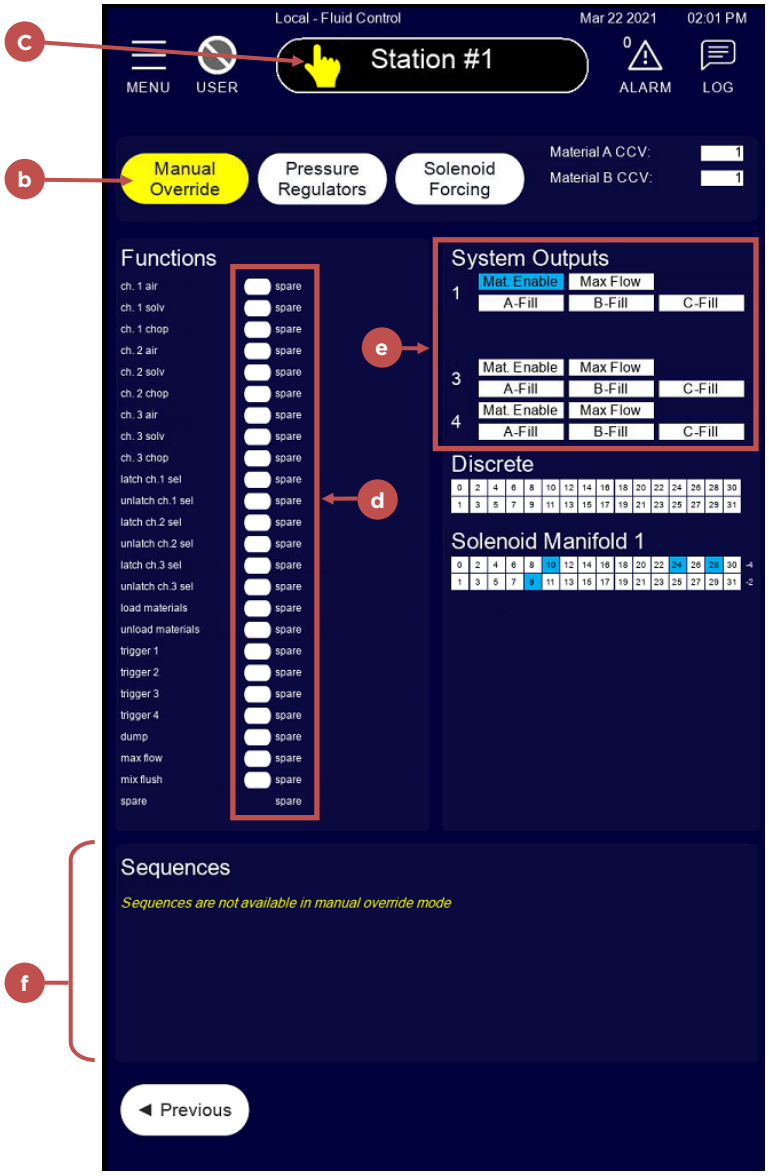
Press the button (d) to the right of any listed function and its corresponding output will activate appropriately as if the function had been activated in a sequence. The output status is shown to the right of the page (e).

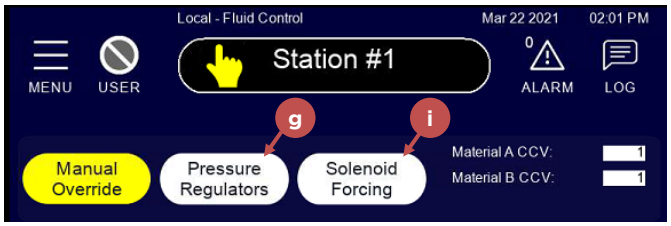
NOTE

Output interlocks that have been configured will continue to work in this mode, so it is not possible to turn on two incompatible solenoids at one time from this menu.

While manual override is active, material A, B, and C color valves (CCVs) can be selected. When a function activates that allows the 'load color' system output to activate, the selected material valves will activate. Unlatching 'load color' will shut all color valves off.

From this menu, when manual override is not active, it is possible to run fluid sequences directly by pressing their associated buttons near the bottom of the menu (f). While active, functions and outputs will indicate their status, allowing a sequence to be viewed in operation from this menu.

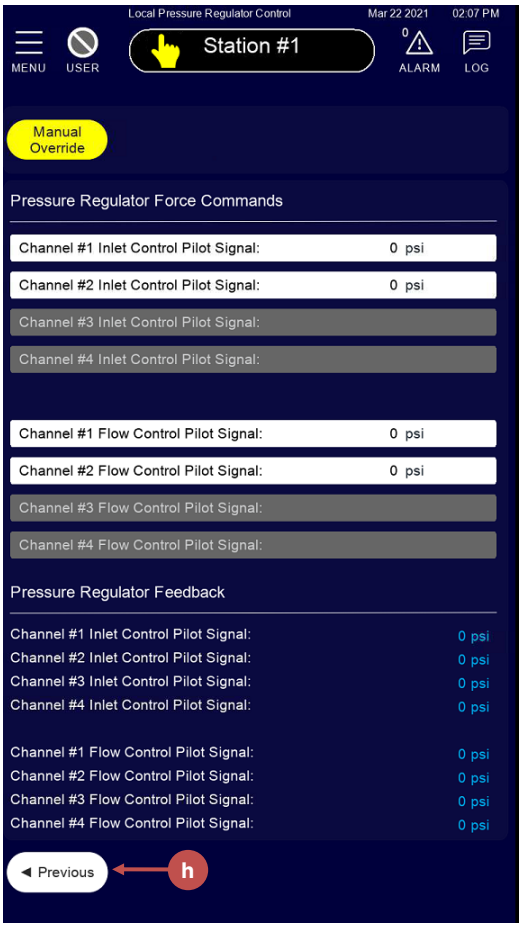




Pressing ‘Pressure Regulators’ (g) from the Local Fluid Control menu opens the menu shown below.

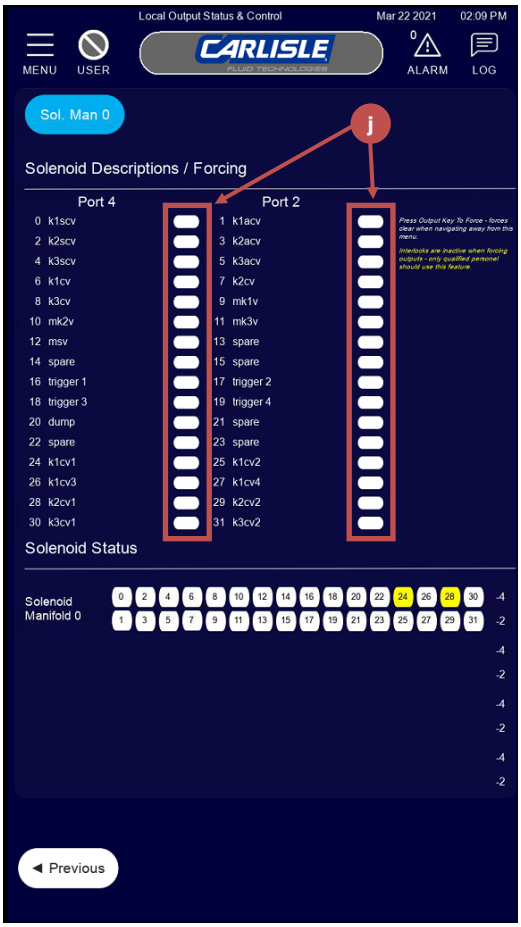
From this menu, manual override mode can be activated and deactivated, and all configured pressure regulators can be operated manually.

Press ‘previous’ (h) to return to the Local Fluid Control Menu.



Pressing ‘Solenoid Forcing’ (i) from the Local Fluid Control Menu opens the menu shown on the right. This menu is only available if manual override is selected.

From this menu, each installed solenoid may be forced on or off by pressing the button (j) to the right of the output descriptions in the list.



WARNING

In this mode, output interlocks are not observed.

SHUTTING DOWN THE SYSTEM

Before shutting down, it is desirable to purge any material that is in tubing to prevent it from clogging fluid tubing, etc.

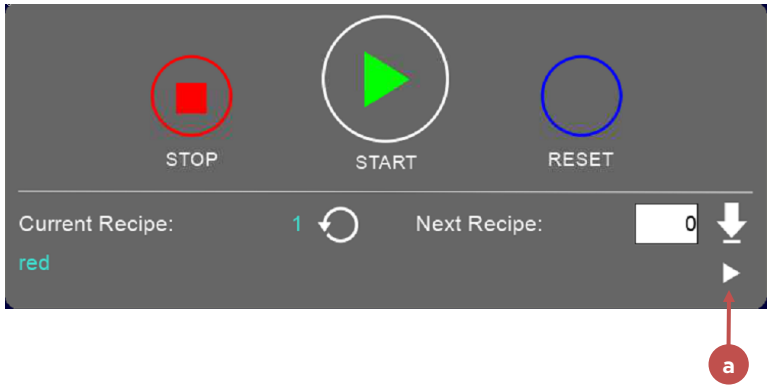
All recipes have a 'Purge All' sequence designated and when the supervisory controller calls a purge command, the system will run that sequence.

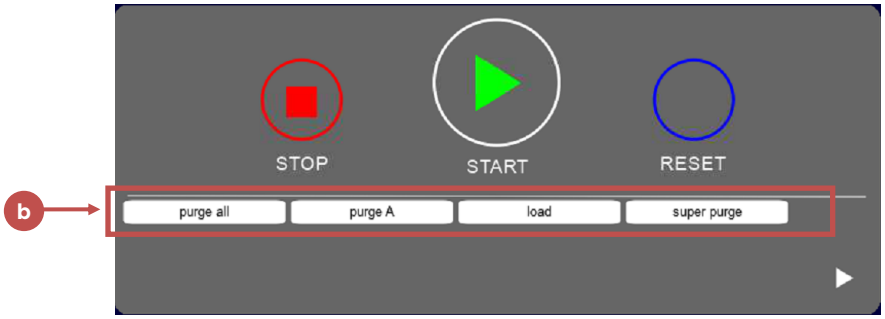
To purge from the HMI – press the triangle (a) button on the bottom right of the start panel on the main run page.

All sequences that have been configured for the selected station will be shown (b) in place of the recipe selection information in the run panel. To run a sequence, the RF2 must be in 'Run' mode, and all interlocks from other systems must be ok. Press the button for the sequence that is desired, and it will run.

For the shutdown purge, press the button corresponding to the sequence that has been programmed to purge all material. 'Purge All' for example.

After the purge sequence has been completed, you can proceed to shutdown the system using the power switch on the right of the system's enclosure.



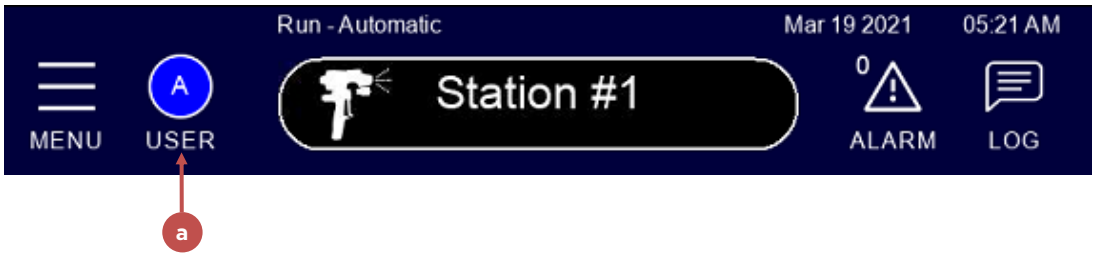


ADMINISTRATOR FUNCTIONS

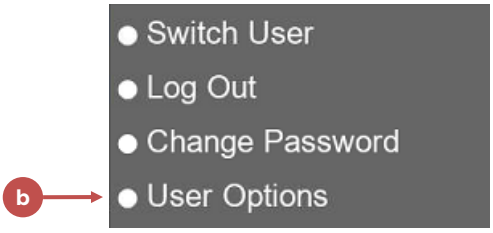
Users that are members of the 'admin' group can access functions not available to other users and to modify access for other users.

User Options

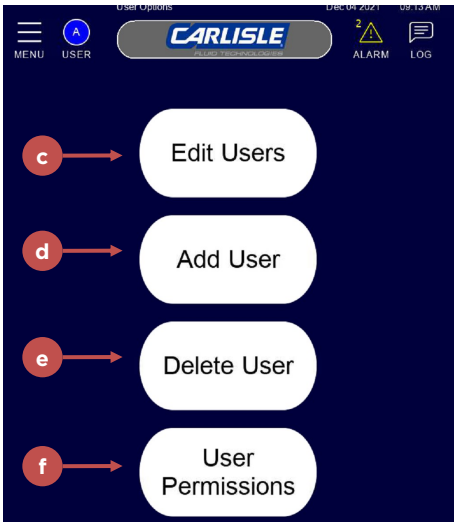
To access the user options page, log in as an administrator and then press the 'user' (a) menu key to open the user actions dialog.

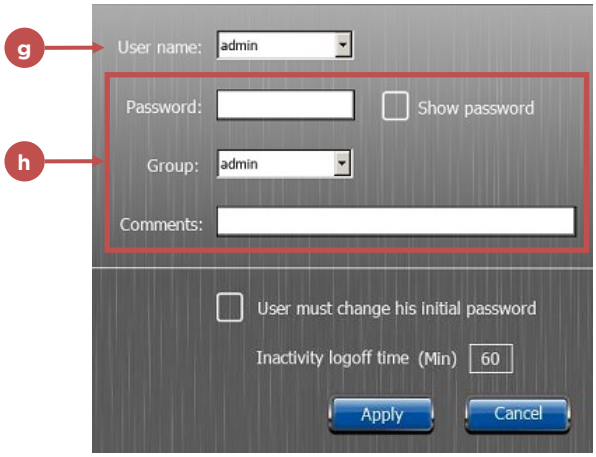


A dialog box will open and the administrator will see an option called 'User Options' (b).



From the user options menu you can Edit users (c), Add users (d), Delete users (e), or change User permissions (f).





Edit user

To edit a user, press the Edit Users menu.

Select the user you want to edit (g)

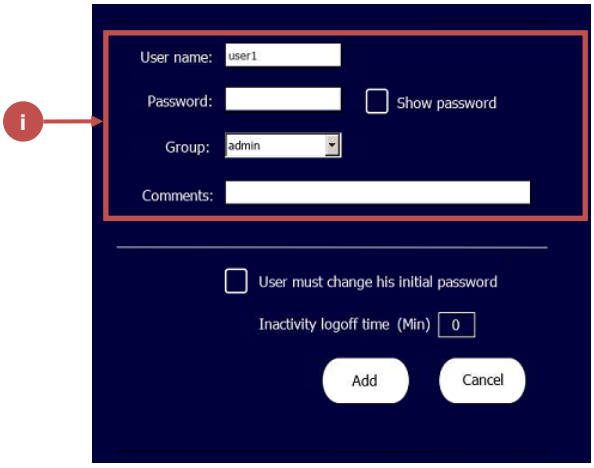
Modify the user's parameters (h). This includes user-group assignment.

Add user

The operator interface supports up to fifty individual users.

To add a user, enter the Add User menu.

Fill in the parameters (i) including user name, group assignment and initial password.

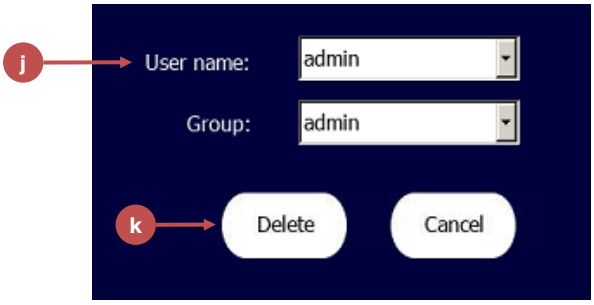


Delete user

To delete a user, enter the Delete User menu.

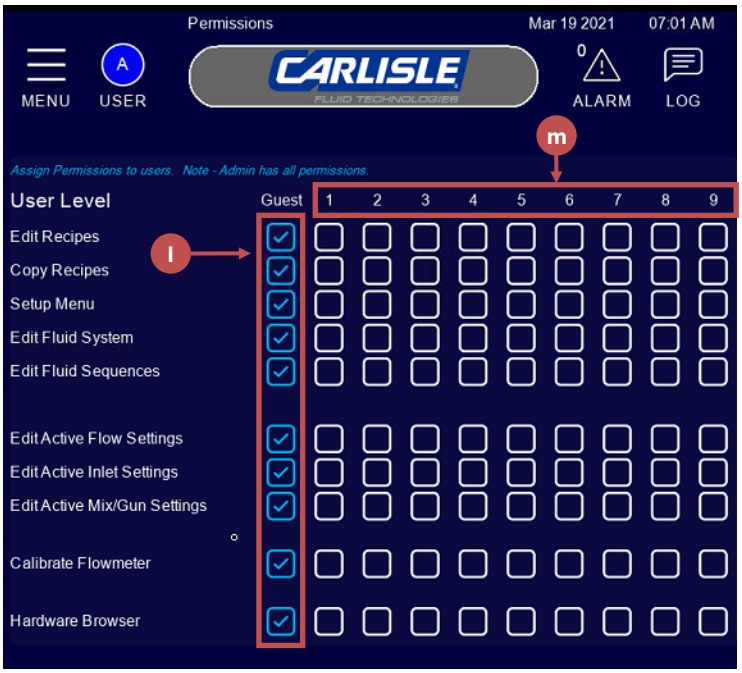
Select the user (j) you want to delete.

Click on delete (k).



User permissions

Various functions within the operator interface can have their access controlled depending on their group assignment. See more details about this in the 'Security' section in the 'Process Configuration' chapter. To assign rights to different user groups, enter the 'User Permissions' menu from the User Options menu, and select or deselect access for each function (l) by user level (m).



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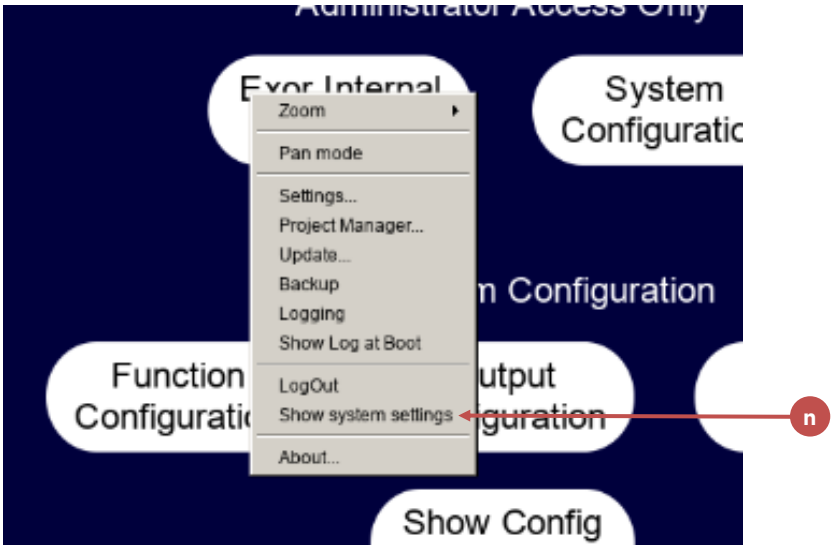
Disabling Cloud Access

Although the cloud access feature of the RF2 is a great way to allow diagnosis, troubleshooting and updates to the equipment, some customers may not wish to utilize this service.

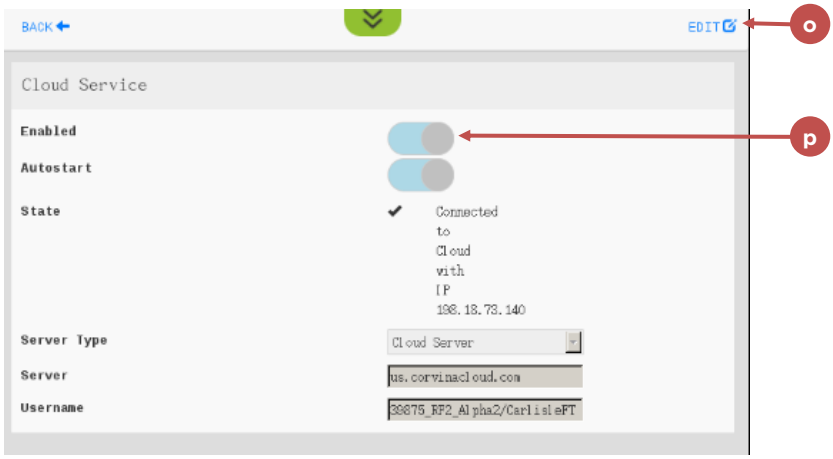
Access to the RF2 via Exor's Corvina Cloud service can be disabled in two ways:

1. Disconnecting the RF2's physical 'Cloud' RJ-25 port from a network connection.
2. Through the Exor's internal menu:



From the settings menu (when logged in as an administrator), press 'Exor Internal Menu' and select 'Show system settings' in the dialog box that opens (n)

In the settings menu that opens, press 'Services' and then 'Cloud Service' to access the menu shown below.



In the Cloud Service menu, press 'Edit' (o) at the top right, and then click the 'Enabled' slider to disable the service (p). Press 'Save'.

Press Back, Menu, Exit to return to the runtime environment.

WARNING

Though unlikely, a malicious actor having access to the RF2 via the cloud service would have the ability to activate the unit remotely. The greatest hazard in this case is the potential for the release of chemicals while no personnel are present. However, this hazard is mitigated if the air and fluid supplies to the RF2 are deactivated when no personnel are to be present (as recommended in the safety section).

If it is suspected that someone has unauthorized access to your RF2. Contact your Corvina Cloud organization's administrator (This could be the distributor of your equipment). If this information is not known, contact Carlisle Fluid Technologies.

SETUP

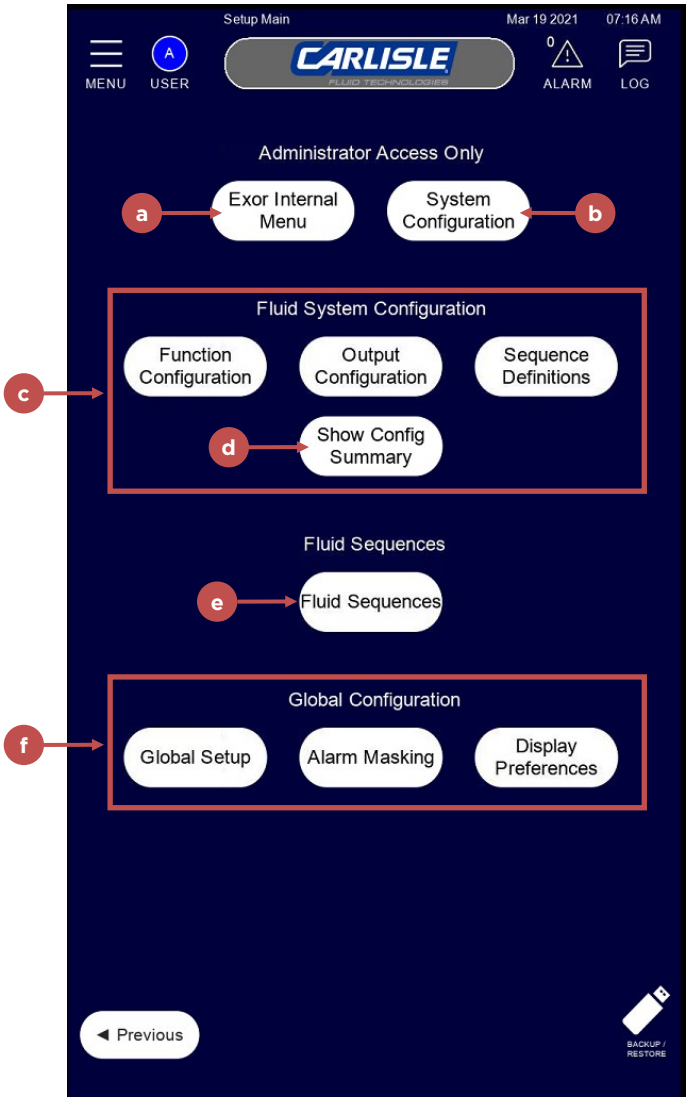
To access the main setup menu, select ‘Setup’ from the main pull-down menu.

On the main setup page, the top two selections are available only to administrators. These are ‘Exor Internal Menu’ (a) which opens a popup dialog allowing internal settings for the Exor operator interface to be modified, and ‘System Configuration’ (b)– which opens the system configuration menu.

The next group of selections involve setting up the ‘Fluid System’ (c) which involves setting up outputs, functions, and overall sequence definitions and settings. These selections are access-controlled by the administrator. The ‘Show Config Summary’ (d) button will open a page showing an overview of the system configuration.

The ‘Fluid Sequences’ (e) selection allows individual fluid sequences, including step timing and order of operations to be modified. This menu is access controlled by the administrator.

The final group of menus (f) are for modifying several miscellaneous parameters used by the system that dictate its behavior.



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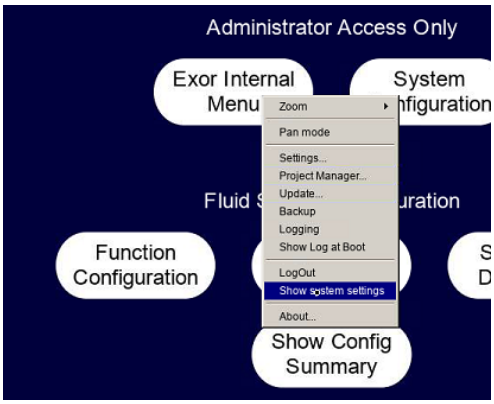
Exor internal menu

The dropdown dialog allows access to the root settings for the Exor operator interface's internal settings. Setting IP addresses for the three networks provided with the interface (described in the Installation section above), and setting the date and time displayed on the panel are the only operations that are necessary to operate the RF2.

For more information, consult the user manual for the Exor eX715 operator interface.



System configuration

System configuration is a group of four menus that are used to define the hardware installed on the RF2:

- Fluid Mix/Guns
- Channels
- Stations and AnyBUS Gateways
- Solenoid Manifolds, Pressure/Regulators, and Analog Outputs

Fluid Mix / Guns

The first page allows the Fluid Mix / Guns to be configured.

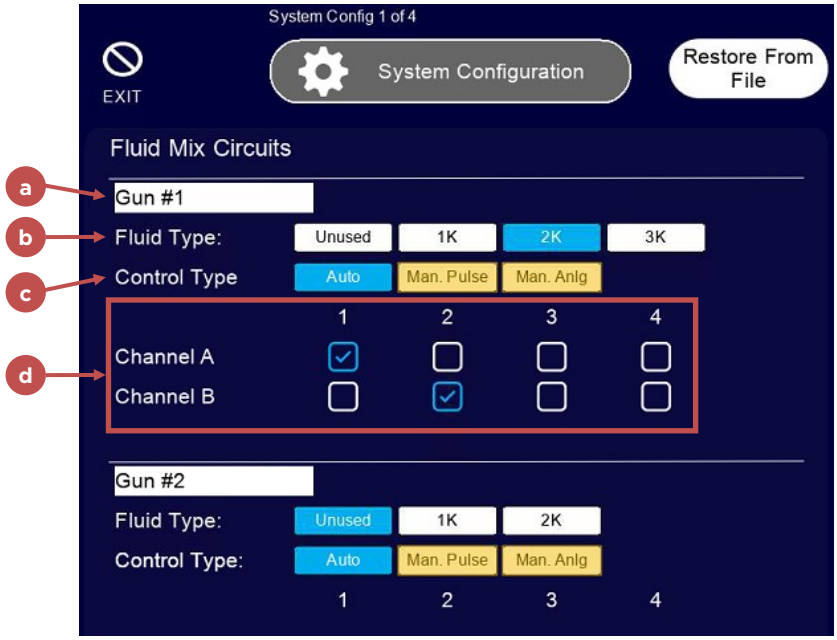
Definitions for each Gun / Mix include:

a. **Description**: Each unit can be named – this name will be displayed on the main menus and will be what is used for referencing the gun / mixer.

b. **Fluid Type**: Unused, 1,2, or 3 component fluids.

c. **Control Type**: Auto, Manual Pulse (Future), Manual Analog (Future).

d. **Channel Selections**: Depending on the fluid type selected, Channels A, B, and C may be available – these can be mapped to physical channels 1-4.



NOTE

Since only four channels are available to the RF2, selections for one of the four gun/mix units will affect the availability of others. For example, if 3k is selected for Gun/Mix 1, then only 1K will be available for the other three units, only one of which will be allowed to use the remaining channel.

NOTE

A physical channel can only be mapped to one channel of one gun/mixer, selecting one that is already selected elsewhere will deselect it in the other location.

Channels

Pressing 'Next' opens the next system configuration menu, for configuration of channels.

Channels that have been selected for use by a gun / mixer in the first system configuration menu will be available for configuration on this page.

Definitions for each channel include:

a. **Description**: Each unit can be named – this name will be displayed on the main menus and will be what is used for referencing the channel.

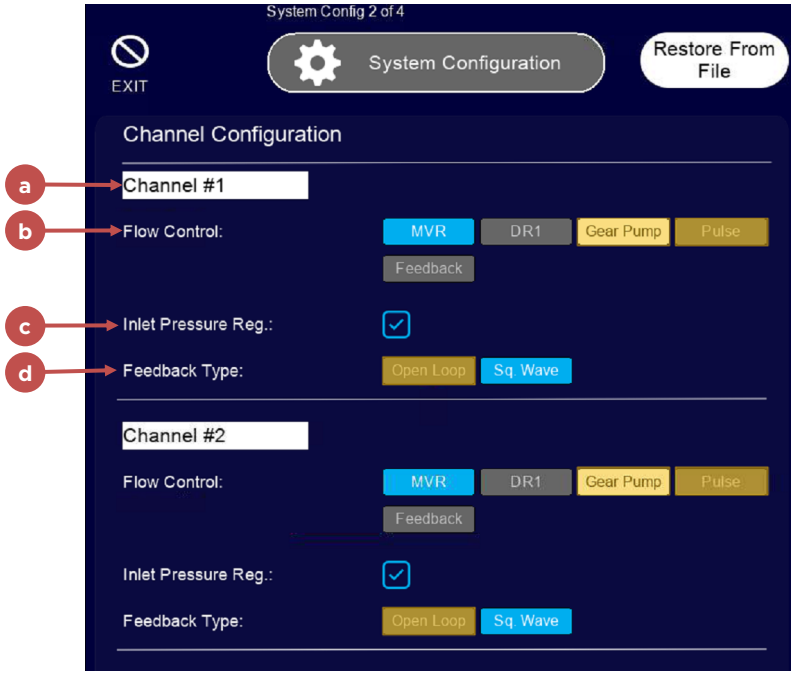
b. **Flow Control**: The type of flow-actuation device that is used by the channel.

- MVR: A Material Volume Regulator is used to control flow.
- DR1: A DR1 or equivalent pressure regulator will be used to control flow by varying fluid pressure. This option is only available for single-component materials.
- Gear Pump: Future option – fluid flow is controlled by a gear-pump.
- Pulse: Future option – fluid flow is controlled by a pulsing valve. This option is only available for secondary (B or C) channels in a gun/mixer.
- Feedback Only: Future Option – flow is not controlled by the RF2 (such as with a manual gun) – this option will only be available for manual systems on the master channel (A).

c. **Inlet Pressure Regulation**: Select if a pressure regulator is to be used in conjunction with a flow control device.

d. **Feedback Type**:

- Square Wave: Flow feedback is given by a pulsing flow meter that has been connected to a High-Speed-Counter input on the I/O block.
- Analog: (Future) Flow feedback is given by an analog flow meter that has been connected to one of the eight analog inputs available on the RF2.
- Open Loop (Future) – no feedback is given – pilot signal only is controlled.



Stations and AnyBUS Gateways

Pressing 'Next' opens the next system configuration menu, for further configuration.

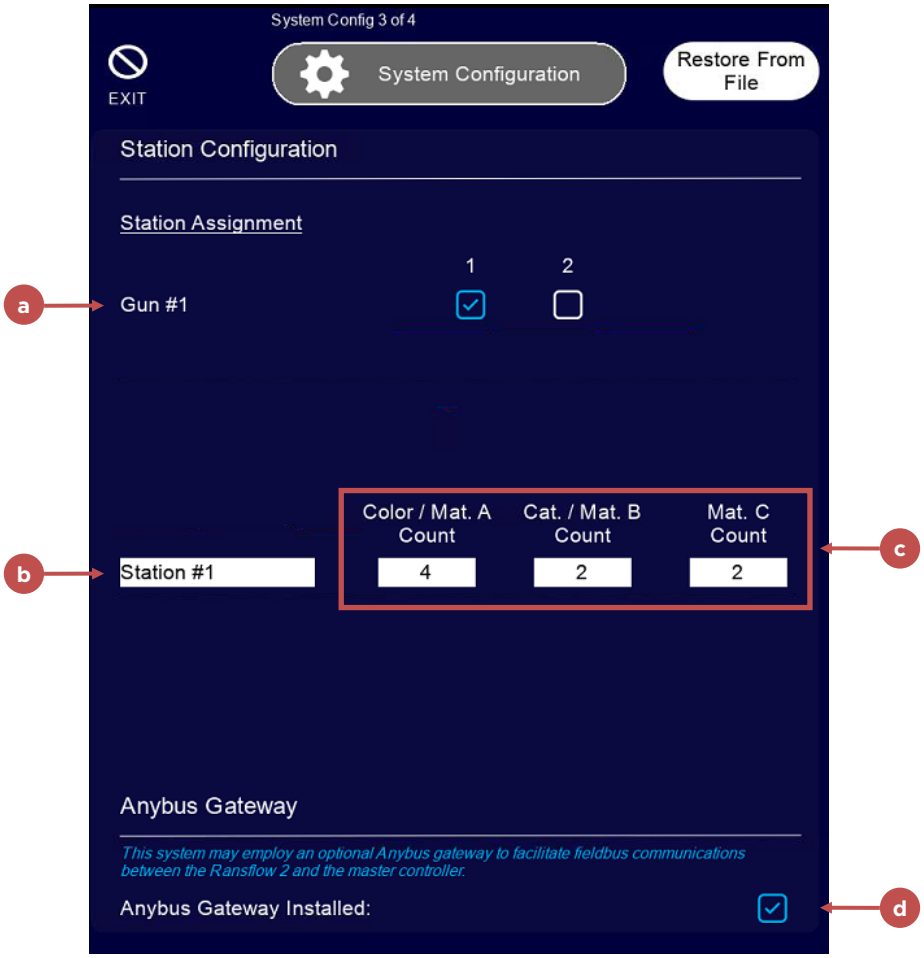
Station definitions include:

a. **Station assignments**: Each gun/mixer configured can be assigned to either station #1 or 2.

b. **Description**: Description for each station, which will be used to reference stations throughout the operator interface.

c. **Material Counts**: For each channel, the amount of solenoid valves available for materials.

Anybus Gateway: If the HMS Anybus gateway is utilized for communications with supervisory processes, this box (d) must be checked.



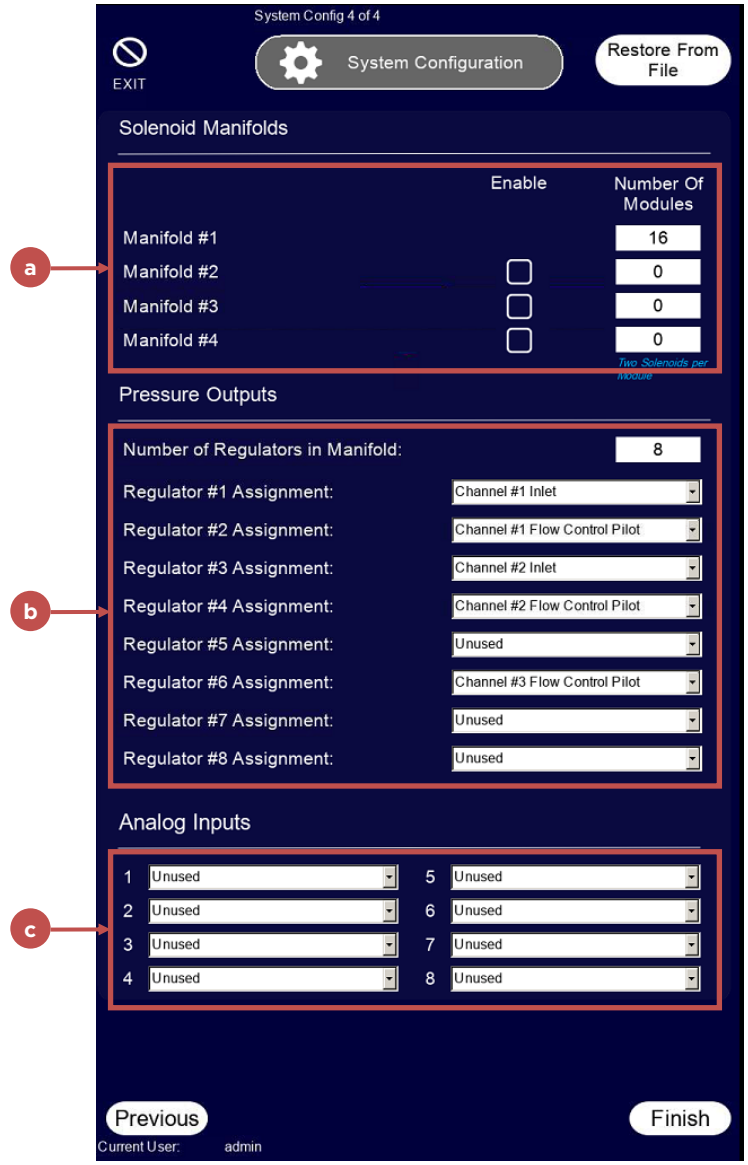
Solenoid Manifolds, Pressure/ Regulators, and Analog Outputs

Pressing 'Next' opens the next system configuration menu, for further configuration.

a. Solenoid Manifolds: Up to four solenoid manifolds may be used by the RF2 (each having up to 16 2-solenoid modules). Manifold #1 is always enabled and must be used.

b. Pressure Outputs: The RF2 can control up to eight pressure regulators. In this section, define the amount of regulators that the RF2 will control, and the assignment for each regulator.

- Regulator assignments include:
  - Channel 1-4 Inlet Pressure Control Pilot: Pilot signal (0-100psi) to a DR1 or equivalent pressure regulation device.
  - Channel 1-4 Flow Pilot: Pilot signal (0-100psi) to an MVR or DR1 that is used for controlling flow.



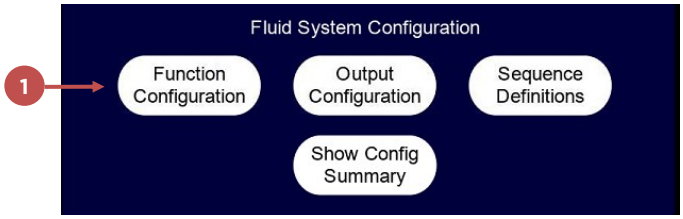
c. Analog Inputs: The RF2 has eight Analog Inputs that can be utilized for different purposes:

- Unused: The analog input is not used by the RF2
- Gun/Mix 1-4 Flow Command: Used as the flow command from an external/supervisory process (PLC or Robot, etc.).
- Channel 1-4 Inlet Pressure: For gear-pump flow actuators, the inlet pressure feedback from an installed sensor.
- Channel 1-4 Outlet Pressure: For gear-pump flow actuators, the outlet pressure feedback from an installed sensor.
- Channel 1-4 Analog Feedback: Analog input is connected to an analog type flowmeter for the channel.
- Station 1-2 Solvent Flowmeter Feedback: Analog input is connected to a solvent flowmeter which is used to verify that enough solvent was used per sequence.

Pressing 'Finish' will save the system configuration parameters and reboot the RF2.

Function configuration

To access this menu, press the 'Function Configuration' button (1) in the Setup Main Menu.



In this menu, the functions can be selected along the left side of the menu. There are fifty functions available per station, pressing the arrow keys toward the bottom of the function list will page up and down.

When a function is selected, its configuration information is shown on the right-hand side of the menu. These parameters can be modified by changing the parameters

Parameters that may be changed are:

a. **Description**: Description of the function selected – often this mirrors the output it works on.

b. **Type**: Type of function (for more information, consult the section System Configuration – Terminology – Functions

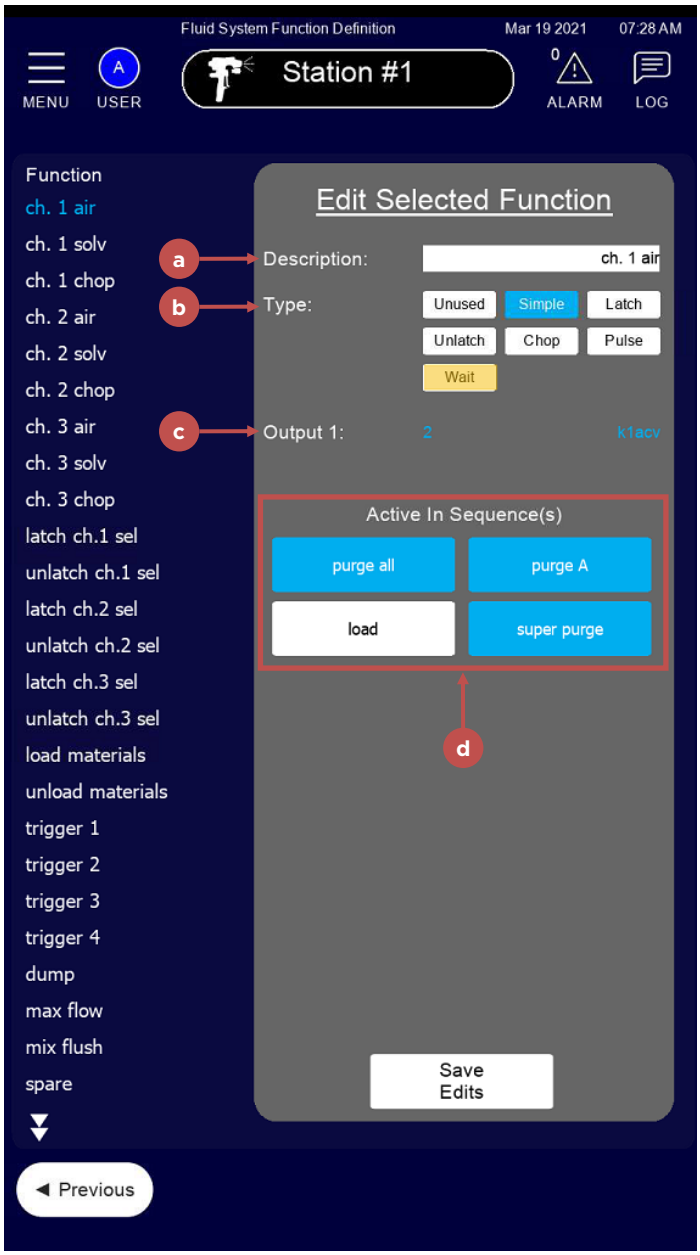
c. **Output 1**:

- For simple, latch, unlatch and pulse types – this is the output that is acted on when the function becomes active.
- For chop type functions, this would be the first output that is active while toggling two outputs.

d. **Output 2**: This is available only for chop type functions, it is the second output in the chop sequence.

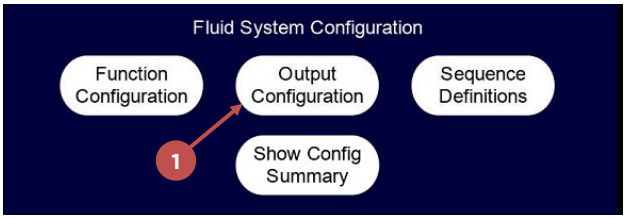
- Pulse Time: Available only for pulse type functions, the time that Output 1 is on during the step where the function is enabled.

e. **Active in Sequences**: Select all sequences that the selected function will be used in.



Output configuration

To access this menu, press the 'Output Configuration' button (1) in the Setup Main Menu.



Along the top of this menu, the various solenoid manifolds that are installed in the system, and the discrete (hardwired) outputs can be selected (a). Only manifolds that are installed will be visible for selection.

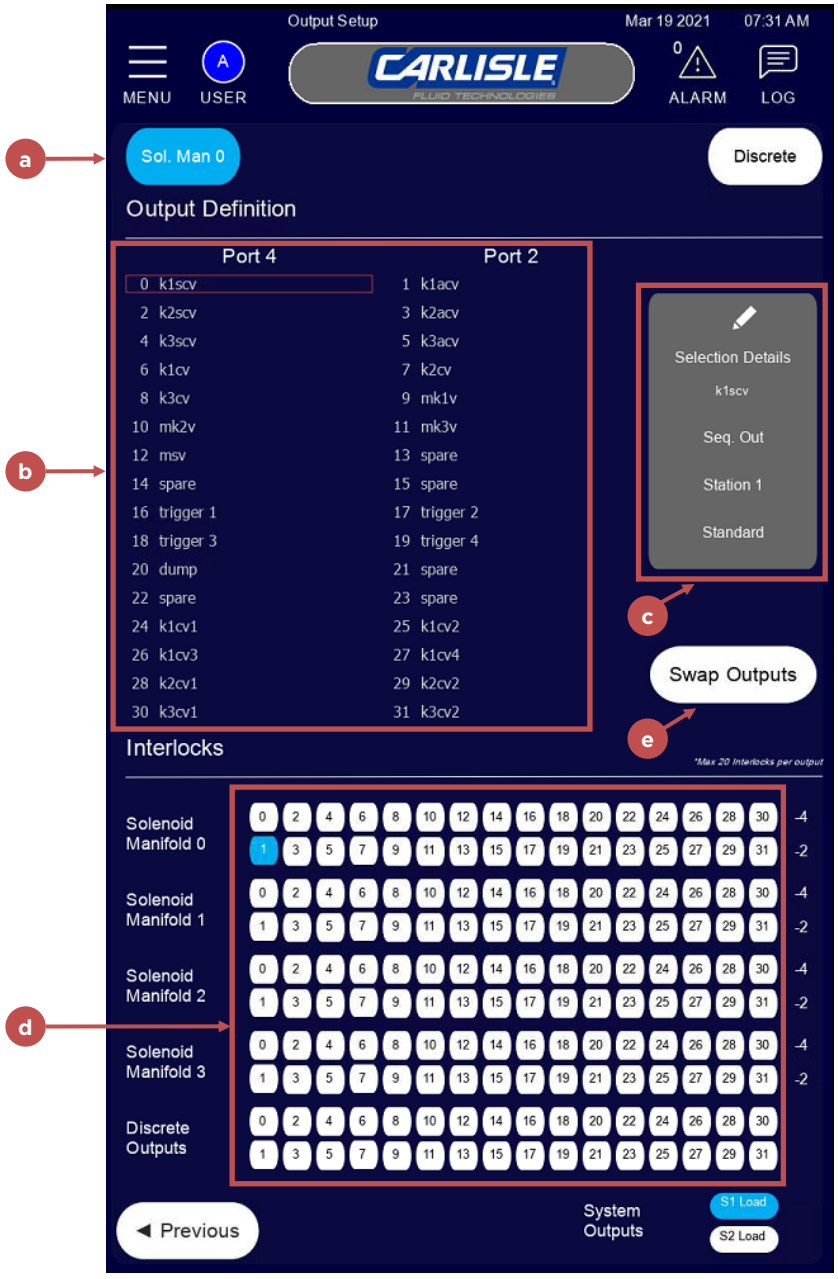
Selecting a manifold causes the list of solenoids in the manifold (b) to be updated. Each Output on the manifold (0-31) can be selected. Note, the outputs are arranged in two columns (Port 4 and Port 2) and their orientation represents the view of the back of the solenoid manifold, looking at the air connections.

Selecting one of the outputs will cause the Selection Details (c) to the right side of the menu to be updated, and the interlocks (d) to be updated.

Output Interlocks prevent two incompatible outputs from being active at any given time. Up to twenty interlocks can be programmed for any individual output. To select or deselect an output as an interlock, simply press the button representing the interlocked output.

If you want to swap outputs, press the 'Swap Outputs' button (e). This process is explained later.

To modify the output details, press the area showing the selection details – this will open a popup dialog menu.



NOTE

System outputs that can be interlocked S1 or S2 load represent that ANY material valve is active. These would be interlocked with solvent or air signals for example. There is no need to interlock various CCV outputs from one another, as the RF2 will only operate one CCV output number at any given time.

Continued in next page...

Parameters to be modified in the 'Configure Output' popup menu are:

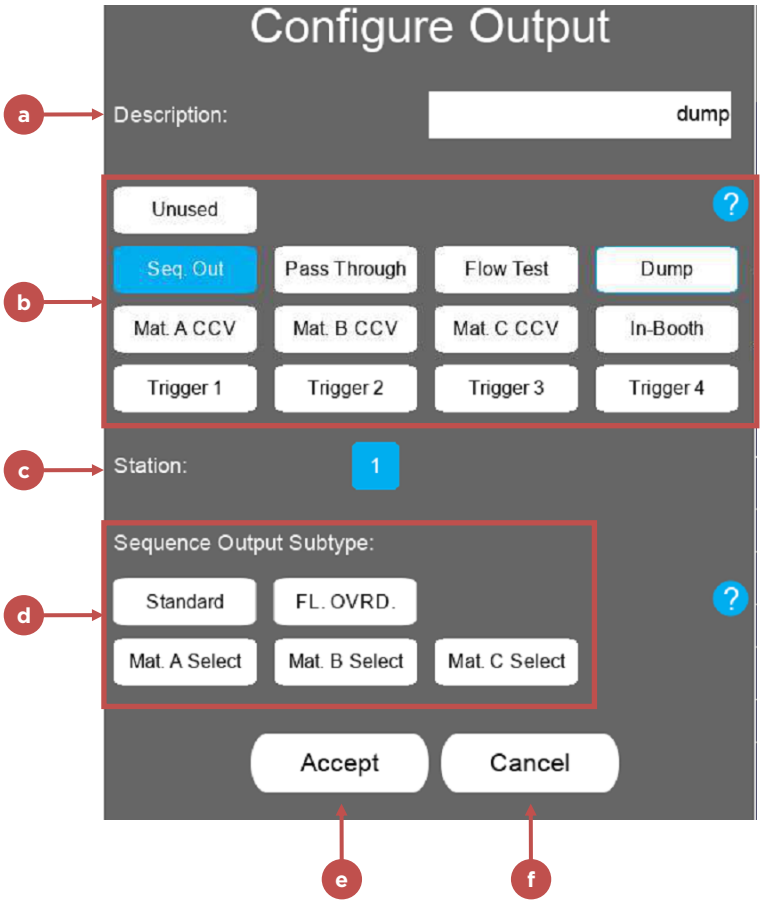
a. **Description**: Description of the output – it is recommended that each output be labeled the same as any tubing labels that are connected to the solenoid valve.

b. **Output Type Selection**: See more about different output types in the section – System Configuration- Terminology – Outputs in page 17.

- Dump – output acts as a trigger and flow will be expected when this output is on.
- In-Booth: Alarm indicator 'Wink-Eye' for in booth controller accessory.

c. **Output ID**: Depending on the type selection, different values will be asked for:

- Station Number: For Sequence Output or Material CCV output types, this represents the station that the output is assigned to.
- Mix / Gun Number: For Trigger output types, this represents the gun or mixer that the output is assigned to.
- Channel Number: For 'Flow Test' output types, this is the channel that the output is assigned to.
- Input Number: For 'Pass Through' output types, this is the input ID that will affect the output.



d. **Sequence Output Subtype**: For sequence outputs that may affect the flow control or its expected behavior in different ways, these subtypes can be selected:

- Standard – output causes no special action on the flow control.
- FL. OVRD – output overrides the flow control device and maximum flow will be expected – any flow control PID functionality will be disabled.
- Material Select – allows material through at the mix block for the indicated channel (A, B, or C). If a gun or mixer is configured with these outputs, the channel will not expect flow if it's mix select valve is not active.

- **CCV Valve Number**: If the output is assigned as a CCV valve for Material A, B, or C – this value is the CCV valve number that will cause this output to activate.

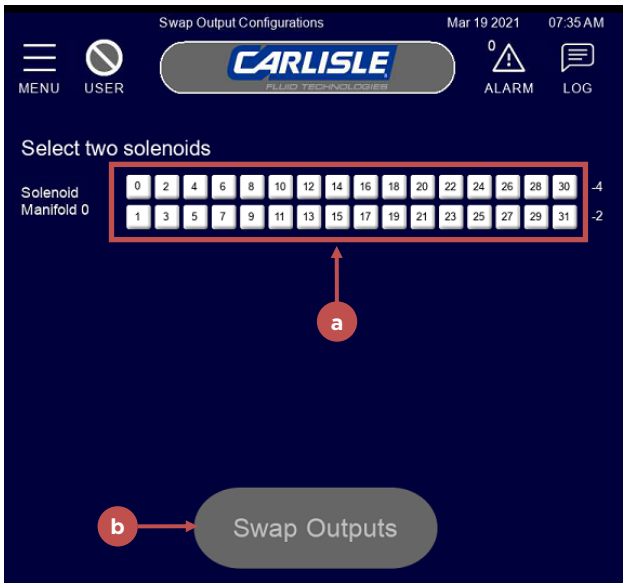
When all selections have been modified, press 'Accept' (e) to save the edits or 'Cancel' (f) to exit without saving.

Swapping outputs

If is desired to swap one output with another (due to failure of a solenoid device, etc.) pressing the 'Swap Outputs' button opens a menu where two solenoids can be selected and swapped. Doing this swaps the output configuration for the two selected outputs, scans all functions used by the RF2, and swaps the outputs in any functions where the selected outputs are used.

To do this, select the two solenoids you want to swap by pressing the number buttons (a).

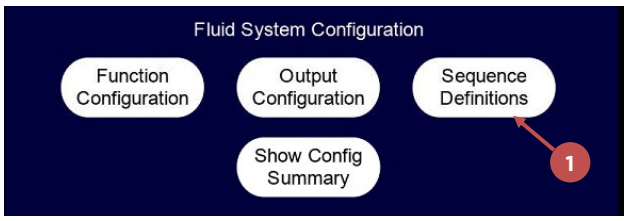
Press 'Swap Outputs' (b) to complete the procedure.

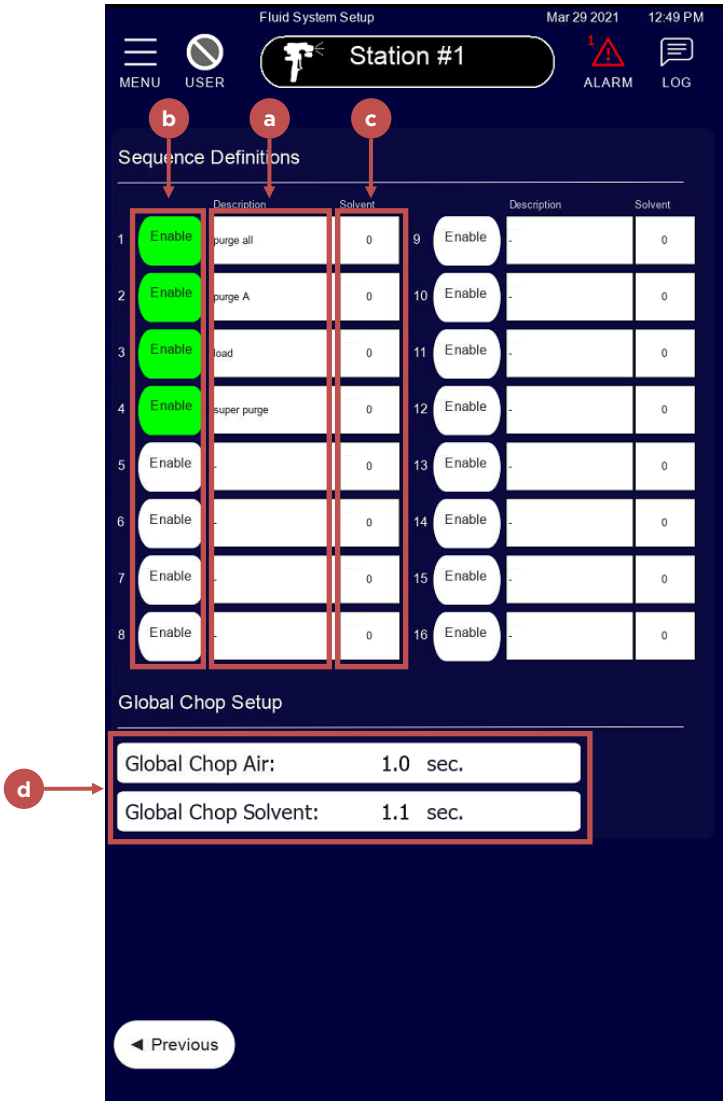


Sequence definitions

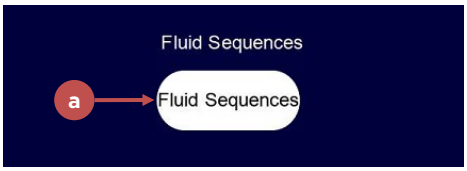
On the Sequence Definitions Setup Menu (1), up to sixteen programmable sequences can be given names (a), and enabled or disabled (b) depending on whether they are necessary for the user's process. If a solvent flow meter is used for the station, enter a 'solvent-check' value (c) which will be compared to the actual solvent used during a fluid sequence do generate an alarm if not met.

Additionally, global values for Chop timing (air and solvent on times) (d) are programmed here.





Fluid sequences



The Fluid Sequence Setup menu allows individual sequences of valve operation to be programmed. Sequences may be used for loading or purging of materials, as well as for other operations, such as bell cup wash, etc. When a sequence is called from the main menu, or from a supervisory process, the sequence will operate. To open this menu, press 'Fluid Sequences' (a) in the Setup Main Menu.

To modify a sequence:

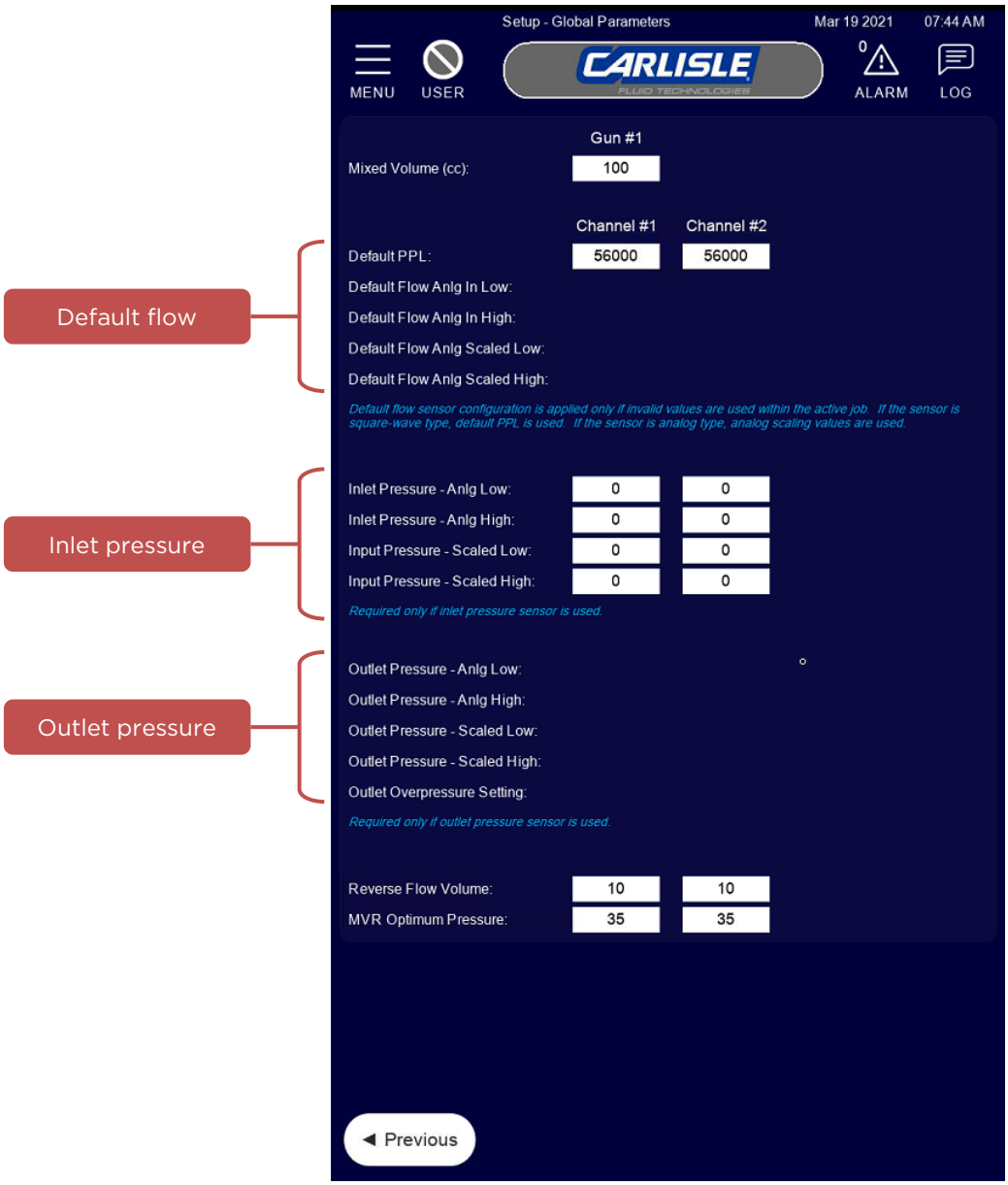
1. Select the station by pressing 'Station 1' or 'Station 2' buttons. The selected station will be highlighted.
2. Select the Sequence to edit by pressing the 'Seq' button or the description to its right. This will open a popup dialog which will allow the sequence to be selected from the list of available sequence definitions.
3. When the station or sequence is changed, or when the refresh (b) button is pressed, the stored parameters will be loaded into the edit fields below.
4. Chop Override: If global timing values for chop air and solvent are not desired, enabling this feature allows these times to be entered in the fields below.
5. Set step times for 12 steps. If a step is not required, enter 0 seconds.
6. The list of functions (c) that are used in the selected sequence will be shown. Each function represents a row in the sequence and pressing the buttons (d) in each column will enable or disable the function in the given step. Buttons are highlighted blue when selected and white when not.
7. The total sequence time (e) is shown near the bottom of the page.
8. When finished with edits, press Save Edits (f) to store them in memory so that they can be used.

Global setup

To modify several parameters that affect system behavior regardless of the recipe that is loaded, press 'Global Parameters' (1) on the Main Setup Menu.

Parameters that are not relevant based on the system configuration will not be shown.

More information about the various parameters is given in 'Process Configuration' – Global parameters.

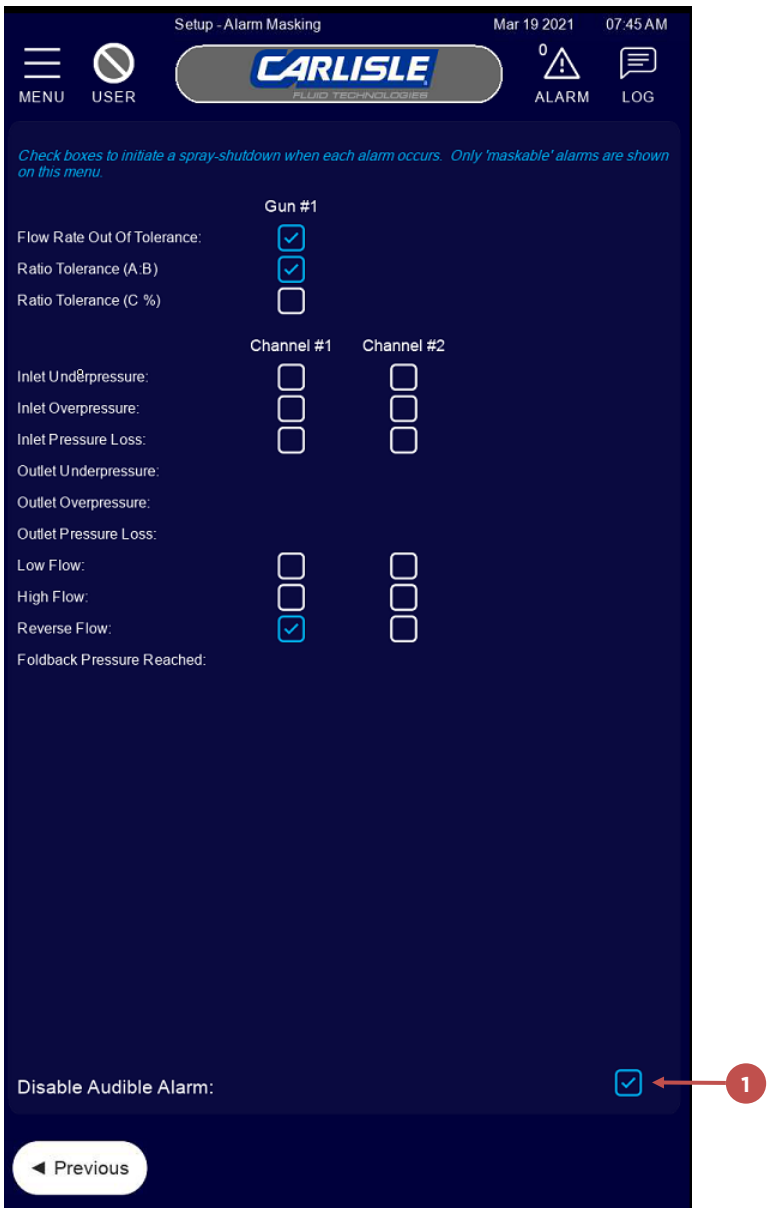


Alarm masking

You can setup various system alarms to cause the system to shut down spray or, if deselected, they will provide a warning while the system keeps running. To do this, press ‘Alarm Masking’ (1) in the Main Setup Menu.

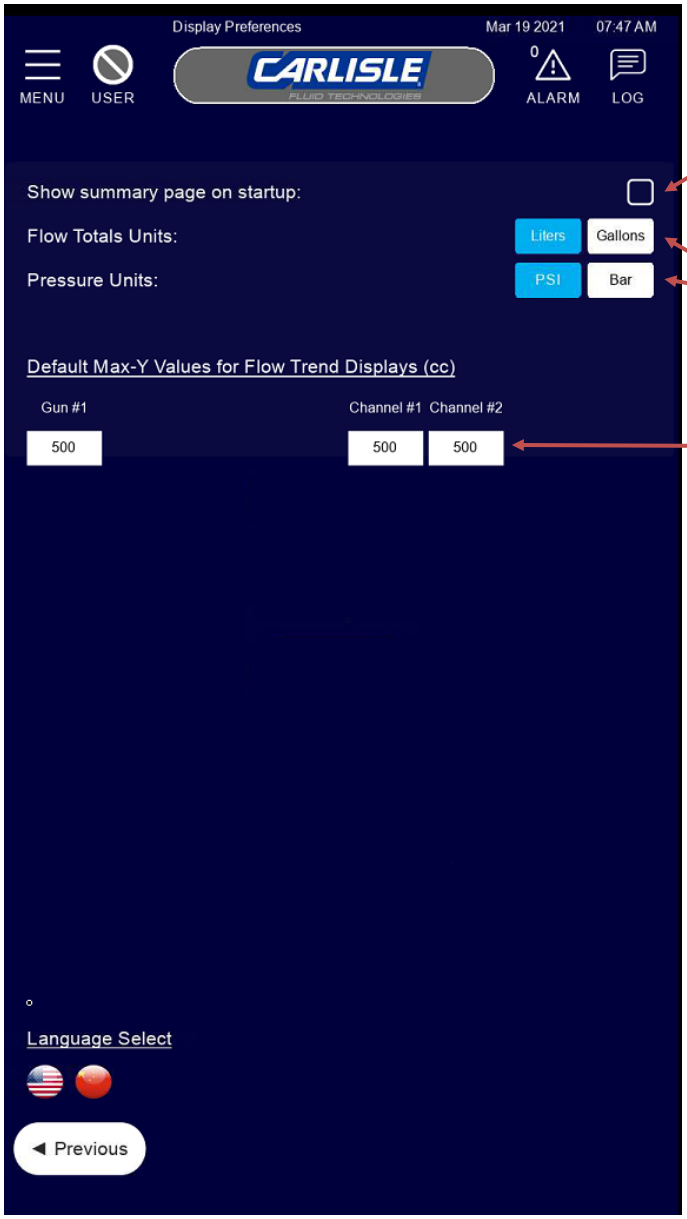
Not all available alarms are shown here, as some alarms will always result in spray shutdowns or warnings.

Selecting ‘Disable Audible Alarm’ (a) disables the alarm horn from chirping when an alarm is activated.



Display preferences

The display preferences menu allows various items to be changed that do not affect system performance, but affect the way that data is displayed to the user. This includes language selection and unit of measure selections.



Select to display configuration summary on startup

Choose default units

Set scaling options for trends when opening Mix/Gun or Channel pop-up menus

Choose system language

BACK-UP/RESTORE

All stored settings, including recipe data, global setup data, fluid system configuration and sequences, etc. can be backed up to a USB stick or restored from USB or other media.

Additionally, this data is automatically backed up to SD card daily, with each daily archive being stored for one year before being deleted.

This functionality allows the entire system configuration (or individual parts of it) to be passed from one RF2 to another or restored in the event of a system failure resulting in the loss of data.

To access the backup and restore menu, navigate to the Main Setup Menu, and click on the 'Backup / Restore' (1) icon on the lower right of the page.

When clicked, the system will display the screen below.

Back-up data

To backup to USB, first connect a USB flash drive into the USB port provided on the front of the control enclosure (a). The system will indicate that a device is found (b). To eject the USB drive, press the 'Eject USB' button (c) and follow the prompts.

When a USB stick is detected, each row will have a 'Store to USB' (d) file available. Pressing any of these stores a .CSV file containing the information selected. The 'All System Data' row (e) will store ALL system information.

If desired, it is possible to open and view the above file with software capable of viewing .CSV files such as Microsoft Excel.

Restore data

Pressing the 'Restore' button (f) on any row will open a file dialog that accesses the operator interface's file system (including the USB drive and SD Card), etc. to look for the appropriate .CSV file.

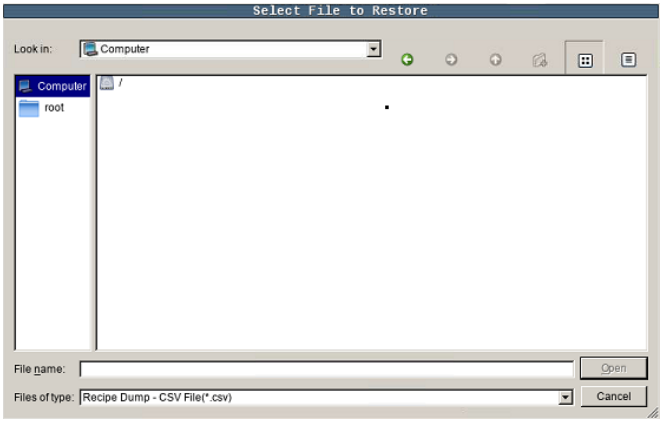
The file restore dialog can be resized.

Within the operator interface file system, which is Linux based, the following paths are commonly used, and may contain file information.

/mnt/sdcard (contents of SD card inserted in the slot)

/mnt/usbmemory (contents of USB card inserted)

Once the file is found in the navigation menu, opening the file will restore the row selected. Note, if an invalid file is selected, the data will not be restored, and a warning message will be displayed.

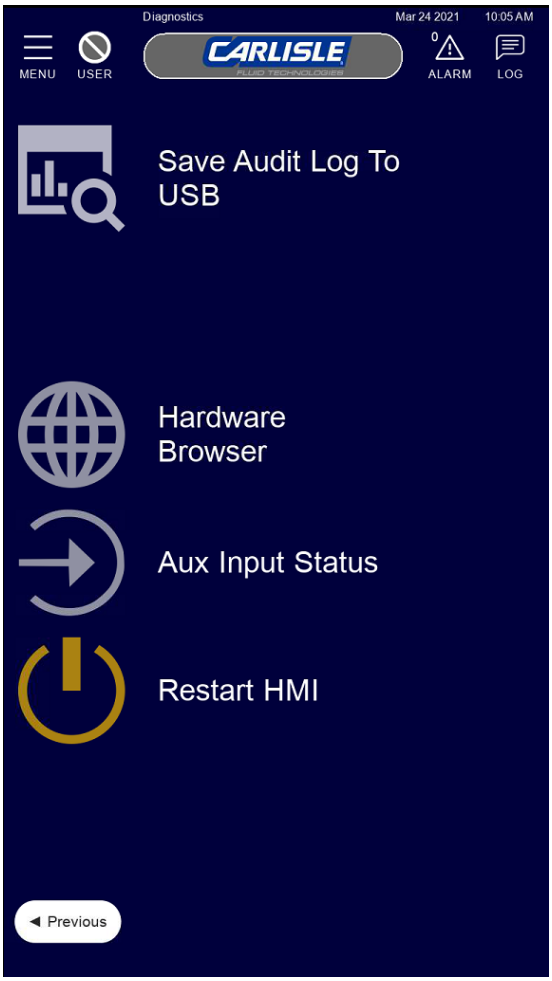


DIAGNOSTICS

The diagnostics menu contains miscellaneous functions for further diagnosing the RF2. Navigate to the diagnostics menu by pressing the 'Diagnostics' pushbutton on the main dropdown menu.

Audit log actions

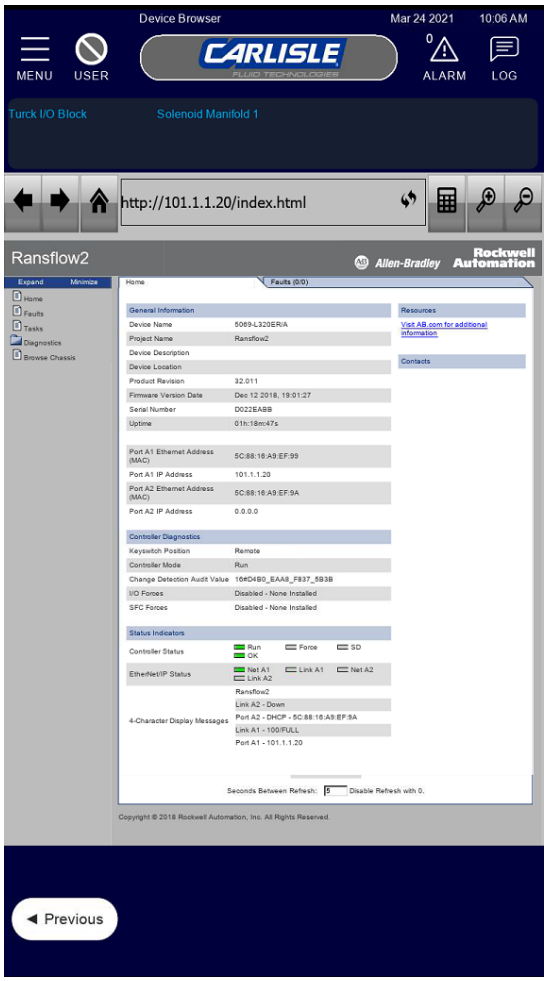
The operator interface audits specific events such as user logged in, etc. From the diagnostics menu, it is possible to export the audit log to USB (in .CSV format), or to delete the audit log if desired.



Hardware Browser

Some of the ethernet-enabled devices that are used by the RF2 have built-in web pages that allow for further diagnosis. The Exor operator interface that is used by the RF2 has a browser that allows viewing of those pages.

The home screen of the device browser shows the RF2s PLC web page. Hyperlinks along the top of the menu access the web pages of the other available devices.

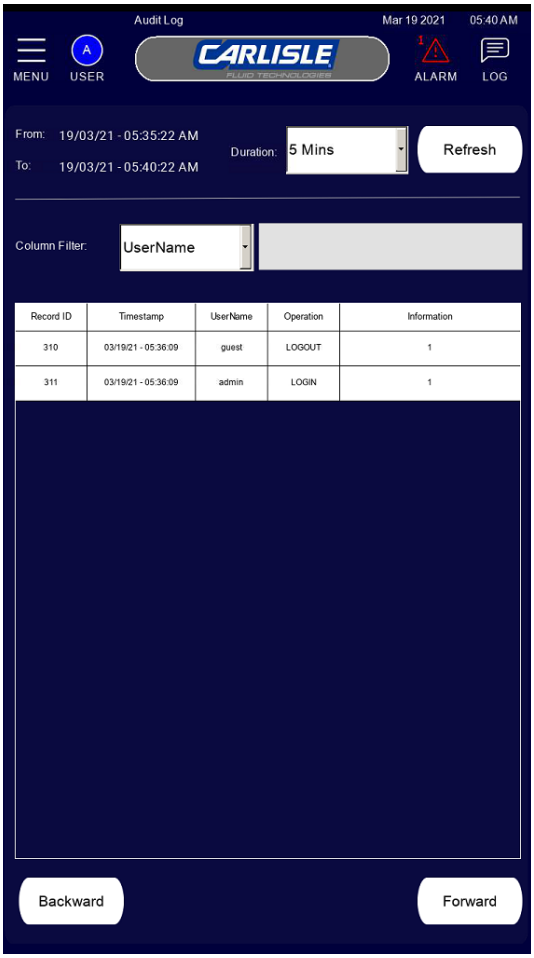


NOTE

The RF2 web browser does not support all functionality for some of the pages. In special cases, a laptop may be needed to browse to those pages to perform certain tasks.

Auxiliary Input Status

To check the functionality of inputs coming from auxiliary devices or some of the sensors that may be connected to the RF2, the Auxiliary Input Status menu allows the viewing of the input states.



Restart HMI

The HMI can be rebooted from the Main Diagnostics Menu showcased in the previous page by pressing the button Restart HMI (a).

DATA LOG/REPORTING

The RF2 stores flow total data and in the future, more detailed runtime data will be tracked. To access the main menu for data logging, press the 'Log' button (1) on the right of the upper menu bar.

After pressing the button, the system will display the following screen,

Flow Totals

The RF2 stores basic material flow data for viewing.

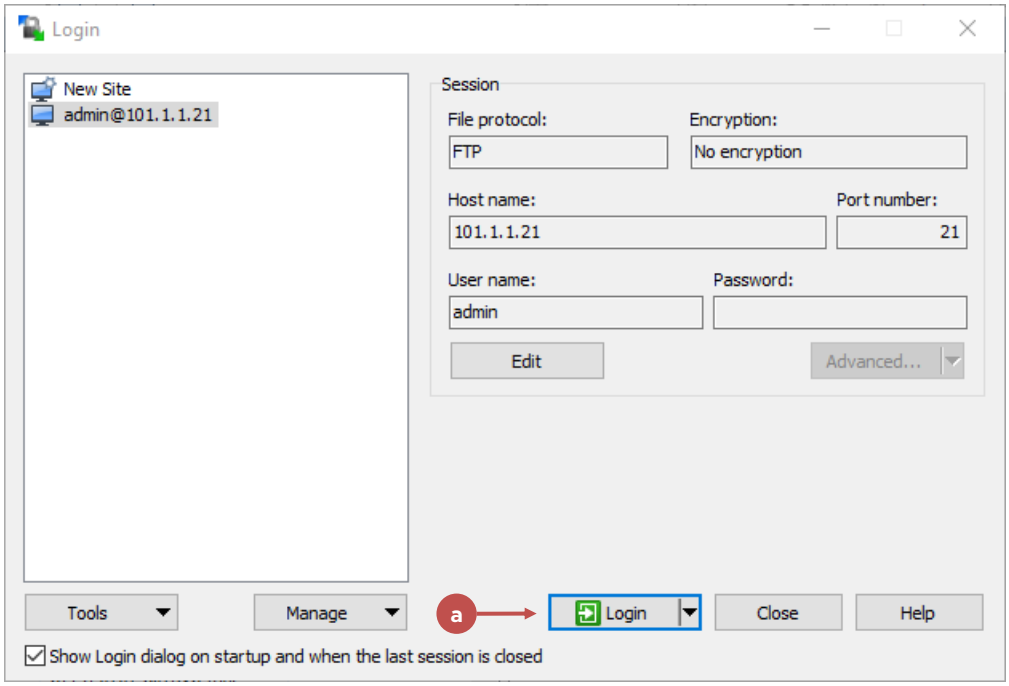
Data is organized by gun / mixer (a), time range (yearly, monthly, weekly, daily, hourly, grand) (b), by recipe (c)– or by all recipes. Data can be shown in liters or gallons (d).

If more detailed data is needed for storage – it is best to connect the RF2 to a SCADA or supervisory PLC, and routinely poll the grand total, and other identifiers to store the changes in a database. More information about connecting the RF2 to fieldbus can be found earlier in this manual in page 35 and in the Appendix starting on page 115.

File Access Via FTP

Files stored on the operator interface, including daily archives of system settings, alarm logs, etc. may be accessed via FTP if a computer is connected to it via one of its three networks.

An FTP access program such as WinSCP may be used for this type of access. Use the following configuration to access the RF2 data.



To Log in – press the login button (a) and enter the credentials for any administrator user account configured.

NOTE

File transfer is allowed in both directions, but it is highly recommended not to overwrite any files that are stored on the system.

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MAINTENANCE

REGULAR MAINTENANCE PROCEDURES AND RECOMMENDATIONS

Material purge

After completing a job, always remember to purge the system thoroughly. Failure to do so may lead to clogging, leaks or cross-contamination of colors and material if disassembling the system.

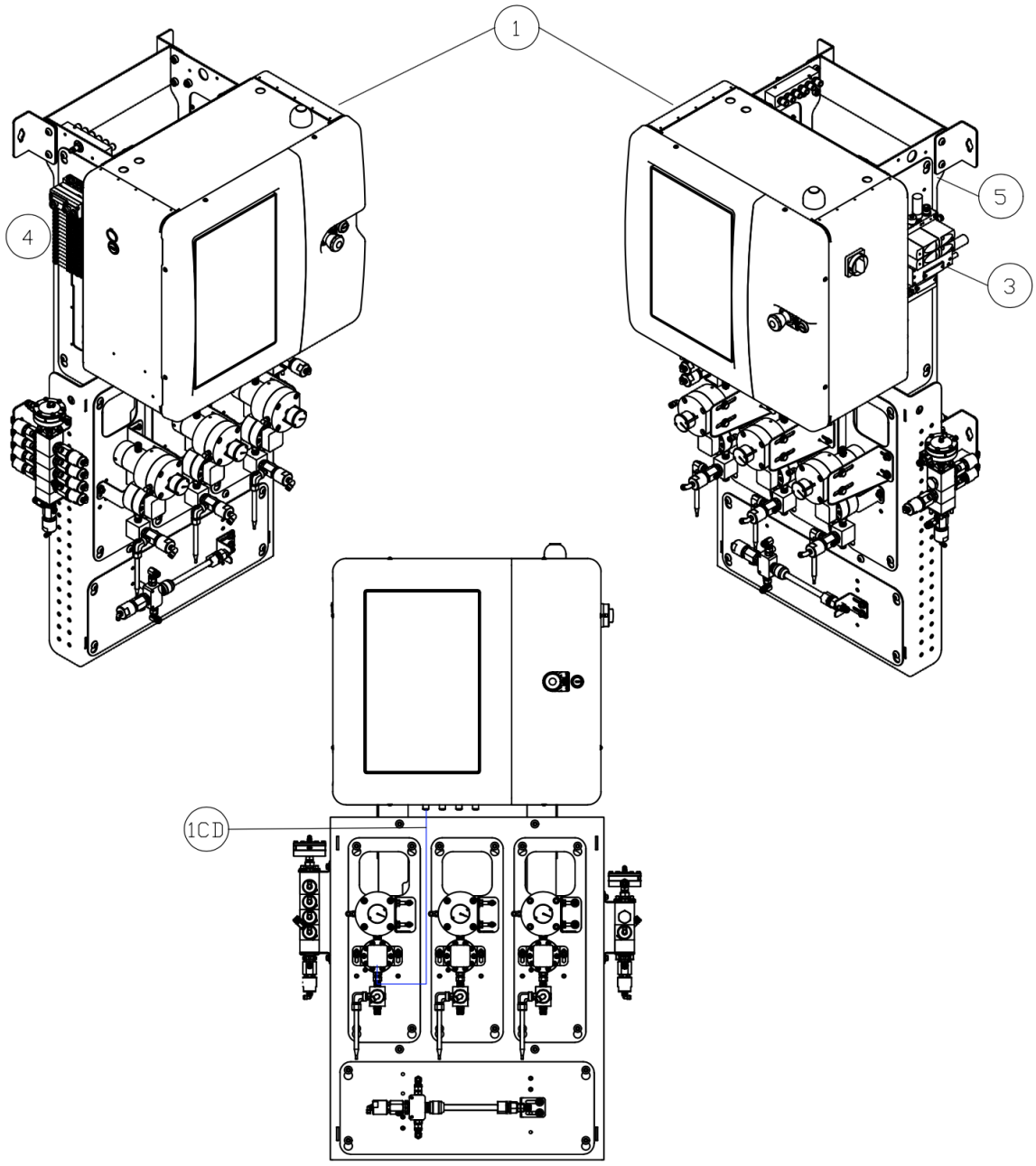
Regular inspection

Continuous use or lack of use of the system may both lead to system malfunctioning. Please conduct regular inspections to the system according to the frequency table below.

Frequency	Description	Inspection Method
Daily	System flushed with solvent	Visual
Daily	Check for leaks	Visual
Daily	Clean spray guns	Visual
Daily	Check alarm history	Visual
Daily	Check for material supply	Visual
Monthly	Check static mixer for clogs	Visual
Monthly	Check all hoses for kinks and wear	Visual
Monthly	Perform flow meter calibration check	Test with beaker
Monthly	Check CCV operation	Trigger manually or from HMI
Monthly	Clean mix manifold and check valves	Disassemble
Monthly	Check fluid hoses for material buildup	Disassemble
As needed	Clean flow meter	Disassemble
As needed	Rebuild color change valves	Disassemble
As needed	Rebuild MVR valve	Disassemble
As needed	Replace static mixer assembly	Disassemble

COMPONENT VIEWS & SPARE PARTS

RF2 Controller

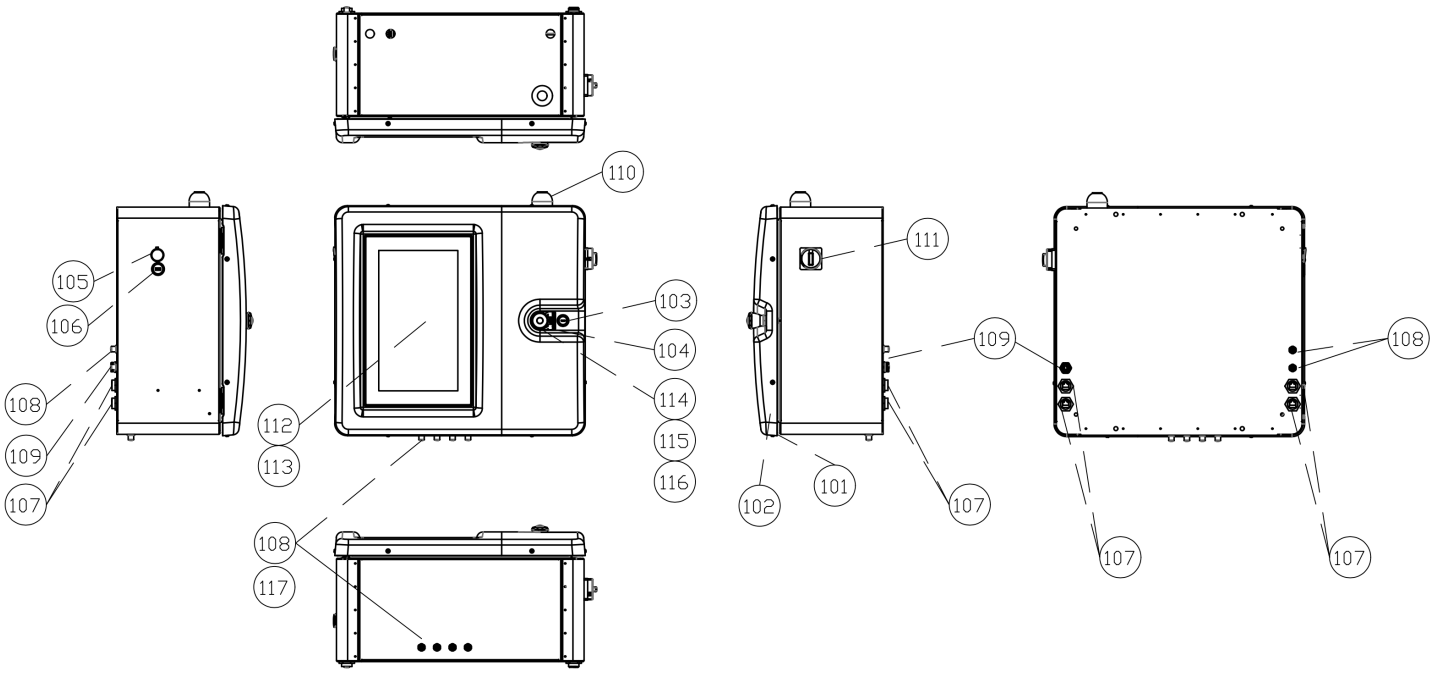


Top Level Part Number						
Prefix	Comms	Wireless		Number of Automatic (MVR / DR1) Channels	Number of Manual Pulse Channels	Number Of Solenoid Manifolds
310-C	A	B	-	C	D	E
	0 = No Gateway	0=None		0 = None	0 = None	1 = 1 Manifold (32 solenoids)
	1 = Ethernet IP	1= Wifi		2 = 2 Channels	2 = 2 Channels	2 = 2 Manifold (64 solenoids)
	2 = Profinet	2 = Cellular		4 = 4 Channels	4 = 4 Channels	3 = 3 Manifold (96 solenoids)
	3 = DeviceNet	3 = Wifi + Cellular				4 = 4 Manifold (128 solenoids)
	4= CCLink					
	5 = EtherCat			Note - Automatic and Manual channels may only add up to 4		

Continued in next page...

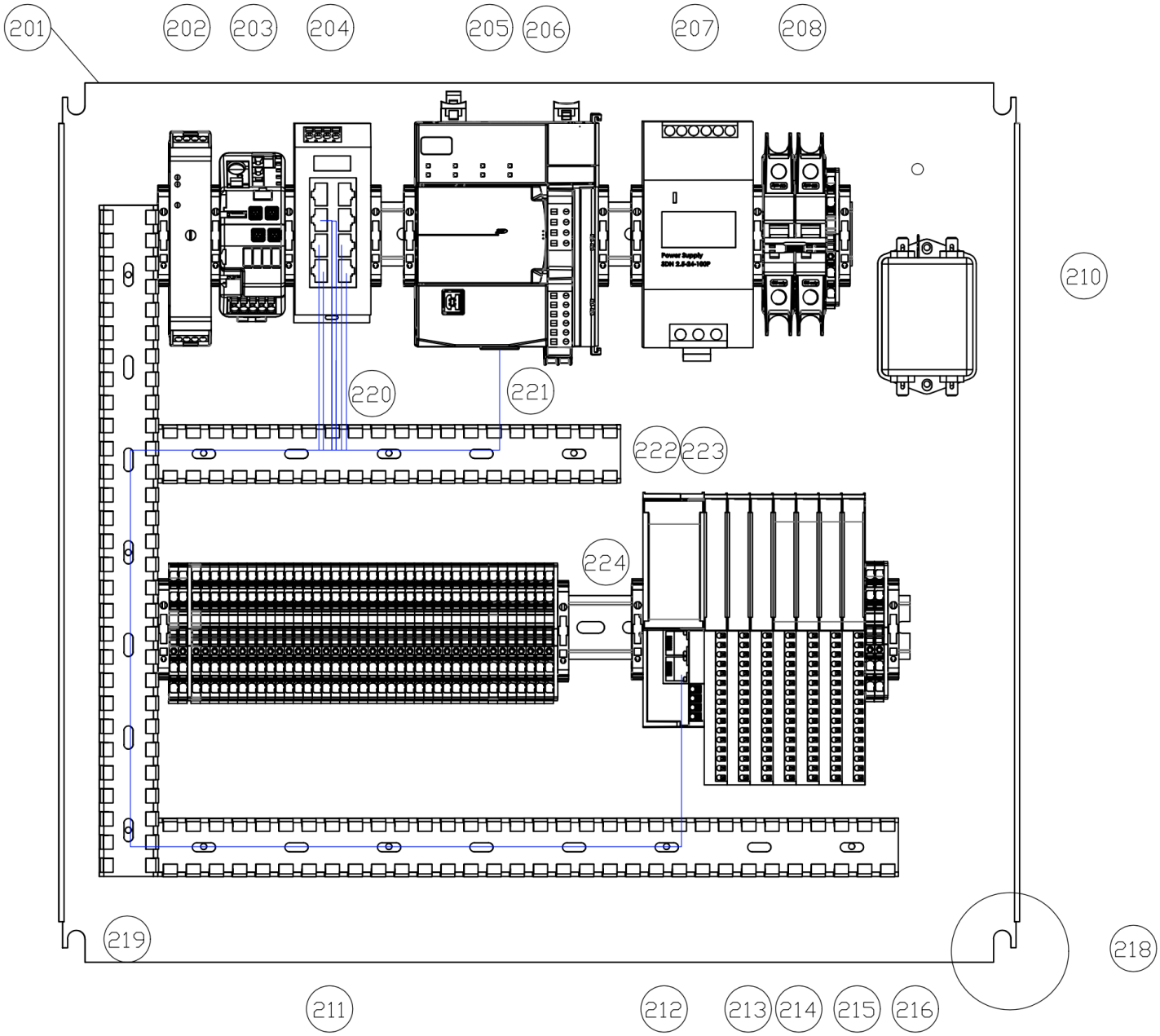
Table 0 - Top Level			
Item	QTY	Part No.	Description
1	1	310-5000	Control Enclosure
1CD	** See 1CD*		*Flowmeter cables for different channel counts*
3	* See Table 3	310-3940	*Pressure Regulator*
4	* See Table 4	310-3960	*Solenoids*
5		310-2010	Mounting Bracket
6			Cover - Pressure Regulators
7			Cover - Solenoids
Table 1CD - Flowmeter Options for different channel counts			
Code -Top Level Columns CD	QTY	Part No.	Description
0	-	-	-
02	2	310-4138	M12-M12, 5PIN, 1M, SHIELDED
04	4	310-4138	M12-M12, 5PIN, 1M, SHIELDED
06	6	310-4138	M12-M12, 5PIN, 1M, SHIELDED
08	8	310-4138	M12-M12, 5PIN, 1M, SHIELDED
20	2	310-4138	M12-M12, 5PIN, 1M, SHIELDED
22	4	310-4138	M12-M12, 5PIN, 1M, SHIELDED
24	6	310-4138	M12-M12, 5PIN, 1M, SHIELDED
26	8	310-4138	M12-M12, 5PIN, 1M, SHIELDED
40	4	310-4138	M12-M12, 5PIN, 1M, SHIELDED
42	6	310-4138	M12-M12, 5PIN, 1M, SHIELDED
44	8	310-4138	M12-M12, 5PIN, 1M, SHIELDED
60	6	310-4138	M12-M12, 5PIN, 1M, SHIELDED
62	8	310-4138	M12-M12, 5PIN, 1M, SHIELDED
80	8	310-4138	M12-M12, 5PIN, 1M, SHIELDED
Table 1A - Communications Module			
Code -Top Level Column A	QTY	Part No.	Description
0	-	-	-
1	1	310-4142	GATEWAY, EIP-EIP
2	1	310-4143	GATEWAY, PROFINET-EIP
3	1	310-4144	GATEWAY, DEVICENET-EIP
4	1	310-4145	GATEWAY, CCLINK-EIP
5	1	310-4146	GATEWAY, ETHERCAT-EIP
Table 1B - Wireless Comm Option			
Code -Top Level Column B	QTY	Part No.	Description
0	-	-	-
1, 3		310-4170	USB Wifi Module
2, 3		310-4171	Exor Cellular Module
2, 3		310-4172	Cellular Antenna
2, 3		310-4173	Antenna Cable

Outer Enclosure



Controls Outer Enclosure			
Item	QTY	Part No.	Description
101	1		Control Enclosure Door Frame
102	1		Control Enclosure Thermoform
103	1		Slotted Door Latch
104	1		E-stop sticker
105	1	310-4127	USB WATERPROOF COVER
106	1	310-4128	CABLE, USB, PANEL MOUNT, 1M CABLE
107	4	310-4129	ETHERNET BULKHEAD, RJ45 FEMALE TO FEMALE
108	6		CONNECTOR, BULKHEAD, M12, 5PIN, FEMALE TO LEAD, 1M
109	1		BULKHEAD CONNECTOR, 7/8" 5 POLE, FEMALE TO LEAD
110	1		LIGHT INDICATOR W/ HORN, 7 COLOR, 10-30VDC, 2M CABLE FLYING LEADS
111	1	240-5159	LOAD SWITCH, 16A, FRONT/DOOR, W/ ACTUATOR
112	1	EX715-CARLISLE	HMI, EX SERIES, 15", W/ CODESYS
113	1		SD CARD, 32GB, CDW P/N 3052120, MFG P/N SDSDB-032G-A46
114	1	240-5166	Non-Illuminated Mushroom Operators, Twist to Release, 40mm, Round Plastic (Type 4/4X/13, IP66), Red
115	1	240-5167	800F Latch, Plastic Latch, Standard Pack
116	2	310-4103	22.5mm PB No Latch, Screw Contact Block, 1 N.C. Self-monitoring
117	4		FERRITE (EMI TOROID 12.2OD x 7x1ID x 12.7MM)

Control Backpanel



Controls Backpanel			
Item	QTY	Part No.	Description
201	1		Electronics Back Panel
202	1	310-4116	SAFETY RELAY
203	1	310-4104	ELEC CIRC PROT, 4CH, CLASS 2
204	1	310-4105	ETH SWITCH, UNMANAGED, 8PRT
205	1		PLC, 2MB
206	1		TERMINAL, SCREW, KIT, 5069 CPU
207	1	310-4147	POWER SUPPLY, 24VDC, 240W, 10A
208	1	240-5176	CIRC. BREAKER, 2 POLE, 5A
209	19		BOLT, MOUNTING
210	1	310-4126	LINE FILTER, 6A, 2STAGE
211	41		TERMINAL BLOCK
	5		GROUND TERMINAL BLOCK
	2		TERMINAL BLOCK END
	3		TERMINAL BLOCK END - YELLOW
	1		JUMPER 2-pole
	1		JUMPER 4-pole
	1		JUMPER 6-pole
	12		END RETAINER
212	1	310-4115	REMOTE I/O, ADAPTER, ETHERNET
213	3	310-4111	REMOTE I/O, 16 PT. DIG. INPUT
214	1	310-4112	REMOTE I/O, 16 PT. DIG. OUTPUT
215	1	310-4114	REMOTE I/O, 8 CH. ANLG INPUT
216	2	310-4113	REMOTE I/O, 2 CH HIGH SPEED IN
217			
218	4		SPACER FOR BACK PANEL
219	1		GROUND STRAP FOR BACK PANEL
220	4	310-4134	CABLE,ETHERNET,5FT
221	4	310-4135	CABLE, ETHERNET, 3FT
222	4 ft		Panduit 1x4", Gray
223	4 ft		Panduit Cover, 1" Gray
224	3 ft		Din Rail, Perforated

Pressure Regulator

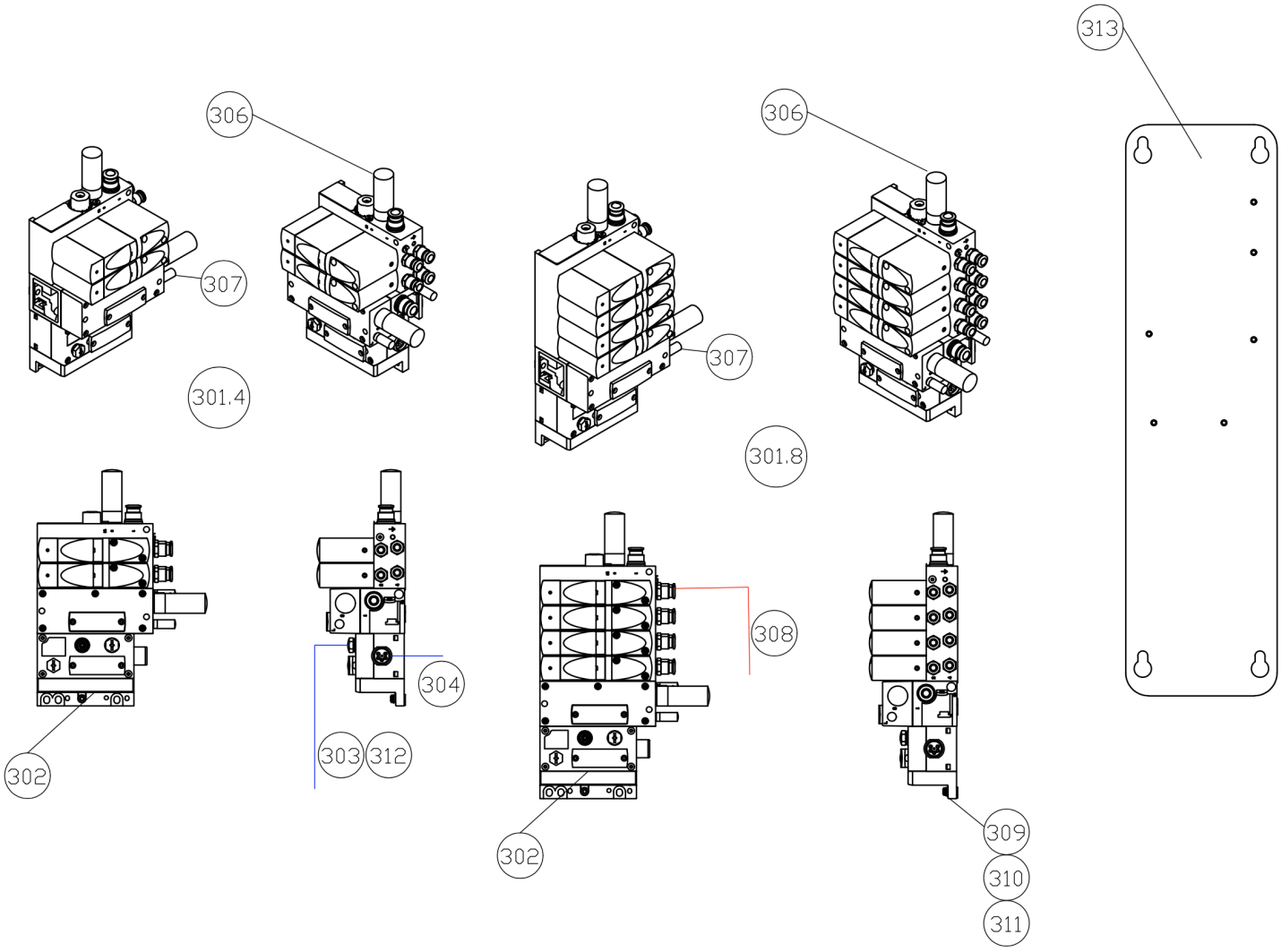


Table 3—Pressure Regulator Modules				
Code -Top Level	Item	QTY	Part No	Description
0		-	-	-
2	301.4	1	310-3910	PRESSURE MANIFOLD ASSEMBLY, 4 REGULATORS (VTEM-S1-27-E1-B1-Q10-U-Q6-CC-BAP-2PD)
	302	incl. w/ manifold		COMM MODULE, FOR FESTO VTEM REGULATORS (50E-F36GCQP-P)
	303	1	310-4136	CBL, ETHERNET, RJ45-M12-90, 1M
	304	1	310-4140	CBL, MINI (7/8), 5P, 2M, F-M
	305	incl. w/ 310-3911	UC-3/8	Pneumatic muffler (comes with 310-3911)
	306	1	20-7023	G3/8 - 3/8 Tube VTEM inlet
	307	2	20-7024	G1/8 - 1/4 Tube VTEM to MVR
	308	16	20-7022	G1/8 - 4mm Tube VTEM to HGB
	309	6	20-7028	VTUG Mounting Bolts
	310	6	20-7026	VTUG Mounting Washers
	311	6	20-7027	VTUG Mounting ToothWashers
	313	1	310-2801	VTEM Mounting Bracket
4	301.8	1	310-3911	PRESSURE MANIFOLD ASSEMBLY, 8 REGULATORS (VTEM-S1-27-E1-B1-Q10-U-Q6-4C-BAP-4PD)
	302	incl. w/ manifold		COMM MODULE, FOR FESTO VTEM REGULATORS (50E-F36GCQP-P)
	303	1	310-4136	CBL, ETHERNET, RJ45-M12-90, 1M
	304	1	310-4140	CBL, MINI (7/8), 5P, 2M, F-M
	305	incl. w/ manifold	UC-3/8	Pneumatic muffler (comes with 310-3911)
	306	1	20-7023	G3/8 - 3/8 Tube VTEM inlet
	307	2	20-7024	G1/8 - 1/4 Tube VTEM to MVR
	308	16	20-7022	G1/8 - 4mm Tube VTEM to HGB
	309	6	20-7028	VTUG Mounting Bolts
	310	6	20-7026	VTUG Mounting Washers
	311	6	20-7027	VTUG Mounting ToothWashers
	313	1	310-2801	VTEM Mounting Bracket

Continued in next page...

Code -Top Level Column C	Item	QTY	Part No	Description
6	301.4	1	310-3910	PRESSURE MANIFOLD ASSEMBLY, 4 REGULATORS (VTEM-S1 -27-E1-B1-Q10-U-Q6-CC-BAP-2PD)
	301.8	1	310-3911	PRESSURE MANIFOLD ASSEMBLY, 8 REGULATORS (VTEM-S1 -27-E1-B1-Q10-U-Q6-4C-BAP-4PD)
	302	incl. w/ manifold		COMM MODULE, FOR FESTO VTEM REGULATORS (50E-F36GCQP-P)
	303	1	310-4136	CBL, ETHERNET, RJ45-M12-90, 1M
	304	2	310-4140	CBL, MINI (7/8), 5P, 2M, F-M
	305	incl. w/ manifold	UC-3/8	Pneumatic muffler (comes with 310-3911)
	306	2	20-7023	G3/8 - 3/8 Tube VTEM inlet
	307	3	20-7024	G1/8 - 1/4 Tube VTEM to MVR
	308	32	20-7022	G1/8 - 4mm Tube VTEM to HGB
	309	12	20-7028	VTUG Mounting Bolts
	310	12	20-7026	VTUG Mounting Washers
	311	12	20-7027	VTUG Mounting ToothWashers
	312	1	310-4133	CABLE, CAT 5E, M12, 1M
	313	2	310-2801	VTEM Mounting Bracket
8	301.8	2	310-3911	PRESSURE MANIFOLD ASSEMBLY, 8 REGULATORS (VTEM-S1 -27-E1-B1-Q10-U-Q6-4C-BAP-4PD)
	302	incl. w/ manifold		COMM MODULE, FOR FESTO VTEM REGULATORS (50E-F36GCQP-P)
	303	1	310-4136	CBL, ETHERNET, RJ45-M12-90, 1M
	304	2	310-4140	CBL, MINI (7/8), 5P, 2M, F-M
	305	incl. w/ manifold	UC-3/8	Pneumatic muffler (comes with 310-3911)
	306	2	20-7023	G3/8 - 3/8 Tube VTEM inlet
	307	3	20-7024	G1/8 - 1/4 Tube VTEM to MVR
	308	32	20-7022	G1/8 - 4mm Tube VTEM to HGB
	309	12	20-7028	VTUG Mounting Bolts
	310	12	20-7026	VTUG Mounting Washers
	311	12	20-7027	VTUG Mounting ToothWashers
	312	1	310-4133	CABLE, CAT 5E, M12, 1M
	313	2	310-2801	VTEM Mounting Bracket

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Solenoid Manifolds

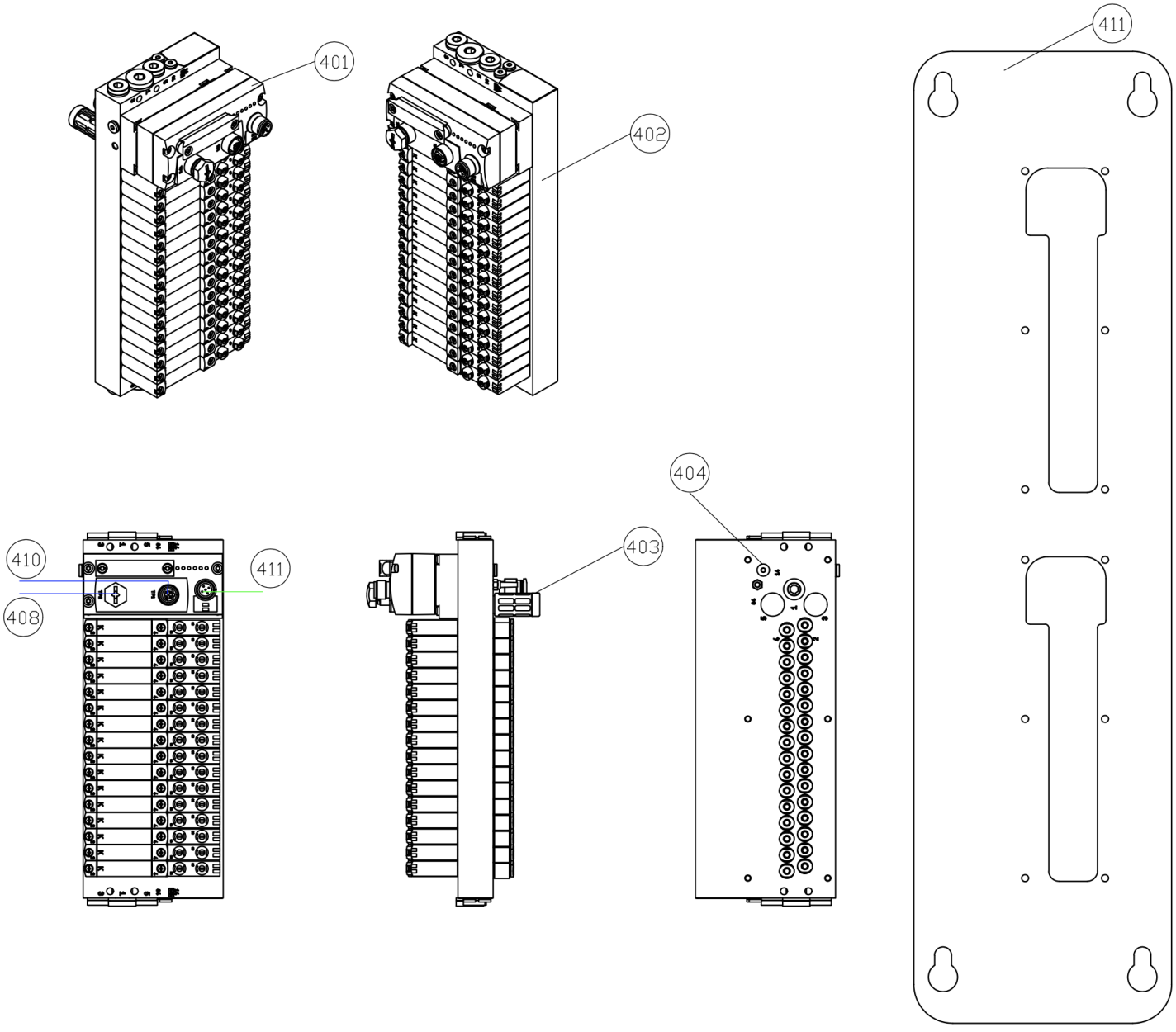
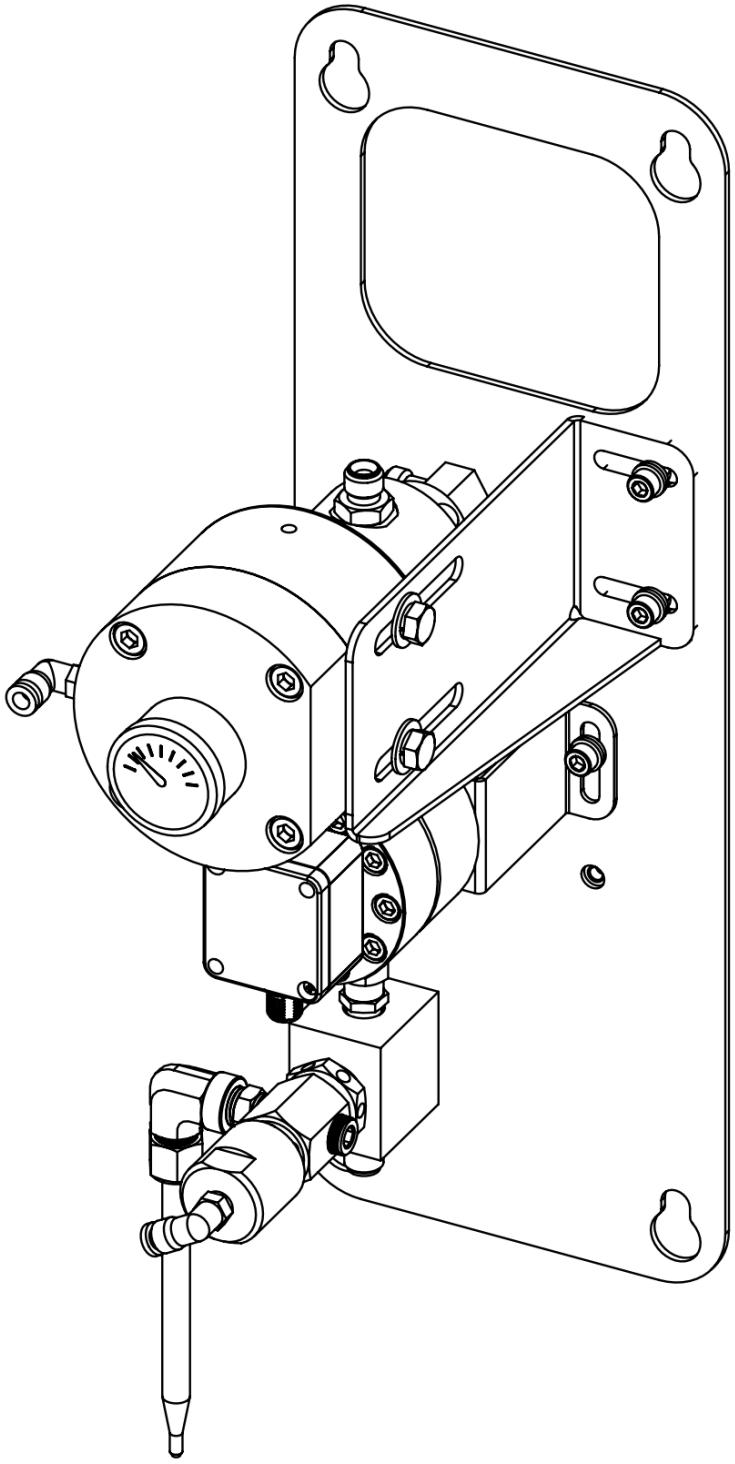
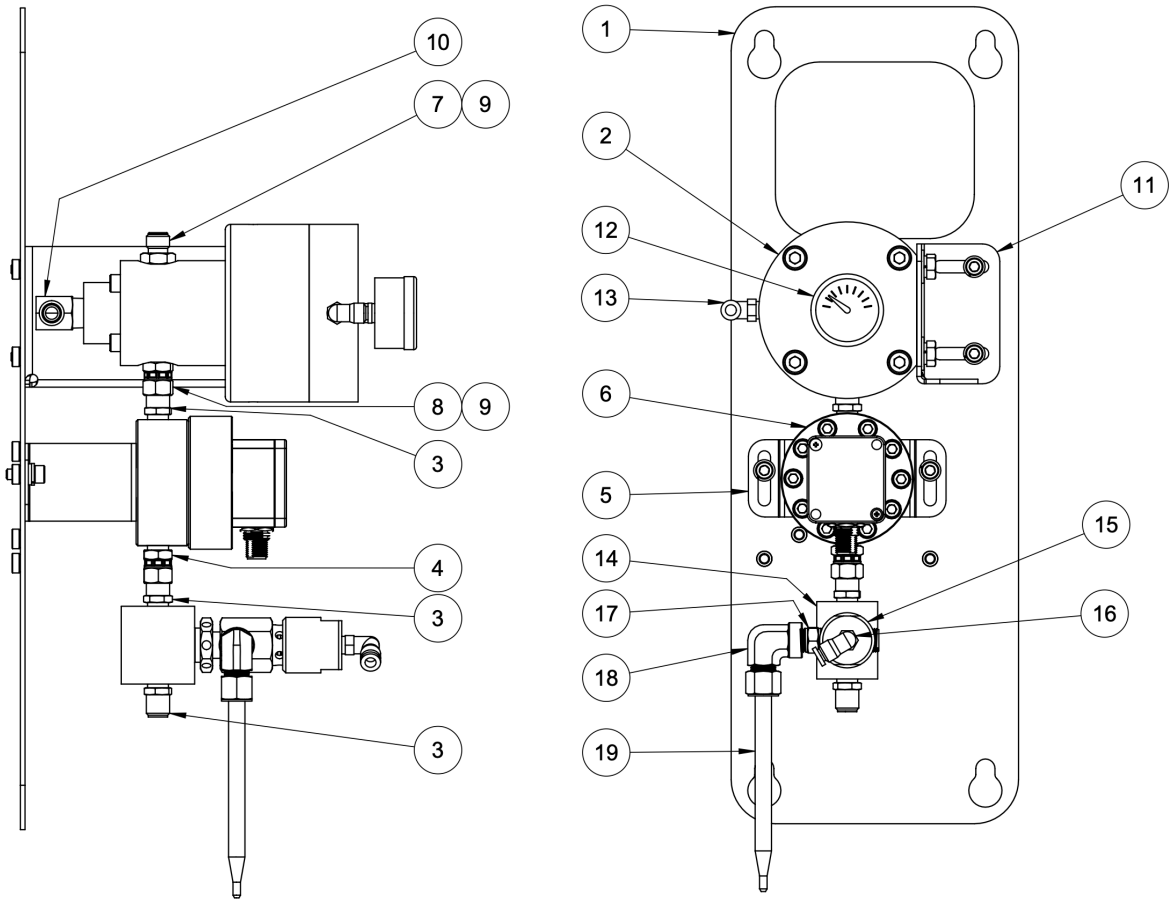


Table 4—Solenoid Manifold Assy.						
Item	QTY				Part No.	Description
	E=1	E=2	E=3	E=4		
401	1	2	3	4	310-3921	VALVE COMM MODULE, EIP
402	1	2	3	4	310-3920	VALVE, PNEUMATIC MANIFOLD 16PORT-16 DUAL SOLENOIDS (VTUG-10-VRPT-B1T-T516B-UB-QH4SU-16K)
403	1	2	3	4	UC-3/8	Pneumatic muffler (comes with 310-3920)
404	2	4	6	8	20-7022	G1/8 - 4mm Tube
405	4	8	12	16	91292A121	VTUG Mounting Bolts (M4 20mm)
406	4	8	12	16	93475A230	VTUG Mounting Washers
407	4	8	12	16	95060A330	VTUG Mounting ToothWashers
408	0	1	2	3	310-4133	CABLE, CAT 5E, M12, 1M
409	1	1	1	1	310-4136	CBL, ETHERNET, RJ45-M12-90, 1M
410	1	2	3	4	310-4148	CBL, M12, 5PIN, 0.3M, 0-90DEG
411	1	2	3	4	310-2800	VTUG Mounting Bracket

Fluid Module

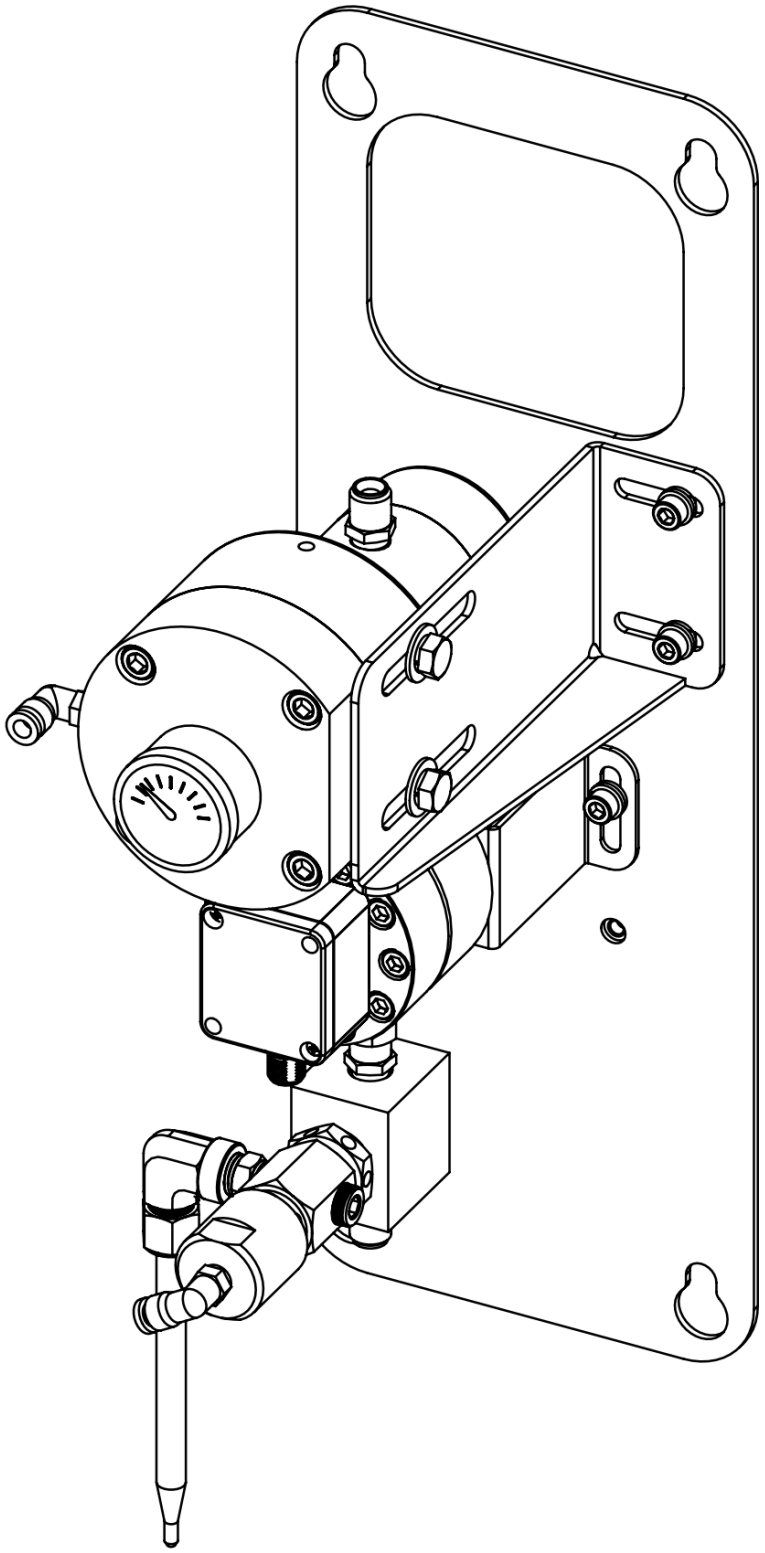
Weeping (Please reference manual No. LN-9112-00 for additional details)

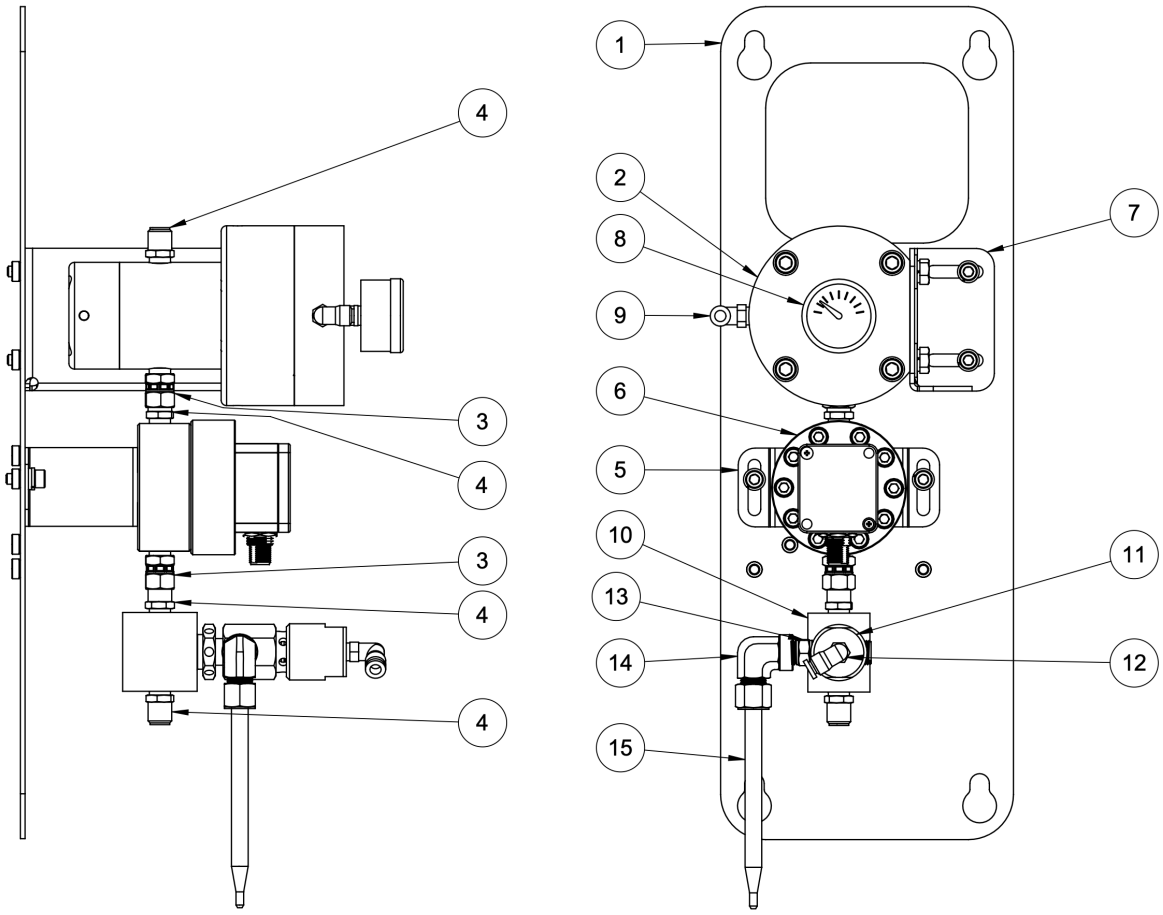




		WEEPING	
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	310-3301	FLUID CONTROL PANEL	1
2	TR-SSMM-147	02 WEEPING MVR	-
2	TR-SSMM-148	03 WEEPING MVR	-
2	TR-SSMM-225	04 WEEPING MVR	-
3	4-6JIC	FITTING, 1/4" NPS (M) X 3/8" JIC (M)	3
4	4SN-6JIC	FITTING, 1/4" NPS (F) X 3/8' JIC (M)	1
5	310-2806	MOUNTING BRACKET	1
6	310-9000	GEAR FLOW METER, DUAL PROBE	-
6	310-9001	GEAR FLOW METER, FIBER OPTIC	-
6	A13296	PISTON FLOW METER	-
7	4-6B	FITTING, 1/4" NPS (M) X 3/8" NPS (M)	1
8	4SN-6B	FITTING, 1/4" NPS (M) X 3/8" NPS (M)	1
9	TR-110952	SEAL	2
10	6T-4-90	FITTING, ELBOW , 3/8" NPT(M) X 1/4" NPS(M)	1
11	310-2802	MVR MOUNTING BRACKET	1
12	GA-338	1/8" NPT BACK MOUNT GAUGE (0-160 PSI), 1 1/2" DIA	1
13	JML-14-2T	ELBOW 1/8 NPT(M) X 1/4 ODT	1
14	310-8200	CALIBRATION BLOCK	1
15	CCV-503-SS	CCV VALVE	1
16	JML-532-2T	ELBOW 1/8 NPT(M) X 1/4 ODT	1
17	4T-4T	FITTING, 1/4" NPT(M) X 1/4" NPT(M)	1
18	SSP-6443	FITTING, ELBOW, 1/4 NPT (M) X 3/8" ODT	1
19	LSMM0059-01	CALIBRATION TUBE	1

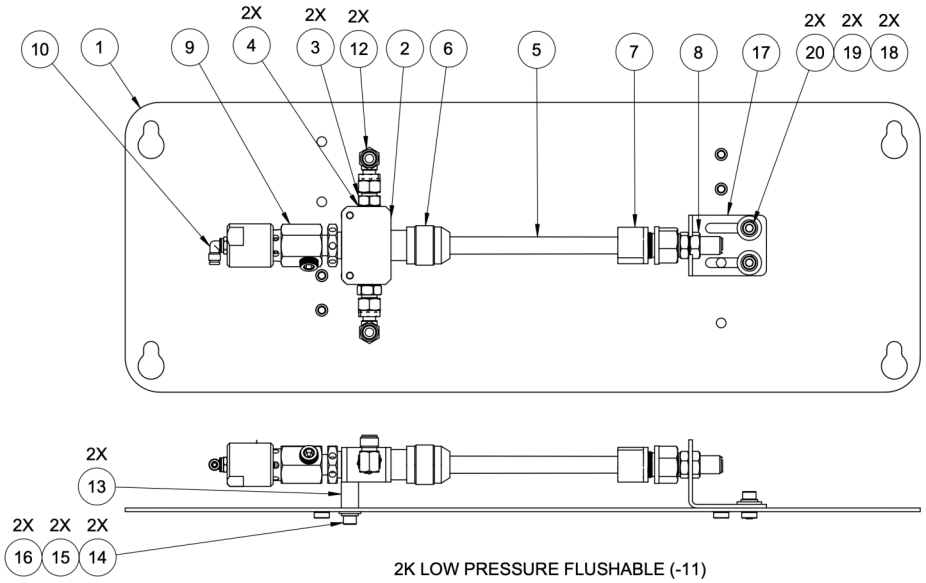
Weepless (Please reference manual No. LN-9225-00 for additional details)



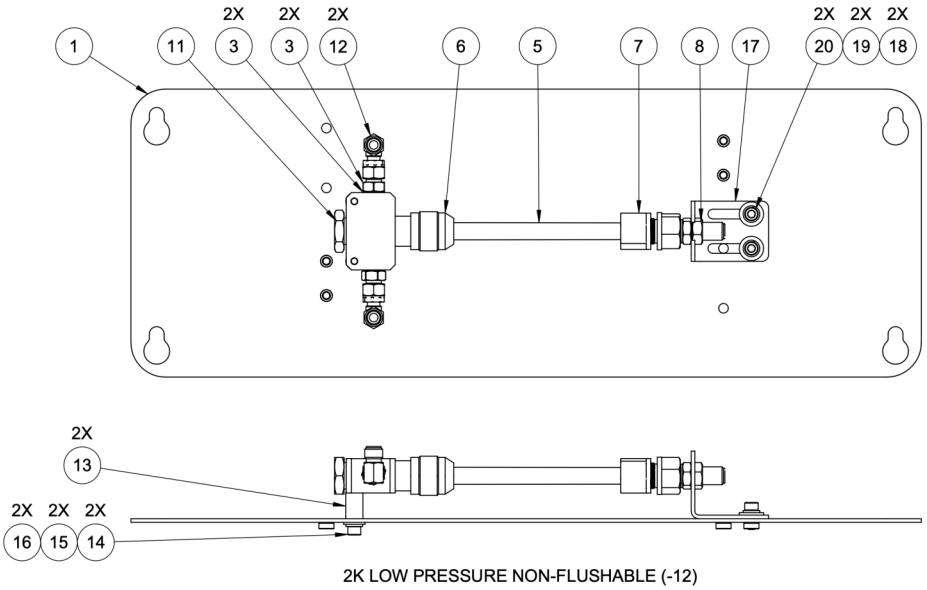


		WEEPLESS	
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	310-3301	FLUID CONTROL PANEL	1
2	76624-02	02-WEEPLESS MVR	-
2	76624-03	03 WEEPLESS MVR	-
2	76624-04	04 WEEPLESS MVR	-
3	4SN-6JIC	FITTING, 1/4" NPS (F) X 3/8" JIC (F)	1
4	4-6JIC	FITTING, 1/4" NPS (M) X 3/8" JIC (M)	4
5	310-2806	MOUNTING BRACKET	1
6	310-9000	GEAR FLOW METER, DUAL PROBE	-
6	310-9001	GEAR FLOW METER, FIBER OPTIC	-
6	A13296	PISTON FLOW METER	-
7	310-2802	MVR MOUNTING BRACKET	1
8	GA-338	1/8" NPT BACK MOUNT GAUGE (0-160 PSI), 1 1/2" DIA	1
9	JML-14-2T	ELBOW 1/8 NPT(M) X 1/4 ODT	1
10	310-8200	CALIBRATION BLOCK	1
11	CCV-503-SS	CCV VALVE	1
12	JML-532-2T	ELBOW 1/8 NPT(M) X 1/4 ODT	1
13	4T-4T	FITTING, 1/4" NPT(M) X 1/4" NPT(M)	1
14	SSP-6443	FITTING, ELBOW, 1/4 NPT (M) X 3/8" ODT	1
15	LSMM0059-01	CALIBRATION TUBE	1

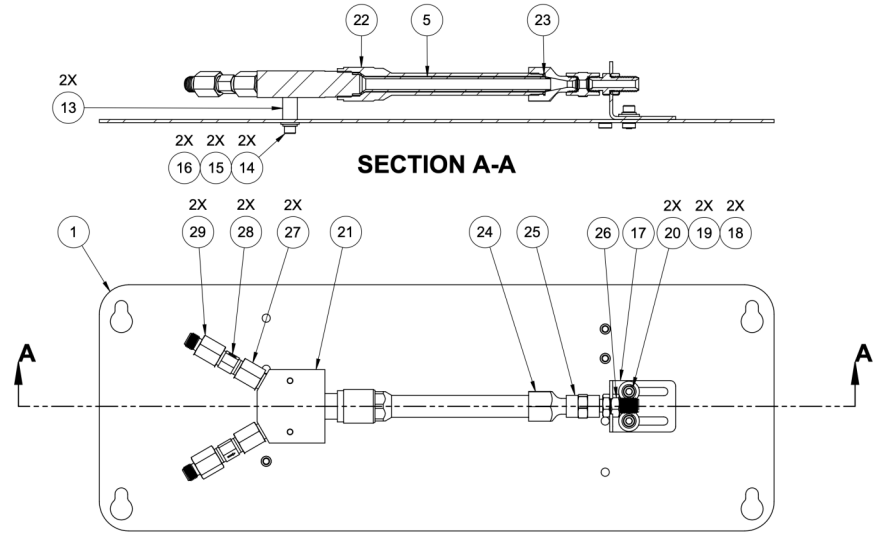
Fluid Mix Panel



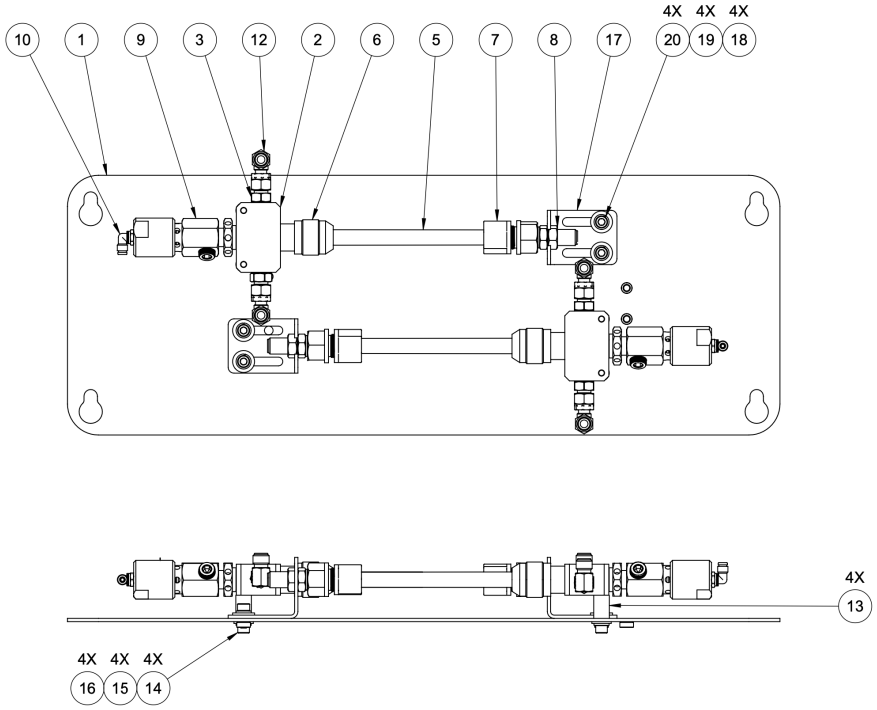
2K LOW PRESSURE FLUSHABLE (-11)



2K LOW PRESSURE NON-FLUSHABLE (-12)



2K HIGH PRESSURE (-22)



3K LOW PRESSURE FLUSHABLE STAGED MIXING (-13)

ITEM NO.	PART NUMBER	DESCRIPTION	2K LOW PRESSURE FLUSHABLE (-11)	2K LOW PRESSURE NONFLUSHABLE (-12)	3K, LOW PRESSURE FLUSHABLE (-13)	2K HIGH PRESSURE (-22)
1	310-3807	FLUID MIX PANEL WELDMENT	1	1	1	1
2	78015	2K MIX BLOCK	1	1	2	-
3	22-280	CHECK VALVE ASSEMBLY	2	2	4	-
4	22-285	SEAL	2	2	4	-
5	LSMM0056-00	3/8 ID X 18 ELEMENT MIXER	1	1	2	1
6	LSMM0057-00	MIX TUBE RETAINING NUT	1	1	2	-
7	20-7047	FITTING, 1/2" ODT X 3/8 NPT(F), ACETAL	1	1	2	-
8	6T-4RB	FITTING, 3/8" NPT(M) X 1/4" NPS(M), BULKHEAD	1	1	2	-
9	CCV-503-SS	VALVE ASSEMBLY	1	-	2	-
10	41-FTP-1006	1/8 NPT(M) X 5/32" TUBE ELBOW	1	-	2	-
11	KK-4370	PLUG KIT	-	1	-	-
12	4SN-4-90	ELBOW FITTING, 1/4" NPS(M) X 1/4" NPS (F)	2	2	4	-
13	20-7016	SPACER, 1/2" OD, 1/4" ID, 3/4" LG	2	2	4	2
14		SHCS, 1/4"-20, 1-7/8" LG, 18-8	2	2	4	2
15		LOCK WASHER, 1/4", 18-8	2	2	4	2
16		WASHER, 1/4", 18-8	2	2	4	2
17	310-3808	MIXER MOUNT BRACKET	1	1	2	1
18		WASHER, M6, 18-8	2	2	4	2
19		LOCK WASHER, M6, 18-8	2	2	4	2
20		SHCS, M6X1, 14MM LG, 18-8	2	2	4	2
21	LBAL0016-00	" Y " - BLOCK, 2K	-	-	-	1
22	LBAL0022-00	JACKET, HIGH PRESSURE, FOR DISPOSABLE MIXER	-	-	-	1
24	LBAL0023-00	ADAPTER, FLUID HOSE, HIGH PRESSURE	-	-	-	1
25	240-3133	FITTING, 1/4" NPT(F) X 1/4" NPT(F)	-	-	-	1
26	4T-4RB	FITTING, 1/4" NPT(M) X 1/4" NPS(M), BULKHEAD	-	-	-	1
27	6GTX	FITTING, 1/4" NPT(F) X 3/8" JIC(M)	-	-	-	2
28	SSV-809	CHECK VALVE	-	-	-	2
29	4-4T(F)	FITTING, 1/4" NPS(M) X 1/4" NPT(F)	-	-	-	2

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TROUBLESHOOTING

Although the RF2 is a fairly complex machine, troubleshooting the unit is straight forward with a few basic steps.

ALARM LIST

The first indication that something may be wrong with the process being controlled by the RF2 is through the alarm dialog. Below is a list of alarms and troubleshooting steps.

Alarm description	Details and troubleshooting steps
Safety Fault	The safety circuit for the RF2 is open, operation is not possible
	This fault most occurs in conjunction with other alarms, such as an E-Stop pressed, fire -detect, etc. - Address any of these faults before troubleshooting further. If no other fault is present with this one, check the wiring of the safety relay. See schematics for more details.
E-Stop PB Pressed	The E-Stop on the front of the RF2 control enclosure has been pressed.
	Pull the emergency stop pushbutton to reset the alarm
Festo VTEM Pressure Regulator Module (x) Fault	The indicated module (x) has on the Festo pressure regulator manifold has a fault.
	Most often, this alarm will occur at the same time as all other pressure regulator modules. This is most often caused by a lack of input air pressure being fed to the manifold. Ensure main air pressure is turned on. Press 'Reset' button on the main HMI. If the fault persists, see section on troubleshooting the pressure regulator manifold further.
Comm Loss with Master Controller	After having been established, communications between the supervisory (master) PLC and the RF2 has been interrupted.
	Check master process controller for proper operation. Power cycle the RF2 Check cabling between master controller and RF2 unit.
Comm Loss with Aux. Communications Gateway	The Anybus gateway installed, and communications between it and the RF2 controller have been interrupted.
	Power cycle the RF2 Check cabling between the RF2 and the Anybus gateway.
Station (x) - Recipe Update Failed	The indicated station (x) has had a failure in loading a recipe (timeout occurred).
	Try loading the recipe again. Power cycle the RF2 Contact Technical Support

Alarm description	Details and troubleshooting steps
Station (x) - Fluid Sequence Failed	The indicated station (x) has experienced a failed (incomplete) fluid sequence. Material may not be properly loaded or purged from the system.
	This occurs when an interlock is lost during a sequence. Check all wired interlocks to make sure these are not turning on at inappropriate times. Check other alarms that may have occurred in conjunction with this for more detailed cause analysis. Retry running the fluid sequence
Station (x) - Solvent Flow Low	The indicated station (x) has run a sequence, and detected not enough solvent flow in comparison to the solvent check settings.
	Ensure solvent supply is adequate and not restricted. Check Solvent Flow Meter Check timing of fluid sequence to ensure that solvent flow occurs for enough time to flush the system.
Pot Life Expired	The material pot life for the indicated Gun / Mixer has elapsed.
	If safe to do so, trigger the gun / mixer in order to allow fresh material into the system - OR flush the system.
Ratio Out Of Tolerance	The RF2 has calculated that the ratio of mixtures A:B or %C has deviated by more than the allowed tolerance.
	Determine if fluid delivery is ok, fluid pressures are correctly set, etc. Check for restrictions in any of the fluid channels. Check material viscosity for abnormalities Check recipe settings for ratio tolerance.
Flow Rate Out Of Tolerance	The RF2 has calculated that the overall flow rate is out of tolerance.
	Determine if fluid delivery is ok, fluid pressures are correctly set, etc. Check for restrictions in any of the fluid channels. Check material viscosity for abnormalities Check recipe settings for flow tolerance
Ratio Shutdown	A Ratio Out Of Tolerance fault has been generated, shutting down the station.
	Determine if fluid delivery is ok, fluid pressures are correctly set, etc. Check for restrictions in any of the fluid channels. Check material viscosity for abnormalities Check recipe settings for ratio tolerance. To disable shutdown of the system for this fault - see the instructions concerning

Alarm description	Details and troubleshooting steps
Flow Rate Shutdown	A Flow Rate Out Of Tolerance Fault has occurred, shutting down the station.
	Determine if fluid delivery is ok, fluid pressures are correctly set, etc.
	Check for restrictions in any of the fluid channels.
	Check material viscosity for abnormalities
	Check recipe settings for flow tolerance
	To disable shutdown of the system for this fault - see the instructions concerning alarm-masking.
Channel (x) - Outlet Underpressure	The indicated channel (x) has detected low pressure on its outlet pressure sensor (applicable only for gear-pump controlled channels).
	Determine if fluid delivery is ok, fluid pressures are correctly set, etc.
	Check for restrictions in the tubing feeding this channel.
	Check material viscosity for abnormalities
	Check settings for low pressure.
	Check pressure sensor scaling / operation.
Channel (x) - Outlet Overpressure	The indicated channel (x) has detected high pressure on its outlet pressure sensor (applicable only for gear-pump controlled channels). This event will cause a spray-shutdown.
	The indicated channel (x) has detected low pressure on its outlet pressure sensor (applicable only for gear-pump controlled channels).
	Determine if fluid delivery is ok, fluid pressures are correctly set, etc.
	Check for restrictions in the tubing downstream from this channel.
	Check material viscosity for abnormalities
	Check settings for high pressure.
	Check settings for trigger timing
	Check pressure sensor scaling / operation.
Channel (x) - Inlet Underpressure	The indicated channel (x) has detected low pressure on its inlet pressure sensor (applicable only for gear-pump controlled channels).
	Determine if fluid delivery is ok, fluid pressures are correctly set, etc.
	Check for restrictions in the tubing feeding this channel.
	Check material viscosity for abnormalities
	Check settings for low pressure.
	Check pressure sensor scaling / operation.
Channel (x) - Inlet Overpressure	The indicated channel (x) has detected high pressure on its inlet pressure sensor (applicable only for gear-pump controlled channels).
	Determine if fluid delivery is ok, fluid pressures are correctly set, etc.
	Check for restrictions in the tubing feeding this channel.
	Check material viscosity for abnormalities
	Check settings for high pressure.
	Check pressure sensor scaling / operation.

Alarm description	Details and troubleshooting steps
Channel (x) - Low Flow	RF2 has determined flow rate for this channel is low.
	Determine if fluid delivery is ok, fluid pressures are correctly set, etc. Check for restrictions in any of the fluid channels. Check material viscosity for abnormalities Check recipe settings for flow tolerance Check Flow Sensor Calibration / Operation
Channel (x) - High Flow	RF2 has determined flow rate for this channel is high.
	Determine if fluid delivery is ok, fluid pressures are correctly set, etc. Check for restrictions in any of the fluid channels. Check material viscosity for abnormalities Check recipe settings for flow tolerance Check Flow Sensor Calibration / Operation
Channel (x) - Flow Feedback Loss	Zero flow is detected by the RF2 for the indicated channel (x)
	Determine if fluid delivery is ok, fluid pressures are correctly set, etc. Check for restrictions in any of the fluid channels. Check material viscosity for abnormalities Check recipe settings for flow tolerance Check Flow Sensor Calibration / Operation
Channel (x) - Spray Shutdown	The indicated channel (x) has caused a spray shutdown, due to a flow or feedback fault that has been configured to shut down the system.
	Address other channel faults that occurred in conjunction with this fault. To disable shutdown of the system for this fault - see the instructions concerning alarm-masking.
Channel (x) - Reverse Flow Detected	The RF2 has detected flow in the reverse direction, exceeding the reverse-flow volume setting. This will cause a spray shutdown.
	Inspect check-valves on mix manifold and color stacks. Check wiring to flow meter Check trigger timing settings Check settings for reverse flow volume. It is normal to detect a small reverse reading when triggering off, as the fluid may create a wave in the reverse direction momentarily - this does not indicate fluid has passed beyond the check valve.
Channel (x) - Inlet Pressure Loss of Feedback	If an inlet pressure sensor is configured (gear-pump systems only), the RF2 has detected no feedback from the inlet pressure sensor.
	Check Pressures sensor scaling / operation.
Channel (x) - Outlet Pressure Loss of Feedback	If an outlet pressure sensor is configured (gear-pump systems only), the RF2 has detected no feedback from the outlet pressure sensor.
	Check Pressures sensor scaling / operation.

Alarm description	Details and troubleshooting steps
Channel (x) - Flow Out Of Range	The flow actuator (MVR or DR1) is operating at its maximum pilot pressure signal, but flow rate is low.
	Check that the desired flow rate is attainable given the system flow restrictions (gun tip settings, tubing size and lengths, etc.) Check material viscosity for abnormalities
Channel (x) - Unconfigured Inlet Pressure Pilot	The indicated channel has been configured with inlet pressure control, but no pressure regulator has been assigned for this purpose.
	Check System Configuration Settings
Channel (x) - Unconfigured Flow Pressure Pilot	No flow rate pilot signal has been assigned to a regulator.
	Check System Configuration Settings

TROUBLESHOOTING—FESTO VTEM PRESSURE REGULATOR MANIFOLD

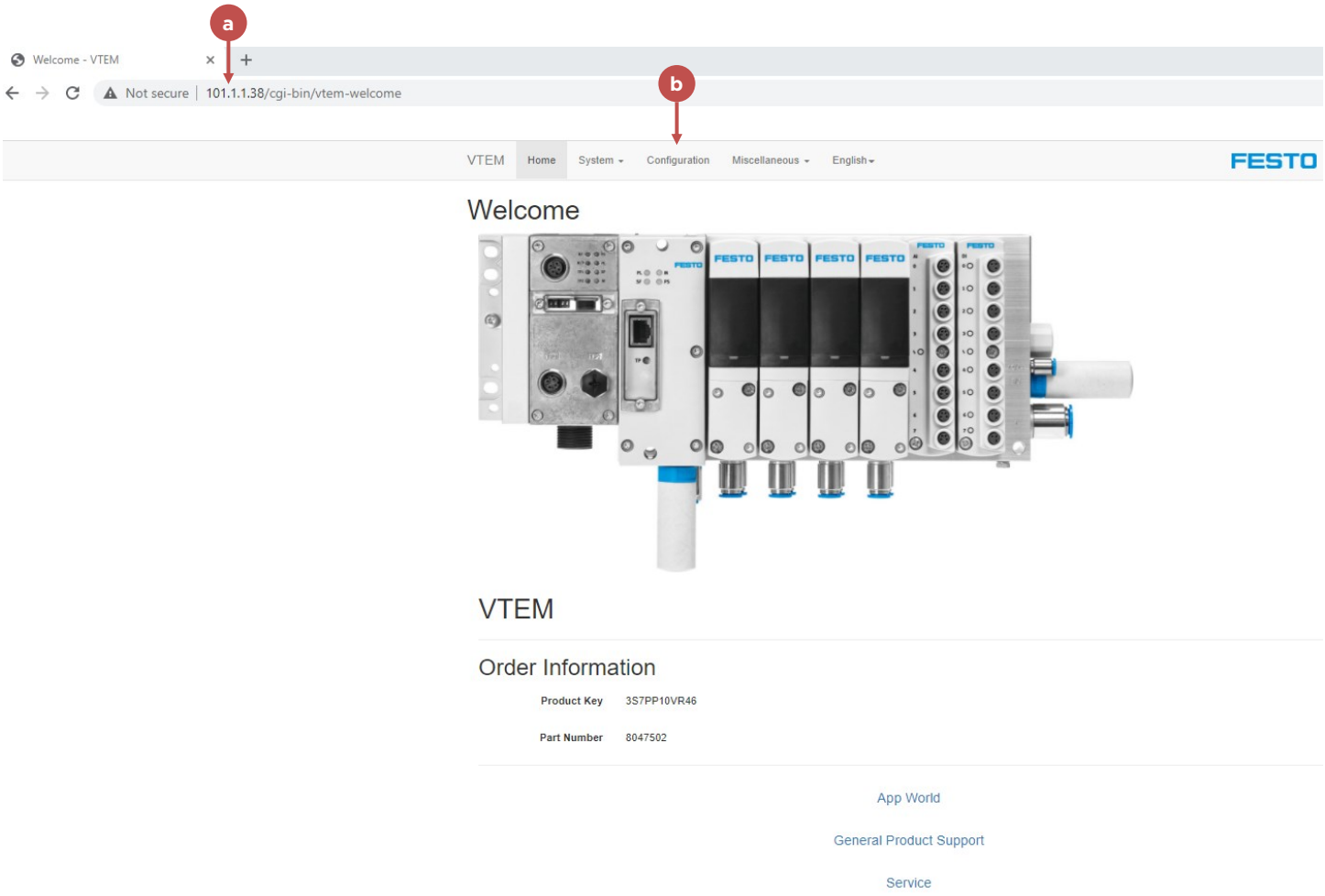
If there is an issue with the Festo VTEM Pressure regulator manifold, more detailed troubleshooting is possible by accessing the unit directly.

To do this – first locate the RJ45 port (1) used for configuring the VTEM module. Connect a PC to this port.

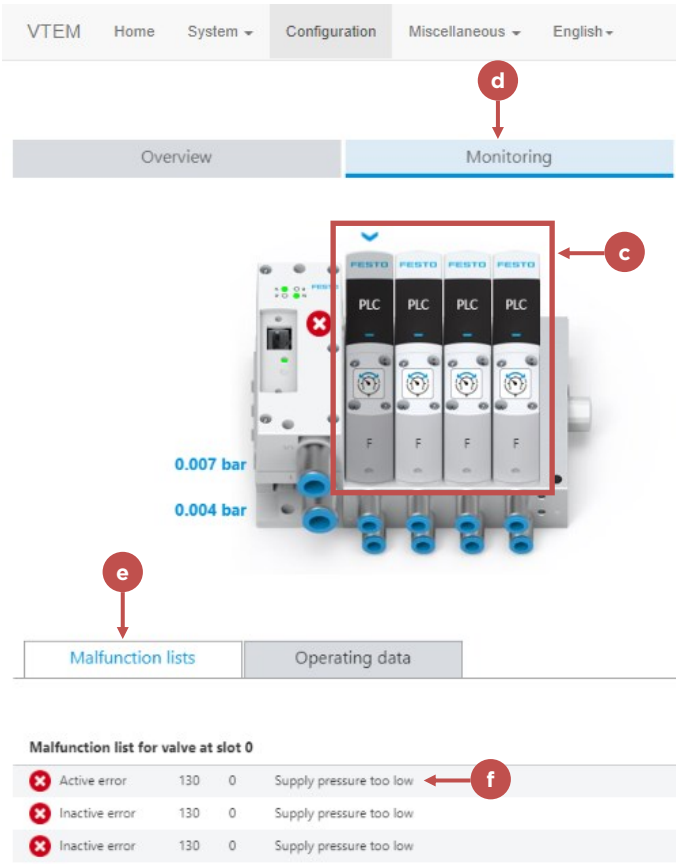
Set the IP address of the connected PC to 101.1.1.99.

Open a web browser and enter 101.1.1.38 (a)

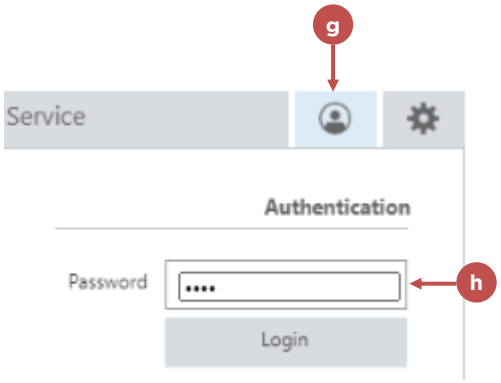
To troubleshoot a module, click the configuration tab (b).



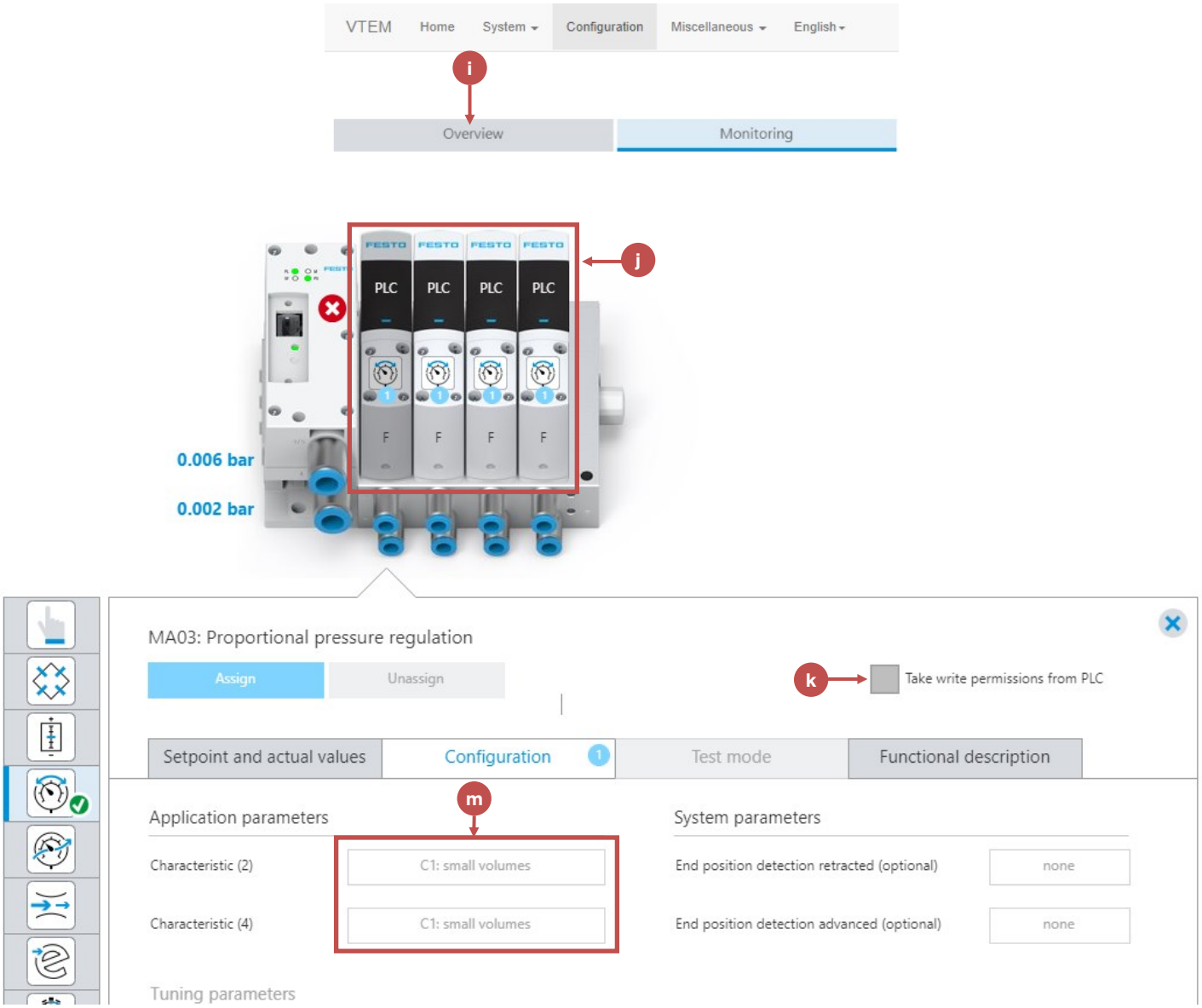
You will be able to select any module by clicking on it (c). Selecting the monitor tab (d) will show a list of malfunctions (e). In the example below, we see that the supply pressure is too low (f).



If the fluid panels for the RF2 have been installed far away from the unit itself, it may be desirable to modify the tuning for the pressure regulators. To do this, log into the VTEM unit by pressing the login key (g) and entering the password (h). Factory default is '**vtem'**. It is recommended that you **DO NOT** change this password.



Once logged in, select the overview tab (i) and select the module (j) you wish to edit. To make any modifications, it is necessary to 'Take Write Permissions from the PLC' (k) – **this will not be allowed if the PLC is communicating to the VTEM manifold. So it is necessary to unplug the M12 Ethernet cable at the front of the manifold, before checking the box below.**

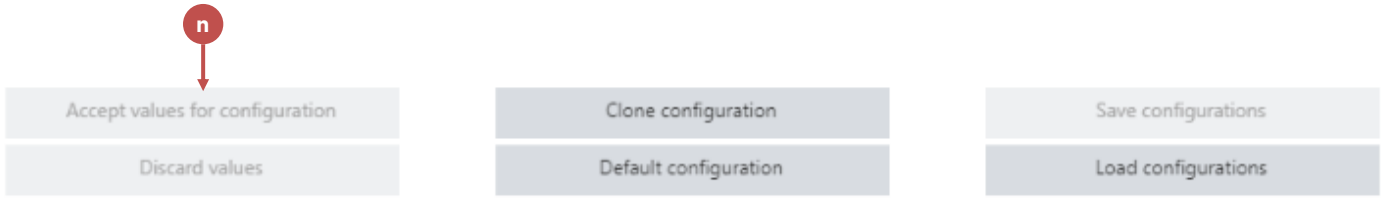


Determine the port of the module (4 or 2) labeled on the module itself that is connected to the tubing you wish to change the tuning for. Modify the 'Characteristic' (m) parameter by selecting from the dropdown: small, medium, or large volumes. It is also possible to custom tune the regulator.

When edits have been made, select 'Accept values for configuration', (n) then press 'Save Configurations' (o). Note if configuration is not saved, the unit will revert to its earlier settings upon power up.

To replace a failed pressure regulator module, loosen the bolts on the module, and pull the module out directly. Ensure the new module's gasket is properly located it its channel and press directly into the open slot – tighten bolts, as to not overly squeeze the gasket.

Consult Festo VTEM operations manual for more details.

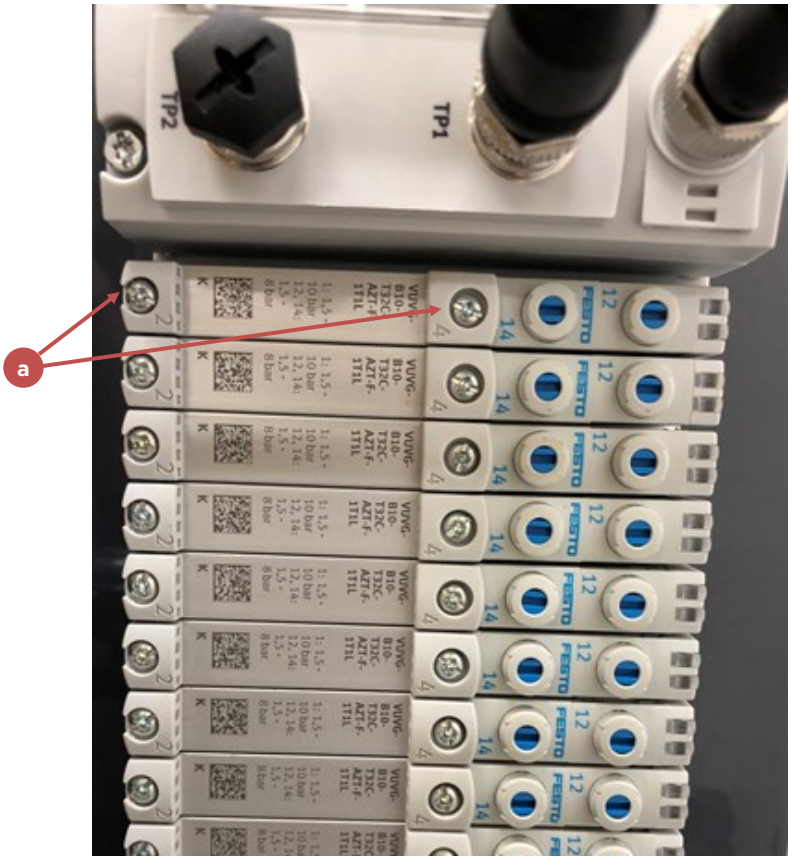


TROUBLESHOOTING—FESTO VTUG SOLENOID MANIFOLD

To replace a failed solenoid module on the Festo VTUG manifold, loosen the bolts (a), and pull the module out directly. Ensure the new module's gasket is properly located it its channel and press directly into the open slot – tighten bolts, as to not overly squeeze the gasket.

WARNING

Ensure the air is disconnected before attempting to remove a solenoid module.

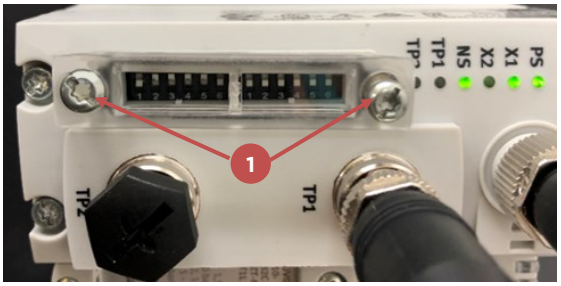


The RF2 can control up to four solenoid modules. If these modules have not been installed in the purchased configuration, they can be installed later in the field. Each manifold (1-4) must be set to a specific IP address – listed below:

- Manifold #1: 101.1.1.30
- Manifold #2: 101.1.1.31
- Manifold #3: 101.1.1.32
- Manifold #4: 101.1.1.33
- Subnet mask for all manifolds is 255.255.255.0

To set the IP address – do the following:

1. Remove the cover to access the dip switches on the front of the CTEU-EP communications module on the solenoid manifold.
2. Set the dip switches for the last octet of the IP address.
3. Connect a PC to the ethernet port of the CTEU, or connect through an ethernet switch. Set the laptop to IP address 192.168.1.99
4. Open 'Festo Field Device Tool' software. This can be downloaded from Festo's website.



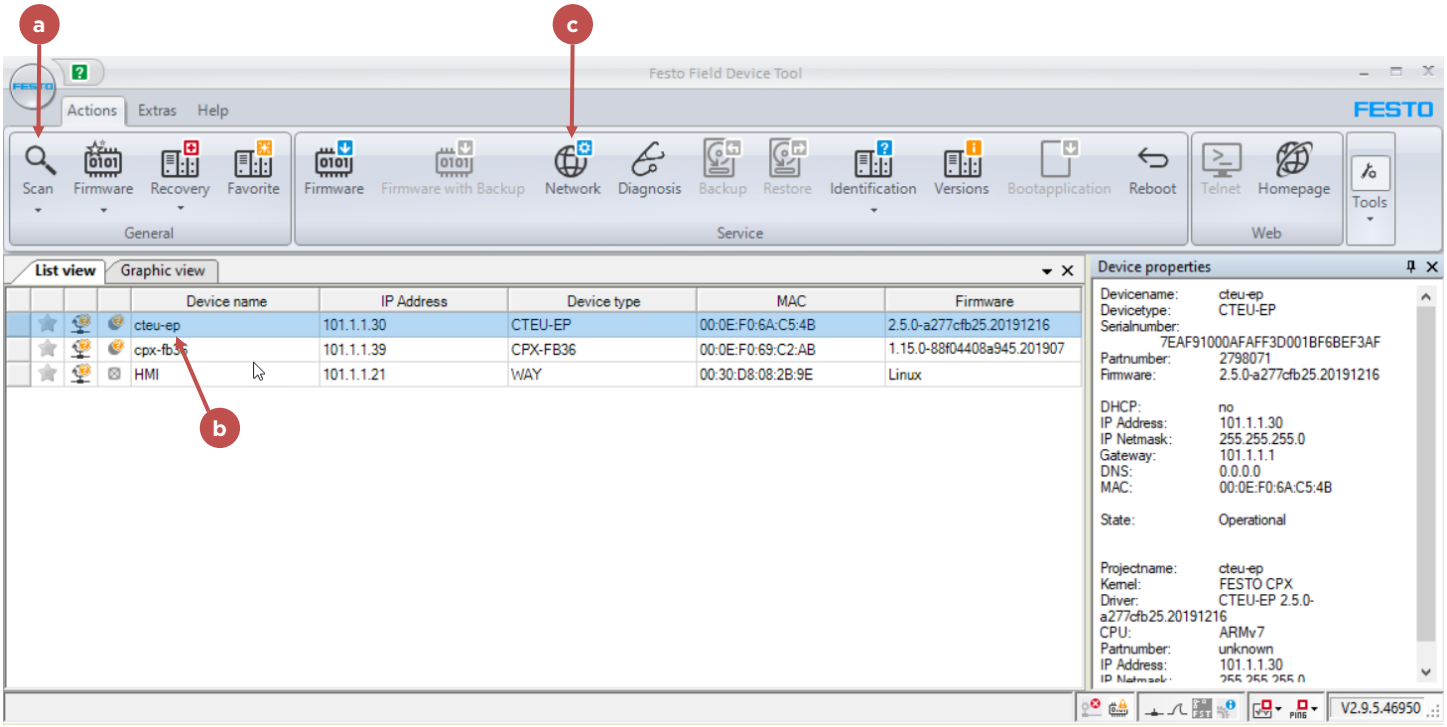
From left to right.

1-1 = least significant bit.

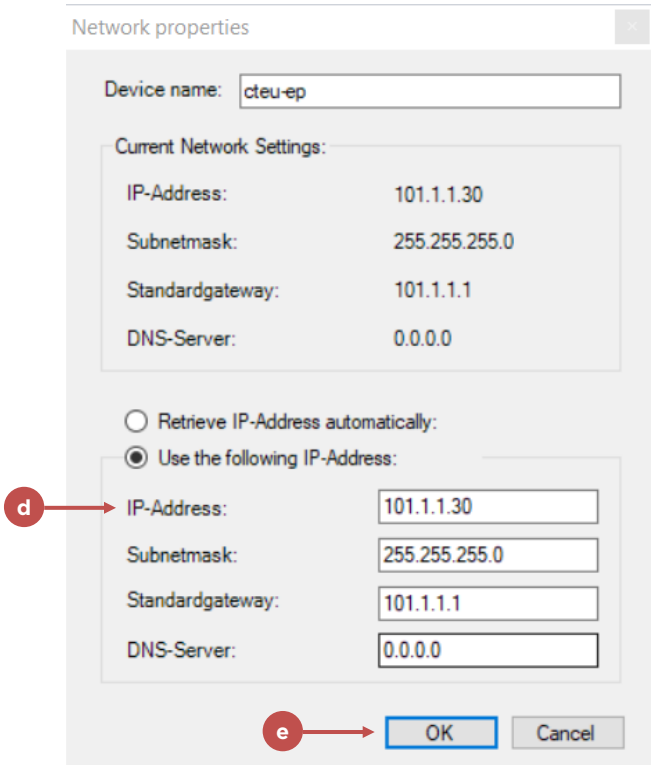
2-2 = most significant bit

Leave 2-3 – 2-6 at zero.

5. Scan (a) the network and find the module (b) you wish to modify. Highlight it and select 'Network' (c)



6. Change the IP settings (d) to 101.1.1.x (from list specified in the previous page).
7. Click OK (e)
8. Return PC IP Address to normal, re-cover the dip-switches.



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APPENDIX

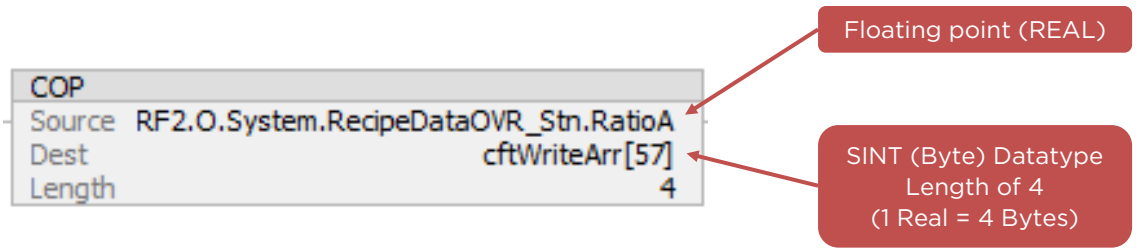
FIELDBUS I/O

There are two methods for communicating to the RF2 over fieldbus.

- Direct CIP access to tag arrays given below. No gateway is used.
    - RF2 Input Array (PLC -> RF2):
        - AuxInArr (SINT 496)
    - RF2 Output Arrays (RF2 -> PLC):
        - AuxOutArr1 (SINT 496)
        - AuxOutArr2 (SINT 496)
- Access through Anybus gateway (if purchased).
    - In this method, the communications protocol is converted from the customer's side to Ethernet/IP on the RF2 side. Tag registers within the RF2 are overwritten by the tags communicated through the gateway.

Carlisle can provide sample or importable code for Rockwell software solutions for both methods above.

Datatypes that are in the form of BOOL, integer (INT), double integer (DINT), or Floating Point (REAL), are represented by varying amounts of bytes. The code used in the master controller must take this into account – for example:



The above code copies a real value into 4 bytes.

The above code copies 4 bytes into a real value.

NOTE

The above examples are given in Allen Bradley software – other PLC software may have different methods for accomplishing the datatype conversions

Handshaking: The RF2 will fault if it detects a connection has been lost between its master controller and itself after communications has been established. It detects communications through a handshaking word which it increments after the master controller has echoed it back. The master controller communicating must set its output byte #1 equal to its input byte #1 continuously.

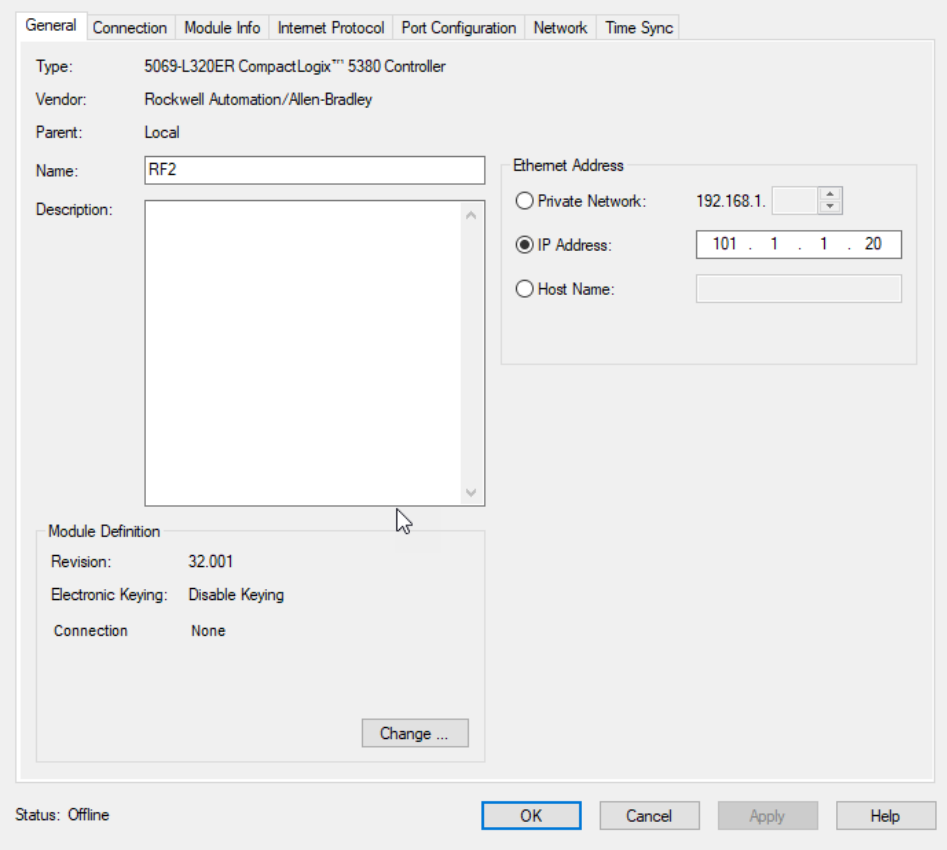
Direct Access / CIP communications

If an Allen Bradley Logix PLC is used, or another controller where direct access to the RF2 input and output arrays (AuxInArr, AuxOutArr1, AuxOutArr2) is possible, no gateway or special hardware is needed to communicate to the RF2. All the RF2 communications arrays are in the form of 496 SINT Data types.

CIP Message Setup

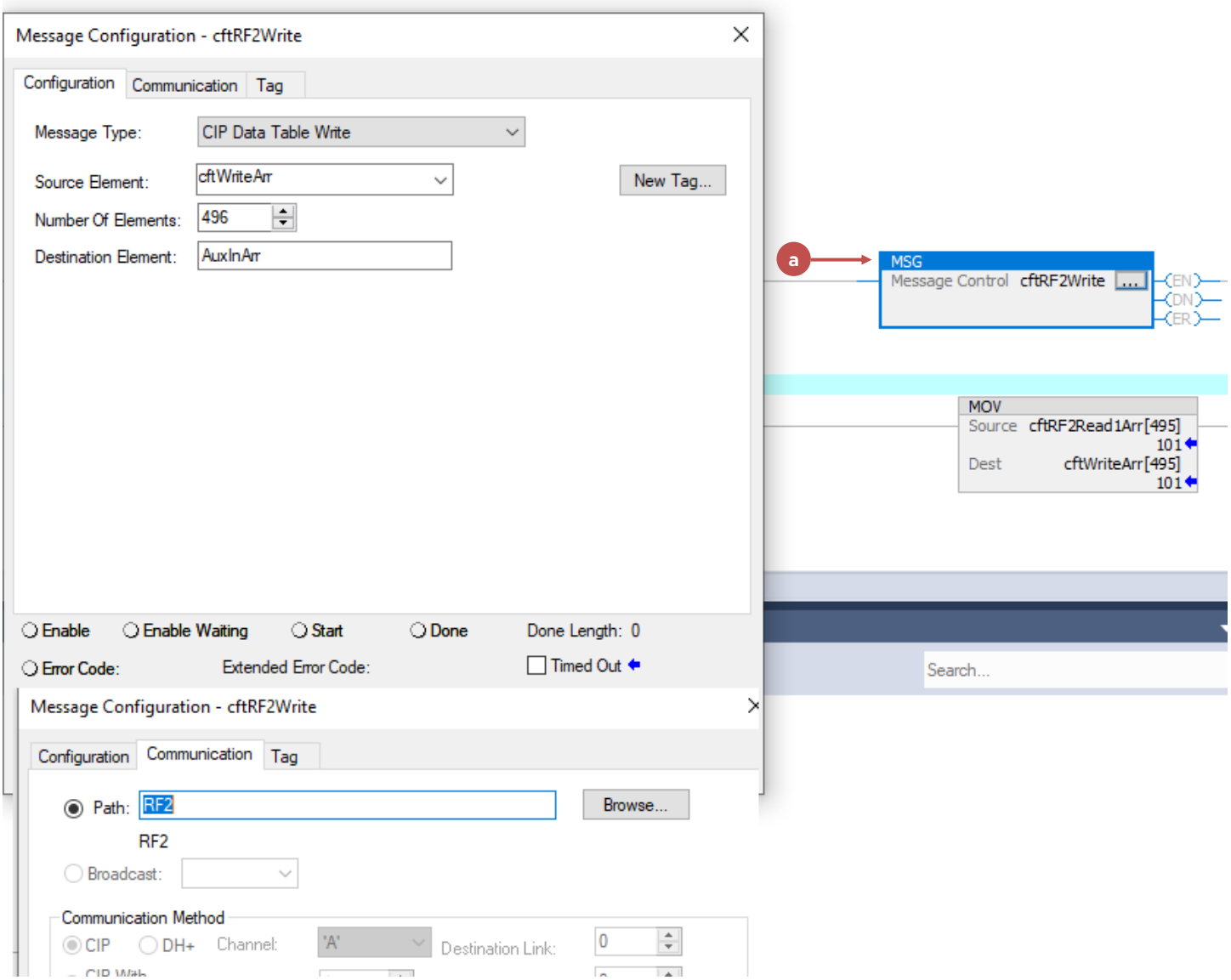
To make the RF2 as flexible as possible in being able to communicate to as many devices as possible, with different IP address configurations, etc. All communications are handled by the master controller, and the RF2 simply contains the tag arrays used for the transfer. Examples of Allen Bradley Message setups are given below. Note: The below code examples would be placed in the master PLC.

Other PLCs or systems may require other methods for getting data into the RF2's tag arrays.

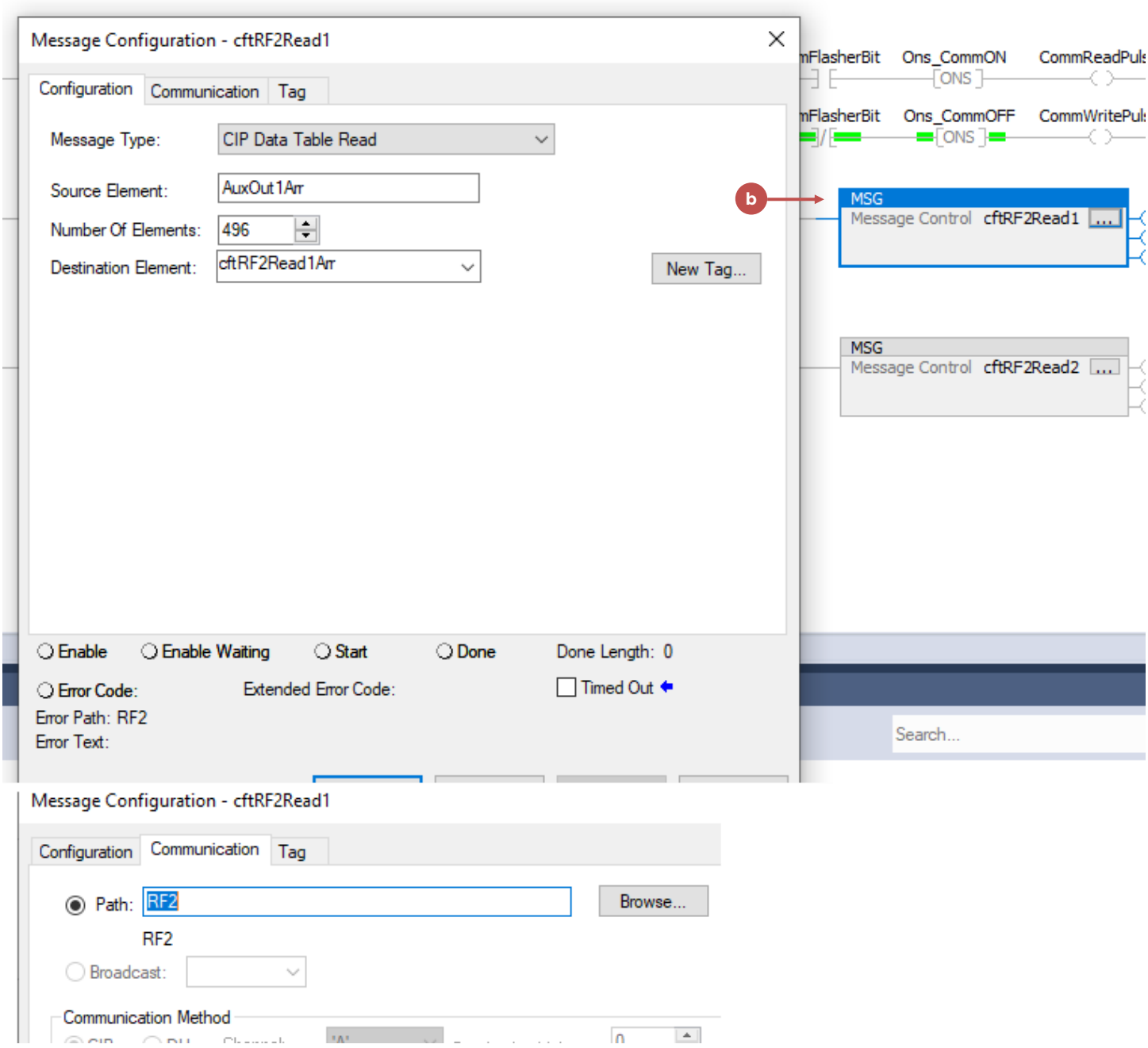


RF2 Node Setup in an Allen Bradley PLC.

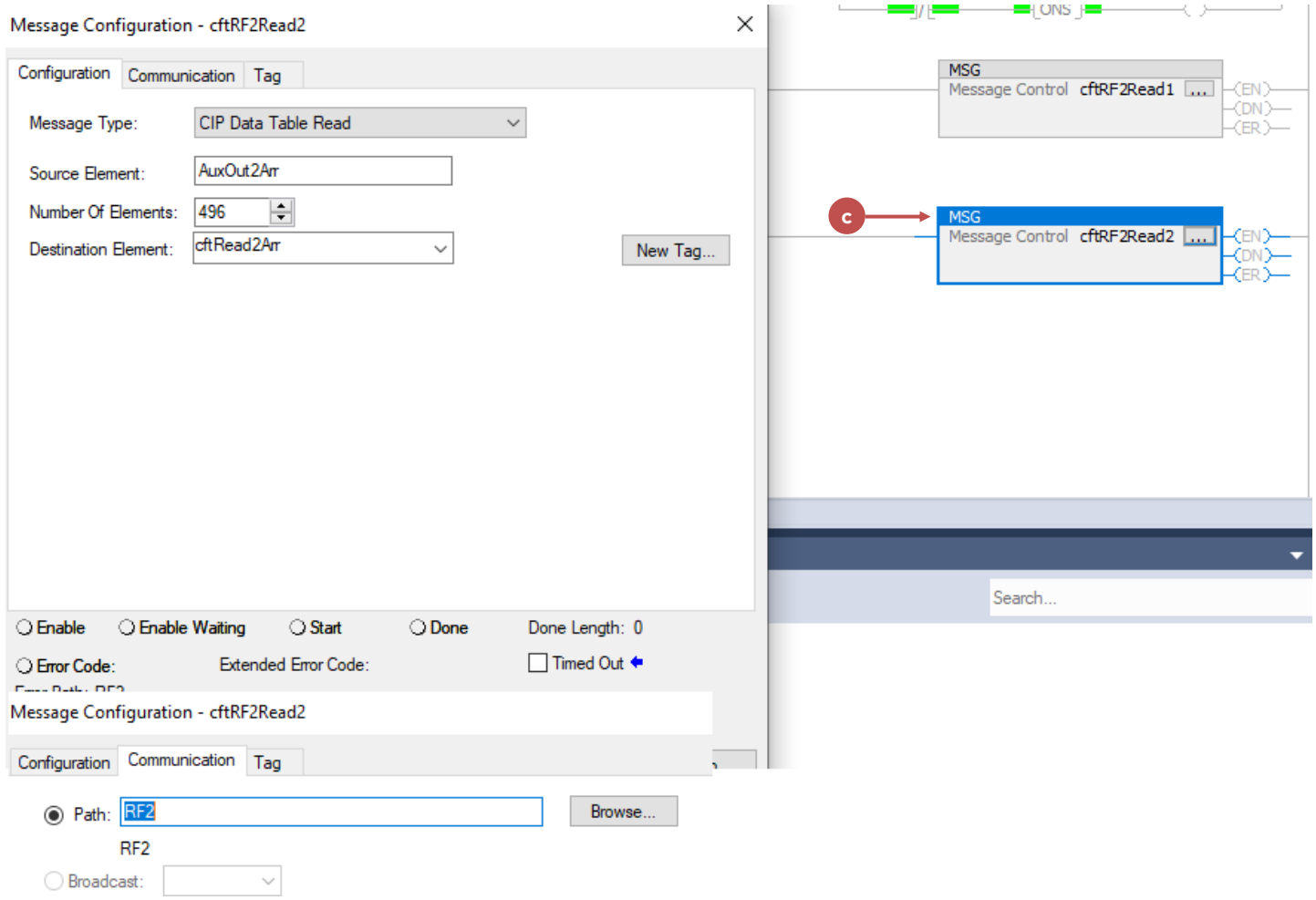
IP Address: Set to IP assigned to the A2 port of the RF2s Compact Logix PLC. See "Setting the IP Address for Fieldbus Communications (No Gateway)" in the Installation Chapter for more details.



RF2 Input Array (Master PLC Write) (a)



RF2 Output Array 1 (Master PLC Read) (b)



RF2 Output Array 2 (Master PLC Read) (c)

Message Polling: It is recommended to poll the messages on a periodic interval. In the example code the RF2 Inputs and Outputs are offset by 20 milliseconds. Note – it is not always necessary to receive both RF2 Output Arrays – the second array is used only if active recipe data is being communicated, which is not required for running the RF2.

The RF2 Communications arrays represent the following Data

RF2 Input Array (SINT 496)			
Address	Length	Datatype	Description
0	1 Byte	SINT	System Control Byte 0 - See Detail Below
1	1 Byte	SINT	Handshake Word
2	1 Byte	SINT	Station 1 Control Byte 0 - See Detail Below
3	1 Byte	SINT	Station 1 Control Byte 1 - See Detail Below
4..5	2 Byte	INT	Station 1 Job Select (1-250). This job will be loaded when the Station Job Strobe bit is activated.
6	1 Byte	SINT	Station 2 Control Byte 0 - See Detail Below
7	1 Byte	SINT	Station 2 Control Byte 1 - See Detail Below
8..9	2 Byte	INT	Station 2 Job Select (1-250). This job will be loaded when the Station Job Strobe bit is activated.
10..13	4 Bytes		Reserved
14	1 Byte	SINT	Gun / Mix 1 Trigger
15..16	2 Byte	INT	Gun / Mix 1 Flow Command (0-3500 cc)
17	1 Byte	SINT	Gun / Mix 2 Trigger
18..19	2 Byte	INT	Gun / Mix 2 Flow Command (0-3500 cc)
20	1 Byte	SINT	Gun / Mix 3 Trigger
21..22	2 Byte	INT	Gun / Mix 3 Flow Command (0-3500 cc)
23	1 Byte	SINT	Gun / Mix 4 Trigger
24..25	2 Byte	INT	Gun / Mix 4 Flow Command (0-3500 cc)
26..39	14 Bytes		Reserved
40	1 Byte	SINT	Request Totals - Gun/Mix (1-4 = View Totals for Gun / Mix 1-4)
41	1 Byte	SINT	Request Totals - Job (0 = All Jobs,1-250 = Job 1-250)
42	1 Byte	SINT	Request Totals - Time Range (0=Grand, 1=Yearly, 2=Monthly, 3=Weekly,4=Daily,5=Hourly)
43..49	7 Bytes		Reserved

RF2 Input Array (SINT 496)			
50	1 Byte	SINT	Request Station Command Data (1-2)
51	1 Byte	SINT	Override Station Command Data (1-2 -- Selected Station Active Command Data - materials portion-overwritten with data given below.
52	1 Byte	SINT	Override Data - Station Selected In Byte 51 - Component A - Valve Number
53	1 Byte	SINT	Override Data - Station Selected In Byte 51 - Component B - Valve Number
54	1 Byte	SINT	Override Data - Station Selected In Byte 51 - Component C - Valve Number
55..56	2 Byte	INT	Override Data - Station Selected In Byte 51 - Pot Life Time - Minutes x 100
57..60	4 Byte	REAL	Override Data - Station Selected In Byte 51 - Ratio A
61..65	4 Byte	REAL	Override Data - Station Selected In Byte 51 - Ratio B
65..68	4 Byte	REAL	Override Data - Station Selected In Byte 51 - Ratio C
69	1 Byte	SINT	Override Data - Station Selected In Byte 51 - Purge A Seq Select (1-16)
70	1 Byte	SINT	Override Data - Station Selected In Byte 51 - Purge All Seq Select (1-16)
71	1 Byte	SINT	Override Data - Station Selected In Byte 51 - Load Seq Select (1-16)
72..80	9 Byte	SINT	Reserved
81	1 Byte	SINT	Request Gun / Mix Command Data (1-4)
82	1 Byte	SINT	Override Gun / Mix Command Data (1-4 -- Selected Gun/Mix Active Command Data - materials portion - overwritten with data given below.
83..84	2 Byte	INT	Override Data - Gun/Mix Selected In Byte 82 - Default Flow Command (0-3500)
85..86	2 Byte	INT	Override Data - Gun/Mix Selected In Byte 82 - Max Flow Command (0-3500)
87..88	2 Byte	INT	Override Data - Gun/Mix Selected In Byte 82 - Min Flow Command (0-3500)

RF2 Input Array (SINT 496)			
89..90	2 Byte	INT	Override Data - Gun/Mix Selected In Byte 82 - Ratio Tolerance (0-100%)
91..92	2 Byte	INT	Override Data - Gun/Mix Selected In Byte 82 - Ratio Tolerance Volume
93..94	2 Byte	INT	Override Data - Gun/Mix Selected In Byte 82 - Flow Rate Tolerance (0-100%)
95..96	2 Byte	INT	Override Data - Gun/Mix Selected In Byte 82 - Flow Rate Tolerance Time
97..98	2 Byte	INT	Override Data - Gun/Mix Selected In Byte 82 - Trigger On Delay
99..100	2 Byte	INT	Override Data - Gun/Mix Selected In Byte 82 - Trigger Off Delay
101..102	2 Byte	INT	Override Data - Gun/Mix Selected In Byte 82 - Sequence High Flow Rate
103.122	20 Byte		Reserved
123	1 Byte	SINT	Request Channel Command Data (1-4)
124	1 Byte	SINT	Override Channel Command Data (1-4 -- Selected Channel Active Command Data - materials portion - overwritten with data given below.
125..128	4 Byte	DINT	Override Data - Channel Selected In Byte 124 - Pulse Flow Meter Calibration (PPL)
129..130	2 Byte	INT	Override Data - Channel Selected In Byte 124 - Analog Flow Meter Calibration- Input Low
131..132	2 Byte	INT	Override Data - Channel Selected In Byte 124 - Analog Flow Meter Calibration- Input High
133..134	2 Byte	INT	Override Data - Channel Selected In Byte 124 - Analog Flow Meter Calibration- Scaled Low
135..136	2 Byte	INT	Override Data - Channel Selected In Byte 124 - Analog Flow Meter Calibration- Scaled Low
137..140	4 Byte	REAL	Override Data - Channel Selected In Byte 124 - Flow Kp
141..144	4 Byte	REAL	Override Data - Channel Selected In Byte 124 - Flow Ki
145..148	4 Byte	REAL	Override Data - Channel Selected In Byte 124 - Flow Kd
149..150	2 Byte	INT	Override Data - Channel Selected In Byte 124 - Inlet Pressure Setpoint

RF2 Input Array (SINT 496)			
151..154	4 Byte	REAL	Override Data - Channel Selected In Byte 124 - Inlet Pressure Kp
155..158	4 Byte	REAL	Override Data - Channel Selected In Byte 124 - Inlet Pressure Ki
159..162	4 Byte	REAL	Override Data - Channel Selected In Byte 124 - Inlet Pressure Kd
163..166	4 Byte	REAL	Override Data - Channel Selected In Byte 124 - Inlet Pressure PID Deadband
167..168	2 Byte	INT	Override Data - Channel Selected In Byte 124 - Minimum Inlet Pressure
169..170	2 Byte	INT	Override Data - Channel Selected In Byte 124 - Maximum Inlet Pressure
171..172	2 Byte	INT	Override Data - Channel Selected In Byte 124 - Minimum Control Pressure
173..174	2 Byte	INT	Override Data - Channel Selected In Byte 124 - Foldback Pressure
175..178	4 Byte	REAL	Override Data - Channel Selected In Byte 124 - I Band
179..182	4 Byte	REAL	Override Data - Channel Selected In Byte 124 - C Band
183..219	37 Bytes		Reserved
220	1 Byte	SINT	User Input Bits (0..7 = Input 1-8)
221	1 Byte	SINT	User Input Bits (0..7 = Input 9-16)
222	1 Byte	SINT	User Input Bits (0..7 = Input 17-24)
223	1 Byte	SINT	User Input Bits (0..7 = Input 25-32)
224..495	272 Bytes		Reserved

System Control Byte 0			
Address	Length	Datatype	Description
0.0	1 Bit	Bool	Fault Reset
0.1	1 Bit	Bool	Spare
0.2	1 Bit	Bool	Spare
0.3	1 Bit	Bool	Spare
0.4	1 Bit	Bool	Spare
0.5	1 Bit	Bool	Spare
0.6	1 Bit	Bool	Spare
0.7	1 Bit	Bool	Spare

Station Control Byte 0			
Address	Length	Datatype	Description
x.0	1 Bit	Bool	Strobe Job
x.1	1 Bit	Bool	Purge
x.2	1 Bit	Bool	Spare
x.3	1 Bit	Bool	Seq Run Bit *
x.4	1 Bit	Bool	Seq Select Bit 0 *
x.5	1 Bit	Bool	Seq Select Bit 1 *
x.6	1 Bit	Bool	Seq Select Bit 2 *
x.7	1 Bit	Bool	Seq Select Bit 3 *
*When Seq Run Bit is active, the selected sequence is the binary representation of the Seq Select Bits. A value of 0-15 will call sequence 1-16 in the sequence list.			

Station Control Byte 1			
Address	Length	Datatype	Description
x.0	1 Bit	Bool	Run Mode Pulse
x.1	1 Bit	Bool	Halt Pulse
x.2	1 Bit	Bool	Spare
x.3	1 Bit	Bool	Spare
x.4	1 Bit	Bool	Spare
x.5	1 Bit	Bool	Spare
x.6	1 Bit	Bool	Spare
x.7	1 Bit	Bool	Spare

Gun / Mix Trigger Word			
Address	Length	Datatype	Description
x.0	1 Bit	Bool	Trigger 1
x.1	1 Bit	Bool	Trigger 2
x.2	1 Bit	Bool	Trigger 3
x.3	1 Bit	Bool	Trigger 4
x.4	1 Bit	Bool	Spare
x.5	1 Bit	Bool	Spare
x.6	1 Bit	Bool	Spare
x.7	1 Bit	Bool	Spare

RF2 Output Array 1 (SINT 496)			
Address	Length	Datatype	Description
0	1 Byte	SINT	System Status Byte 0 - See Detail Below
1	1 Byte	SINT	Handshake word
2	1 Byte	SINT	Station 1 Status Byte 0 - See Detail Below
3	1 Byte	SINT	Reserved
4..5	2 Byte	INT	Station 1 Active Recipe (1-250), 0= No Recipe Loaded
6	1 Byte	SINT	Station 2 Status Byte 0 - See Detail Below
7	1 Byte	SINT	Reserved
8..9	2 Byte	INT	Station 2 Active Recipe (1-250), 0= No Recipe Loaded
10..13	4 Byte		Reserved
14	1 Byte	SINT	Gun / Mixer #1 Status Byte - See Detail Below
15..18	4 Byte	Real	Gun / Mixer #1 Actual Flow A (cc/min)
19..22	4 Byte	Real	Gun / Mixer #1 Actual Flow B (cc/min)
23..26	4 Byte	Real	Gun / Mixer #1 Actual Flow C (cc/min)
27..30	4 Byte	Real	Gun / Mixer #1 Actual Total Flow (cc/min)
31..34	4 Byte	Real	Gun / Mixer #1 Actual Ratio A (parts)
35..38	4 Byte	Real	Gun / Mixer #1 Actual Ratio B (parts)
39..42	4 Byte	Real	Gun / Mixer #1 Actual Ratio C (%)
43	1 Byte	SINT	Gun / Mixer #2 Status Byte - See Detail Below
44..47	4 Byte	Real	Gun / Mixer #2 Actual Flow A (cc/min)
48..51	4 Byte	Real	Gun / Mixer #2 Actual Flow B (cc/min)
52..55	4 Byte	Real	Gun / Mixer #2 Actual Flow C (cc/min)
56..59	4 Byte	Real	Gun / Mixer #2 Actual Total Flow (cc/min)
60..63	4 Byte	Real	Gun / Mixer #2 Actual Ratio A (parts)
64..67	4 Byte	Real	Gun / Mixer #2 Actual Ratio B (parts)
68..71	4 Byte	Real	Gun / Mixer #2 Actual Ratio C (%)
72	1 Byte	SINT	Gun / Mixer #3 Status Byte - See Detail Below
73..76	4 Byte	Real	Gun / Mixer #3 Actual Flow A (cc/min)
77..80	4 Byte	Real	Gun / Mixer #3 Actual Flow B (cc/min)
81..84	4 Byte	Real	Gun / Mixer #3 Actual Flow C (cc/min)
85..88	4 Byte	Real	Gun / Mixer #3 Actual Total Flow (cc/min)
89..92	4 Byte	Real	Gun / Mixer #3 Actual Ratio A (parts)
93..96	4 Byte	Real	Gun / Mixer #3 Actual Ratio B (parts)
97..100	4 Byte	Real	Gun / Mixer #3 Actual Ratio C (%)
101	1 Byte	SINT	Gun / Mixer #4 Status Byte - See Detail Below
102..105	4 Byte	Real	Gun / Mixer #4 Actual Flow A (cc/min)
106..109	4 Byte	Real	Gun / Mixer #4 Actual Flow B (cc/min)
110..113	4 Byte	Real	Gun / Mixer #4 Actual Flow C (cc/min)

RF2 Output Array 1 (SINT 496)			
114..117	4 Byte	Real	Gun / Mixer #4 Actual Total Flow (cc/min)
118..121	4 Byte	Real	Gun / Mixer #4 Actual Ratio A (parts)
122..125	4 Byte	Real	Gun / Mixer #4 Actual Ratio B (parts)
126..129	4 Byte	Real	Gun / Mixer #4 Actual Ratio C (%)
130	1 Byte	SINT	Channel #1 Status Byte 0 - See Detail Below
131	1 Byte	SINT	Reserved
132..135	4 Byte	Real	Channel #1 Actual Inlet Pressure (psi) if applicable
136..139	4 Byte	Real	Channel #1 Actual Outlet Pressure (psi) if applicable
140..143	4 Byte	Real	Channel #1 Actual Flow (cc / min)
144..147	4 Byte	Real	Channel #1 Actual Flow Command (cc / min)
148..151	4 Byte	Real	Channel #1 Actual Inlet Pressure Pilot (psi)
152..155	4 Byte	Real	Channel #1 Actual Flow Pilot (psi)
156..171	16 Byte		Reserved
172	1 Byte	SINT	Channel #2 Status Byte 0 - See Detail Below
173	1 Byte	SINT	Reserved
174..177	4 Byte	Real	Channel #2 Actual Inlet Pressure (psi) if applicable
178..181	4 Byte	Real	Channel #2 Actual Outlet Pressure (psi) if applicable
182..185	4 Byte	Real	Channel #2 Actual Flow (cc / min)
186..189	4 Byte	Real	Channel #2 Actual Flow Command (cc / min)
190..193	4 Byte	Real	Channel #2 Actual Inlet Pressure Pilot (psi)
194..197	4 Byte	Real	Channel #2 Actual Flow Pilot (psi)
198..213	16 Byte		Reserved
214	1 Byte	SINT	Channel #3 Status Byte 0 - See Detail Below
215	1 Byte	SINT	Reserved
216..219	4 Byte	Real	Channel #3 Actual Inlet Pressure (psi) if applicable
220..223	4 Byte	Real	Channel #3 Actual Outlet Pressure (psi) if applicable
224..227	4 Byte	Real	Channel #3 Actual Flow (cc / min)
228..231	4 Byte	Real	Channel #3 Actual Flow Command (cc / min)
232..235	4 Byte	Real	Channel #3 Actual Inlet Pressure Pilot (psi)
236..239	4 Byte	Real	Channel #3 Actual Flow Pilot (psi)
240..255	16 Byte		Reserved
256	1 Byte	SINT	Channel #4 Status Byte 0 - See Detail Below
257	1 Byte	SINT	Reserved
258..261	4 Byte	Real	Channel #4 Actual Inlet Pressure (psi) if applicable

RF2 Output Array 1 (SINT 496)			
262..265	4 Byte	Real	Channel #4 Actual Outlet Pressure (psi) if applicable
266..269	4 Byte	Real	Channel #4 Actual Flow (cc / min)
270..273	4 Byte	Real	Channel #4 Actual Flow Command (cc / min)
274..277	4 Byte	Real	Channel #4 Actual Inlet Pressure Pilot (psi)
278..281	4 Byte	Real	Channel #4 Actual Flow Pilot (psi)
282..297	16 Byte		Reserved
298	1 Byte	SINT	Alarm Word 0 - Byte 0
299	1 Byte	SINT	Alarm Word 0 - Byte 1
300	1 Byte	SINT	Alarm Word 0 - Byte 2
301	1 Byte	SINT	Alarm Word 0 - Byte 3
302	1 Byte	SINT	Alarm Word 1 - Byte 0
303	1 Byte	SINT	Alarm Word 1 - Byte 1
304	1 Byte	SINT	Alarm Word 1 - Byte 2
305	1 Byte	SINT	Alarm Word 1 - Byte 3
306	1 Byte	SINT	Alarm Word 2 - Byte 0
307	1 Byte	SINT	Alarm Word 2 - Byte 1
308	1 Byte	SINT	Alarm Word 2 - Byte 2
309	1 Byte	SINT	Alarm Word 2 - Byte 3
310	1 Byte	SINT	Alarm Word 3 - Byte 0
311	1 Byte	SINT	Alarm Word 3 - Byte 1
312	1 Byte	SINT	Alarm Word 3 - Byte 2
313	1 Byte	SINT	Alarm Word 3 - Byte 3
314	1 Byte	SINT	Alarm Word 4 - Byte 0
315	1 Byte	SINT	Alarm Word 4 - Byte 1
316	1 Byte	SINT	Alarm Word 4 - Byte 2
317	1 Byte	SINT	Alarm Word 4 - Byte 3
318	1 Byte	SINT	Alarm Word 5 - Byte 0
319	1 Byte	SINT	Alarm Word 5 - Byte 1
320	1 Byte	SINT	Alarm Word 5 - Byte 2
321	1 Byte	SINT	Alarm Word 5 - Byte 3
322	1 Byte	SINT	Alarm Word 6 - Byte 0
323	1 Byte	SINT	Alarm Word 6 - Byte 1
324	1 Byte	SINT	Alarm Word 6 - Byte 2
325	1 Byte	SINT	Alarm Word 6 - Byte 3
326	1 Byte	SINT	Alarm Word 7 - Byte 0
327	1 Byte	SINT	Alarm Word 7 - Byte 1
328	1 Byte	SINT	Alarm Word 7 - Byte 2
329	1 Byte	SINT	Alarm Word 7 - Byte 3

RF2 Output Array 1 (SINT 496)			
330	1 Byte	SINT	Alarm Word 8 - Byte 0
331	1 Byte	SINT	Alarm Word 8 - Byte 1
332	1 Byte	SINT	Alarm Word 8 - Byte 2
333	1 Byte	SINT	Alarm Word 8 - Byte 3
334	1 Byte	SINT	Alarm Word 9 - Byte 0
335	1 Byte	SINT	Alarm Word 9 - Byte 1
336	1 Byte	SINT	Alarm Word 9 - Byte 2
337	1 Byte	SINT	Alarm Word 9 - Byte 3
338..340	3 Bytes		Reserved
341..344	4 Byte	Real	Fluid Usage Data - Selected Data - Mat. A
345..348	4 Byte	Real	Fluid Usage Data - Selected Data - Mat. B
349..352	4 Byte	Real	Fluid Usage Data - Selected Data - Mat. C
353..356	4 Byte	Real	Fluid Usage Data - Selected Data - Mat. Total
357..360	4 Byte	Real	Fluid Usage Data - Selected Data - Clean
361..493	133 Byte		Reserved
494	1 Byte	SINT	Output Array Identifier (1=Output Array 1, 2= Output Array 2) -- used with Anybus Gateway

RF2 Output Array 2 (SINT 496) - Used only for reporting active recipe values			
Address	Length	Datatype	Description
0	1 Byte	SINT	Station selected in RF2 Input Array[50] - Active Command Data - Component A - Valve Number
1	1 Byte	SINT	Station selected in RF2 Input Array[50] - Active Command Data - Component B - Valve Number
2	1 Byte	SINT	Station selected in RF2 Input Array[50] - Active Command Data - Component C - Valve Number
3..4	2 Byte	INT	Station selected in RF2 Input Array[50] - Active Command Data - Pot Life Time (min x100)
5..8	4 Byte	Real	Station selected in RF2 Input Array[50] - Active Command Data - Ratio A (parts)
9..12	4 Byte	Real	Station selected in RF2 Input Array[50] - Active Command Data - Ratio B (parts)
13..16	4 Byte	Real	Station selected in RF2 Input Array[50] - Active Command Data - Ratio C (%)

RF2 Output Array 2 (SINT 496) - Used only for reporting active recipe values			
17	1 Byte	SINT	Station selected in RF2 Input Array[50] - Active Command Data - Purge A Seq (1-16)
18	1 Byte	SINT	Station selected in RF2 Input Array[50] - Active Command Data - Purge All Seq (1-16)
19	1 Byte	SINT	Station selected in RF2 Input Array[50] - Active Command Data - Load Seq (1-16)
20..30	11 Byte		Reserved
31..32	2 Byte	INT	Gun/Mix selected in RF2 Input Array[82] - Active Command Data - Default Flow (0-3500)
33..34	2 Byte	INT	Gun/Mix selected in RF2 Input Array[82] - Active Command Data - Max Flow
35..36	2 Byte	INT	Gun/Mix selected in RF2 Input Array[82] - Active Command Data - Min Flow
37..38	2 Byte	INT	Gun/Mix selected in RF2 Input Array[82] - Active Command Data - Ratio Tolerance
39..40	2 Byte	INT	Gun/Mix selected in RF2 Input Array[82] - Active Command Data - Ratio Tolerance Volume
41..42	2 Byte	INT	Gun/Mix selected in RF2 Input Array[82] - Active Command Data - Flow Rate Tolerance
43..44	2 Byte	INT	Gun/Mix selected in RF2 Input Array[82] - Active Command Data - Flow Rate Tolerance Time
45..46	2 Byte	INT	Gun/Mix selected in RF2 Input Array[82] - Active Command Data - Trigger On Delay
47..48	2 Byte	INT	Gun/Mix selected in RF2 Input Array[82] - Active Command Data - Trigger Off Delay
49..50	2 Byte	INT	Gun/Mix selected in RF2 Input Array[82] - Active Command Data - Sequence High Flow Rate
51..70	20 Byte		Reserved
71..74	4 Byte	DINT	Channel selected in RF2 Input Array[123] - Active Command Data - Calibration PPL
75..76	2 Byte	INT	Channel selected in RF2 Input Array[123] - Analog Flow Meter Calibration- Input Low
77..78	2 Byte	INT	Channel selected in RF2 Input Array[123] - Analog Flow Meter Calibration- Input High
79..80	2 Byte	INT	Channel selected in RF2 Input Array[123] - Analog Flow Meter Calibration- Scaled Low

RF2 Output Array 2 (SINT 496) - Used only for reporting active recipe values			
81..82	2 Byte	INT	Channel selected in RF2 Input Array[123] - Analog Flow Meter Calibration- Scaled Low
83..86	4 Byte	Real	Channel selected in RF2 Input Array[123] - Flow Kp
87..90	4 Byte	Real	Channel selected in RF2 Input Array[123] - Flow Ki
91..94	4 Byte	Real	Channel selected in RF2 Input Array[123] - Flow Kd
95..96	2 Byte	INT	Channel selected in RF2 Input Array[123] - Inlet Pressure Setpoint
97..100	4 Byte	Real	Channel selected in RF2 Input Array[123] - Inlet Pressure Kp
101..104	4 Byte	Real	Channel selected in RF2 Input Array[123] - Inlet Pressure Ki
105..108	4 Byte	Real	Channel selected in RF2 Input Array[123] - Inlet Pressure Kd
109..112	4 Byte	Real	Channel selected in RF2 Input Array[123] - Inlet Pressure PID Deadband
113..114	2 Byte	INT	Channel selected in RF2 Input Array[123] - Minimum Inlet Pressure
115..116	2 Byte	INT	Channel selected in RF2 Input Array[123] - Maximum Inlet Pressure
117..118	2 Byte	INT	Channel selected in RF2 Input Array[123] - Minimum Control Pressure
119..120	2 Byte	INT	Channel selected in RF2 Input Array[123] - Foldback Pressure
121..124	4 Byte	Real	Channel selected in RF2 Input Array[123] - I Band
125..128	4 Byte	Real	Channel selected in RF2 Input Array[123] - C Band
129..493	365 Bytes		Reserved
494	1 Byte	SINT	Output Array Identifier (1=Output Array 1, 2= Output Array 2) -- Used with Anybus Gateway Only
495	1 Byte	SINT	Handshake word

System Status Byte 0			
Address	Length	Datatype	Description
0.0	1 Bit	Bool	Comm Heartbeat
0.1	1 Bit	Bool	Fault Exists
0.2	1 Bit	Bool	Spare
0.3	1 Bit	Bool	Spare
0.4	1 Bit	Bool	Spare
0.5	1 Bit	Bool	Spare
0.6	1 Bit	Bool	Spare
0.7	1 Bit	Bool	Spare

Station Status Byte 0			
Address	Length	Datatype	Description
0.0	1 Bit	Bool	Run Mode
0.1	1 Bit	Bool	Spare
0.2	1 Bit	Bool	Fluid Sequence Active
0.3	1 Bit	Bool	HV Enable
0.4	1 Bit	Bool	Spare
0.5	1 Bit	Bool	Spare
0.6	1 Bit	Bool	Spare
0.7	1 Bit	Bool	Spare

Gun / Mixer Status Byte			
Address	Length	Datatype	Description
0.0	1 Bit	Bool	Trigger 1
0.1	1 Bit	Bool	Trigger 2
0.2	1 Bit	Bool	Trigger 3
0.3	1 Bit	Bool	Trigger 4
0.4	1 Bit	Bool	Spare
0.5	1 Bit	Bool	Pot Life Expired
0.6	1 Bit	Bool	Warning
0.7	1 Bit	Bool	Spray Shutdown

Channel Status Byte 0			
Address	Length	Datatype	Description
0.0	1 Bit	Bool	Flow Started
0.1	1 Bit	Bool	Calibration Active
0.2	1 Bit	Bool	Manual Override Active
0.3	1 Bit	Bool	Spare
0.4	1 Bit	Bool	Spare
0.5	1 Bit	Bool	Spare
0.6	1 Bit	Bool	Spare
0.7	1 Bit	Bool	Spare

Communications Via Anybus Gateway

If purchased, the RF2 may come equipped with an Anybus gateway which uses Ethernet /IP on the RF2 network, and a protocol of the customer's choosing on its secondary network. This gateway connects implicitly to both networks and transfers 496 bytes of input data and 496 bytes of output data between the networks. When using the gateway, the arrays listed in the section above are mapped into the Anybus tag addresses. The only difference is that since the RF2 utilizes two 496-byte arrays for outputting status data, it must report in byte 494 of the output array, which of the two arrays is represented in the Anybus tags. Programming must be done on the side of the customer to copy the data into the correct registers.

MANUAL CHANGE SUMMARY

10/12/2021	1st Draft
2/4/2022	Added clarity to specifications, Descriptions of Exterior Labels, Anchoring instructions, Grounding Instructions updated (Pages 4, 20, 25)
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WARRANTY POLICY

This product is covered by Carlisle Fluid Technologies' materials and workmanship limited warranty. The use of any parts or accessories, from a source other than Carlisle Fluid Technologies, will void all warranties. Failure to reasonably follow any maintenance guidance provided, may invalidate any warranty.

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